957
URRENT SAFETY TOPICS

Volume 1



GENERAL SESSIONS

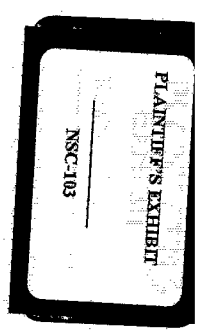
Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS



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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

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ANNUAL COUNCIL MEETING

MINUTES

The 1957 Annual Council Meeting of the National Safety Council was held in the Grand Ballroom of the Conrad Hilton Hotel, Chicago, on October 21, with Ned H. Dearborn, President, presiding.

The meeting opened with a Presentation of the Colors by Explorer Post 2022, Chicago Council of the Boy Scouts of America. The Invocation was offered by Dr. Paul Minnich Robinson, President of the Church Federation of Greater Chicago.

Mr. Dearborn then proceeded with the business of the meeting by announcing a quorum present, in person or by proxy. It was voted to dispense with the calling of the roll; also to dispense with the reading of the minutes of the previous Annual Meeting, as the minutes had been printed and circulated to the membership.

Mr. Dearborn called for the report of the Nominating Committee, which consisted of the following members: George A. Jacoby, Chairman; E. J. Buhner, Franklin M. Kreml, Miss Marion E. Martin, Guy L. Noble, H. J. Spoerer, A. E. Spottke.

Mr. Jacoby reported in behalf of the Nominating Committee, pointing out that the Constitution authorizes the Committee to name candidates for election to the Board of Directors and to all offices except the offices of Executive Vice President and General Manager, and to place in nomination at the Annual Council Meeting said candidates, as well as the candidates for election to the Trustees named by the Trustees. The selections of the Committee, Mr. Jacoby stated, were reported to the Secretary of the Council more than 75 days before this meeting, and were announced to all members of the Council on September 6, 1957.

Mr. Jacoby then presented as nominees for Trustees of the Council, to be elected for a three-year term: Melvin H. Baker, Cason J. Callaway, Cleo F. Craig, Richard R. Deupree, Dr. John F. Thompson, C. E. Wilson. (Secretary's Note: A complete list of the Trustees, including those nominated and elected at this meeting, as well as those continuing in office from previous elections, is given on pages 6 and 7 of this volume.)

Mr. Jacoby presented nominations for Directors, to be elected for a term of one year. (Secretary's Note: A list of the new Board of Directors, as nominated and elected at this meeting, will be found on pages 8 to 11 of this volume.)

Dr. Yant presented nominations for Officers of the Council, to be elected for a term of one year. (Secretary's Note: A list of the Officers nominated and elected at this meeting will be found on page 5 of this volume.)

There were no nominations except those presented by Mr. Jacoby. Mr. Dearborn announced that there were 28,885 votes favoring the slate presented by the Nominating Committee, and no votes opposed. Those attending the meeting voted without dissent in favor of the nominations, and Mr. Dearborn declared the nominees elected.

Mr. Jacoby paid special tribute to the following Council Officers who, after valuable service to the Council, are giving up their positions this year: Walter A. Stewart, Chairman of the Board of Directors; R. H. Ferguson, Vice President for Industry; Boyd Lewis, Vice President for Public Information. Mr. Stewart and Mr. Ferguson, although giving up their offices, will remain on the Board of Directors. Mr. Walter Carey, who has served as Vice President for Traffic and Transportation, is named Chairman of the Board for the new year. Mr. Dearborn introduced various Officers of the Council who were seated on the speakers' platform.

Mr. Dearborn said that two years ago the Board of Directors had approved a plan for inviting a selected list of influential business leaders and government officials from other countries to be our guests at this Congress. Invitation lists were compiled with the assistance of several departments of the federal government and of industrial leaders with world-wide connections. Growing out of this plan, Mr. Dearborn said, 22 special guests are in attendance at the Congress, coming from 19 different countries and representing a great variety of industrial and governmental leadership. The special guests were invited to stand and were greeted with a round of applause.

Mr. Dearborn also expressed warm greetings to all other delegates from foreign countries, many of whom are in attendance year after year, and made particular reference to the many Canadian delegates who attend the Congress.

A large number of young people who were attending the Farm Youth Sessions at the Congress were also asked to stand and were greeted with a round of applause.

Mr. Dearborn then introduced Executive Vice President G. C. Stewart, who called attention to the Council's new annual report, "Report to the Nation, 1957." General Stewart emphasized several highlights of the report and urged careful reading of it by all Council members.

Mr. Dearborn announced that the 1958 National Safety Congress will be held in Chicago, October 20-24.

The remainder of the program consisted of four addresses—by Warren Meland, Mr. Dearborn, Mrs. Gertrude H. Frese, and Major-General B. K. Young. These addresses, as well as the Invocation by Dr. Robinson, are included as a part of these transactions, on the pages immediately following.

In introducing Boy Scout Warren Meland, Mr. Dearborn took occasion to express the great significance which the National Safety Council attaches to the National Safety Good Turn Project of the Boy Scouts of America for 1958. He emphasized the tremendous accident prevention potential that is inherent in this organized effort of four and one-half million Scouts and their adult leaders, all working in cooperation with families, neighbors, businessmen, and public officials.

In introducing General Young, Director-General and chief executive officer of the Royal Society for the Prevention of Accidents, London, England, Mr. Dearborn expressed his great appreciation to General Young for his willingness to make the long journey from London, and also took occasion to thank the General and the Royal Society for the invitation tendered him to address the opening meeting of the Royal Society's National Safety Congress last year. The courtesy shown him at that time and the interest exhibited in his address, Mr. Dearborn said, left him forever grateful.

R. L. Forney
Secretary

THE INVOCATION

By DR. PAUL MINNICH ROBINSON

President of the Church Federation of Greater Chicago

Oh, Lord, our God, who has been a help in ages past and who art our hope for years to come, Thy glory is set above the Heavens and yet Thou dwelleth in the humble hearts of those who love Thee.

We thank Thee for the beauty of the world around us, for all Thy work, declare Thy praise, and the firmament show of Thy handiwork and most of all, now we thank Thee that Thou hast created man in Thy image and has endowed him with the mind and spirit to respond to fellowship to Thy own infinite spirit.

We pray Thou wilt give us such reverence for human life we shall oppose the sign of any act that will endanger or destroy it.

Awaken us all to a sense of responsibility to protect and preserve the safety of all of our citizens in every community across this broad land. Let not the powerful machines men's inventive genius has placed on the highways to bless our lives, because of our careless use of them, become to us a curse.

Grant to them the grace and courtesy and restraint of fast-control, that we shall regard the well-being of our neighbor as important to us as our own.

We pray Thy blessing upon the work of the National Safety Council and those whose concern for the common good of our society has brought them to this place.

May their efforts bring an increased measure of safety to our streets and our highways, to our homes, our families, and our places of daily toil. Unite us all in a deeper dedication to alertness and care which will preserve ourselves and others the life we owe to Thee.

Let Thy Kingdom come and Thy Will be done on earth as it is in Heaven. In Thy name and for the sake of Thy mercy and love, we pray; amen.

THE PRESIDENT'S REPORT

HAVE WE FAILED?

by NED H. DEARBORN
president, National Safety Council, Chicago

You have just elected me as your president for the ensuing year. I pledge you my best efforts. By action of our Board of Directors I shall thereafter be associated with the Council as President Emeritus, and shall, I hope and believe, be able to perform certain services for the Council and its members as desired.

But I do feel that this is the appropriate occasion for me to talk with you frankly and sincerely about a number of things that have been very much in my thoughts over the years.

First, I want you to know that it has been a rare privilege and distinct honor to serve you, and I am profoundly grateful for your confidence, encouragement, and support.

Have we failed? That is the title of this short talk. To begin with, I am mindful of the many gains we have made together during the last 15 years. I am mindful of the vastly increased cooperation of hundreds, even thousands of organizations enlisted in the great crusade for safety.

I am mindful of the active participation of thousands of influential individuals—civilians and public officials—in our great social and economic movement to prevent accidents and thus to save countless lives, reduce serious non-fatal injuries, and to protect property. I am mindful of the enlistment of women and women's organizations in this mighty cause. I am mindful of enlisting labor support. I am mindful of the growing interest of schools and colleges in safety.

AGENCY SUPPORT

I am mindful of increased appreciation of governmental agencies—federal, state and local—in the importance of accident prevention.

I am mindful of the steady gains in home and farm safety.

I am mindful of the constant support of business and industry in safety through their own improved safety records, a growing membership in the Council, and through financial and other contributions.

I am mindful of the slow but steady acceptance of moral and social responsibility in addition to individual responsibility for safe practices.

I am mindful of the growing cooperation from medical and public health agencies.

I am mindful of the recent encouragement by the clergy of all denominations.

I am mindful of the important backing of our Trustees.

I am mindful of the dedicated services of our Boards of Directors.

I am mindful of the space and time contributed by all media of public information.

I am mindful of the consecrated efforts of our staff to the cause which in turn is consecrated to the social and economic welfare of our beloved country.

And I am mindful of the Council's privilege of serving in some measure the people of other countries.

It has been a memorable 15 years for me and I am proud to have been a part of the progress in safety in the time I have been with you.

HEALTHY DISSATISFACTION

One of my guiding principles has been to maintain a high degree of healthy dissatisfaction. This talk is in harmony with that principle.

We have failed thus far to achieve our ideals. All of us together have failed thus far to arouse the American people to the true importance of safety to the social and economic health of our society.

We have failed to stir the hearts of our fellow countrymen. There are scores of eminently worthy causes which arouse widespread support—hear ailments, cancer, tuberculosis, poliomyelitus, muscular distrophy, and, currently, Asian influenza, to mention only a few.

Why, oh why, in the name of humanity, don't the American people react to the terrible toll of accidents— 95,000 killed in 1956 alone, more than a million injured, many thousands of them permanently; and an estimated economic loss of $11,200,000,000.

The facts have been told over and over again. But Americans just don't react as they do to other worthy causes. You and I have failed to reach their hearts and minds.

Who are the "we" I seem to indict so vigorously?

It is all of us who are actively participating in the safety movement. That includes you and it includes me.

SUPPORT STILL WEAK

Business has only recently taken positive action against off-the-job accidents and even so their programs are far from universally applied. Business support of our public service program has grown steadily but slowly but I regret to say that it has been in hundreds of thousands of dollars where it should have been in millions. That is especially true of industries which profit most from accident prevention.

Labor is still a weak safety voice crying in the wilderness.

Women are nowhere near as active, so far, in our field as in other worthy welfare work.

The schools and colleges at best have made only a good beginning.

Government interest and action is growing, but many areas are still sadly neglected.

The U. S. Department of Health Education and Welfare, the natural national official home of safety, has no officer whose sole function is the promotion of safety, except among department employees.

The religious crusade is too recent in origin to assess beyond its potential worth.

All media of public information have earned our highest praise in emphasizing safety, but it apparently hasn't aroused public indignation against violators of safe practices.

Some agencies still show symptoms of apprehension of the National Safety Council's prestige, even though they are free to, and do, participate in the Council's conferences, sections, and committees.

Even the Council's own governing body and its own staff at times exhibit timidity and complacency.

PUBLIC UNIFORMED

Our public information program has enjoyed an incredible success with public information media as measured by time and space, but the Council is still most often mentioned by Mr. and Mrs. John Q. for its weekend holiday estimates of traffic fatalities—only a small fraction of our year-round public information program.

I have made suggestions from time to time related to program changes and additions which in some cases have met with passive opposition. But that can only mean that I personally failed to persuade a sufficient number of my colleagues and associates to a program of action that would set fire to the intelligence, imagination, and emotional reactions of the American public.

Some of my suggestions were either insufficient, inadequate or impractical. Whatever the reason, I repeat, you and I have failed to arouse the American people to the point where militant action against accidents is locally applauded and supported.

One example will typify local attitudes toward safety in contrast with those toward the dread diseases. The Titusville Herald, a first-rate daily newspaper in our recently adopted home of Titusville, Pennsylvania, had a special editorial in its issue of October 14, 1957, entitled "No Cause for Panic." I quote excerpts from it—not at all in criticism of the contents of the editorial or the praiseworthy reasons for publishing it, but to contrast community reaction to one of the dread diseases, in this case typhoid fever, with community reaction to accidents.

REACTION DIFFERS

In the last few days 16 cases of typhoid fever had been recorded in this beautiful city of some 10,000 souls in an even more beautiful setting in the foothills of the Allegheny Mountains. The editorial was as follows:

"The typhoid fever outbreak naturally has the community upset . . . The disease seems to be confined in general to one age group in one school . . . If the disease had struck in

several age groups in several localities, the situation would be far different than it is . . . Parents are now alert to watch for symptoms in their children . . . The medical profession in Titusville has been and is ready to strike back with every medical weapon in its vast pharmacy. The community is also fortunate to possess the fine facilities of the Titusville Hospital . . . Our health authorities will continue in a methodical and scientific way to track the beast to its lair . . ."

In the same issue of the Herald there were seventeen news stories of accidents over the weekend and all but one were about accidents in the immediate area. Eight deaths were reported, three of them in the vicinity of Titusville.

There have been no deaths from typhoid fever and yet the main "talk of the town" is this incipient epidemic. Even the Asiatic flu and good old sputnik have taken back seats to typhoid fever. The only place where accidents seem to be recognized as a primary problem is in the Herald, the police department (whose good work in traffic safety was properly editorialized earlier by the Herald), and a handful of local business concerns whose interest is primarily in plant safety.

NO COMMUNITY EFFORT

The fact remains that there is no organized community effort in Titusville to prevent accidents and no obvious interest in such an enterprise beyond those groups I have mentioned. There are thousands of communities throughout the nation of which similar comment could be made. This is no criticism of the good people of these communities.

It is, rather, a criticism of us in the safety field. I repeat again we have failed to arouse the American people sufficiently to a deadly and diabolic peril which they can control. We can have safety anywhere if a sufficient number of us want it.

What, you may properly ask, can be done about this unhappy situation?

In the first place, a new look at the program of the National Safety Council can be instituted by our Board of Directors.

The new look should be taken by people with scientific training outside our own staff—psychologists, psychiatrists, medical and health officers, sociologists, biologists, mathmaticians, and others who are competent objectively to study the problems and to make recommendations on how to prevent accidents.

You in this audience and other members not represented should welcome and support such an investigation. The report of such a study as I have, in a general way suggested, should be welcomed and supported by every agency, private and public, engaged in accident prevention in any field of safety.

We need to know the basic causes of accidents and how to circumvent them. It is not enough to know where, when and how the accidents occur. We must know why they occur and that is the reason for more and more scientific appraisal of the basic causes. This kind of an appraisal might very well revolutionize our programs of accident prevention. At the very least it would have a very sobering and salutary effect on all of us.

RECHANNEL FUNDS

American business spends enormous sums on research to keep pace with the times. Safety deserves the same kind of support. We lack sufficient finances to conduct adequate research for the things we are doing to say nothing of the research financing needed for the additional things we should do. That just does not make sense.

I am glad to know that this type of traffic safety study now is being undertaken by the Northwestern University Traffic Institute and by the Bureau of Public Roads in the U. S. Department of Commerce.

Evangelism is needed, too. But so far it isn't fiery enough or it has fallen short in methodology. Not all of us are Billy Grahams in the safety movement, but each of us in his own limited way is an evangelist. The net result so far is too few who have made the great decision for safety.

Finally, let each of us in safety work examine and re-examine our own efforts to prevent accidents with a critical eye and a receptive mind to changes in safety education and practices.

Let us each be a more consecrated apostle of safety and win disciples, far and wide, who will spread our sacred gospel to the ends of the earth. This is no less than our solemn duty.▲

1958 NATIONAL SAFETY GOOD TURN

by WARREN MELAND
Explorer Post 2912, Boy Scouts of America, Chicago

You can imagine what a thrill it is for me to appear before the greatest gathering of safety leaders held anywhere, any time, in the United States—and announce that in 1958 the Boy Scouts of America will devote their good turn to safety!

This links the Boy Scouts and the National Safety Council together in what I am sure every one of us agrees is one of the greatest crusades in history—and I can tell you that the Boy Scouts are proud and honored to be part of this safety movement.

OPERATION—SAFETY

I'd like to take just a minute to tell you how the Boy Scouts intend to conduct this safety program, one which all of us—young and old—must make a success.

The Safety Good Turn is a major campaign—within our own Boy Scout movement—and also in the way we will affect the general public. To do it right—and that is the only way the Scouts like to do things—we will break it into bite-sized pieces we can really get our teeth into.

The plan of operation for the 1958 Boy Scout Safety Good Turn will be divided into these three groups: first, traffic safety; second, outdoor safety and lastly, home safety.

Our first phase, traffic safety, will be emphasized during the months of March, April and May of 1958. At this time each Cub Pack, Boy Scout Troop and Explorer Post will take part in a safety project in the automotive, bicycle, pedestrian, railroad or farm equipment field.

During the months of June, July and August the emphasis will be on outdoor safety. Hereby each unit will take part in either a water, fire, firearms or farm safety project.

ALERT THE FAMILIES

The third group to be completed during September, October and November stresses Home Safety. Here, particularly, all units will participate in projects designed to alert the entire family on being prepared to make safety a personal and fundamental part of everyday living.

If the Safety Good Turn does nothing more than alert the Scouts and their immediate families, we can bring safety to 18-million people directly, more than one-tenth of the population of this country.

The 1958 Safety Good Turn then becomes a challenge to every Scout and Scouter in the nation. We know we must promote the proper attitudes toward safety practices in traffic, outdoors and in the home and give everyone the opportunity to put into action the motto "Be Prepared."

We know that national programs are fine—but they must be carried to the individual. In Scouting we like to say, "Learning by Doing" and through your help that is how this safety program will be carried out. Think of what it will mean to have safety played up big by 100,000 Scout units in our country.

SAFETY—DAILY HABIT

These projects must include interesting the youth and the public of our country in safety, making it apparent to everyone the urgent need for reducing the tragic toll of accidents. But, even more important, to stimulate a public concern in the prevention of accidents, the Boy Scouts of America will co-operate with all safety organizations in individual, group, and community safety projects. We will make safety a part of our daily living; almost as much a part as eating, which I am sure no one forgets to do.

The Scouts are proud to have been called upon by the President of the United States to enlist in this campaign. It gives youth the opportunity to serve our community and our nation—in a significant manner—in a way we can be sure of accomplishing something. To have a part in the conservation of human life, to help influence other youth and their families, to reduce injuries and prevent accidents—all of this we will do. But even though I, myself, and my four-

and-one-half-million fellow Scouts are eager to carry this message—we want to carry the right message.

Therefore, we turn to you at this time. In your group is the experience in safety which we must look to.

Here, then, is my message to you. The Boy Scouts are counting on your aid. Thousands of "sign up" cards will be made available to you during this week. Fill out this card indicating your interest in helping the Scouts to do this good turn. Please sign up! We'll try our level best to do our part —but we need your expert safety help.

Every Scout takes the Scout Oath. It starts "On my honor, I will do my best to do my duty to God and my country."

With your interest and aid, Gentlemen, four-and-one-half-million Scouts can and will do their best.

WOMEN IN INDUSTRY

by MRS. GERTRUDE H. FRESE

assistant to vice president and general manager, New York Telephone co., Brooklyn, N. Y.

Are people always going to read the mounting statistics of accidents—fatal and mutilating—and stand by complacently, thinking, I'm immune to all this—I'm different? Or are they going to face up to it and get in and do something about it? Can't we make safety as much a part of daily living as food, clothing, relaxation and spiritual refreshment?

Dr. Norman Vincent Peale in his book *How to Stay Alive All Your Life*—which incidentally would be an appropriate title for a safety campaign—reminds us that "The body is a temple given to us by God." To keep it, we must feed it, cleanse it, use it in moderation. Most of us do this automatically without thinking about it as a temple. That is, we care for ourselves as far as we can through good nutrition, sleep, shelter and clothing. But the Bible says "Know ye not that the body is the temple of the soul." If we could fully comprehend this statement, would we not seek to protect our body, this temple of the soul, from accident in every way possible." That's a big "if."

If we did—wouldn't we be cautious in the home, careful on the street, and alert on the highway?

If we did—knowing that attitudes are formed early in childhood, wouldn't we train our children in safety as a way of life?

If we did—a mother would not look at me in questioning fashion when *I* asked what the local P.T.A. is doing to teach safety to small fry. She wouldn't say blankly—"Safety! I don't think we are doing anything. Why?"

If safety were part of our daily living, children wouldn't be riding bicycles pell-mell down a highway in suburbia on the wrong side of the road, or riding in—"look ma, no hands" style.

THE BIG "IFS"

If—parents wouldn't be rushing to the railroad station with only seconds to spare, the wife in curlers, a coat thrown over her pajamas. Nor would the husband try to drive and drink a cup of coffee at the same time, not only missing his train, but dying in the attempt to make it.

If—a pilot wouldn't be able to say that we lose many more men driving home than we do flying planes.

If—a taxi driver wouldn't drive through a crowded street with one finger on the wheel, his right arm over the seat, turning his head to talk to his passenger.

If safety were part of our daily life, girls wouldn't clip-clop along in toeless, backless, shoeless shoes endangering life and limb with every teetering step down a stairway; nor wear the thin, thin spike heels that sink in every crack and cranny tripping the wearer.

If—teenagers wouldn't drive with one arm out the window as their dads do—or, worse, ride with baby shoes, dice, scarves and feathers dangling on the rear view mirror.

If safety thinking and protection of our body were part of our daily living, a father wouldn't race down the platform and try to board a train as it picks up speed pulling out of the station. If—If—If!

How can we eliminate these big "ifs?" How can we get people to believe the body is the temple of the soul? How can we get them to "stay alive all their lives?"

STATE OF MIND

The remedy, of course, is a properly conditioned state of mind within the individual. The individual must be impressed with the advantages of safeguarding himself against accident and then be given no opportunity to forget these advantages.

In trying to save people from themselves—an accident, an injury, a tragedy that they themselves could prevent or avoid—every idea, every device, every school of thought possible is needed and should be used. But ideas, devices and schools of thought are not of themselves sufficient—we need to enlist people—millions of people—if we are to make safety-consciousness a way of life in our country.

This brings me to my theme—the power of women as a force for safety. This is not a new subject. Women and the power of women we have had with us always! In fact, I can't even claim credit for resurrecting it. General Stewart asked me to go into this. He knows I'm a business woman, and a club woman, as well as a housewife. He further knows that the Women's Activities conference of the National Safety Council this year adopted as its goal, alerting all women to the fact that they are the "guardians of safety" for themselves and their families.

WOMEN'S BASIC INSTINCTS

The power of women which can and must be applied in the safety field is acknowledged by all—men and women alike. It derives naturally from the status of American women, developed down through the years to our present position in society today. Women possess natural basic instincts that tend toward caution, security, absence of violence, love, family stability and protection of the young. We have qualities of intuition frequently not possessed by men. We are the mothers, the teachers of the young, the homemakers of the nation. We are more social than men and set the standards of social conduct and morals.

Women can be a tremendous force for good when they are aroused. Haven't you seen a group of mothers prove to the town fathers that a street light is needed at an intersection? Pretty soon a traffic light is installed. They won their point through united action.

Women can be terrible in their wrath, as every husband present knows. The newspapers recently carried a bit about a man in Albuquerque, New Mexico, who learned the hard way. His car was blocked by a line of traffic. He got out and threatened the woman of the car in front of his. She reached down, picked up a hammer, and hit *him on the head. This rather violent reaction* to masculine criticism is not recommended, of course.

What is our responsibility if we women are to do something in the field of safety? The problem is immense and intricate. There are sociological, physiological, economic and political aspects all wrapped up together. And the American woman can effectively tackle all aspects at once. But how?

OBLIGATIONS OF WOMEN

First, let us consider our obligations and responsibilities in the home.

Are mothers devoting care and thought to safety training for their children? Have some lost the respect of their children and abandoned all effort to guide and control them? The home is the heart of our lives and the wife and mother should be the heart of the home. Here, through courtesy, kindness, consideration, tact and untiring diligence we have our best opportunity to develop safety-minded citizens. Safety by example and training is needed here.

The housewife, however, is the hardest person to reach. If she is a joiner and belongs to a club, she can be approached and taught the meaning of safety. If not, it's more difficult. However, many wives and

mothers are married to men in industry, and industry is beginning to reach out to them. The Bell Telephone company of Pennsylvania, which is part of the Bell System to which I belong, has started a series of evening meetings for the family. Safety skits, motion pictures and talks are part of the program. The children, the husbands and the wives attend. Home and traffic safety are discussed, even to teaching the youngsters how to roller skate safely.

My own company, the New York Telephone company, is about to launch a safety essay contest for children between the ages of nine and 13. The subject is what my mother or father, or both, are doing to prevent accidents. This is another means of reaching into the home—another way to get the wife and mother thinking about safety.

TEACHERS' INFLUENCE

After the home, the next great training field for youth is, of course, the school. Women as teachers can exert great influence for safety in our schools. Furthermore, through our participation in Parent-Teacher and other civic organizations, we can provide assistance in the schools for appropriate safety education.

In Phoenix, Arizona, there is an effective program which I understand, is spreading elsewhere in our country. Children in elementary school are taught how to drive. The schoolyard is marked off to simulate a city street or highway. Small pedal cars are used for instruction purposes. The boys and girls learn to recognize and observe universal signals and signs. This is most effective: for not only does it reach the child, but many parents attend these training meetings. This type of training is invaluable and women could be instrumental in making it available all over the country.

What about the slaughter on our highways? If we have any desire to protect our loved ones and any compassion for pain and suffering, women should act here! And we have plenty of tools—tact, charm, ingenuity and authority to force our friends and loved ones to protect themselves. In this field club women have contributed a great deal.

An example—my own club, the Altrusa International's public affairs program is directed to four major areas of concern. Traffic safety is first in order, with emphasis on three individual goals—to be a safe driver, to promote safe driving and to be a law-abiding pedestrian. The last item is of particular importance. Did you know that another word has been added to our vocabulary in recent years—"Pedestricide?"

TRAFFIC SAFETY MONTH

As a result of Altrusa's forward-looking public affairs program, many of our clubs over the country have been contributing toward safety in the community. In Oregon, the month of February was designated as traffic safety month and the Portland Altrusa club promoted safety on a state-wide basis.

One interesting event was a fashion show which featured such items for traffic safety as: white umbrellas, white overshoes and white raincoats for pedestrians. Another organization, "The American Council of Railroad Women," has a code called "Good manners are good business," and item three is a rule as to how a women should act as a pedestrian and a driver.

I have attended many club board meetings, the purpose of which was to find a project for the club year. Women in every town and hamlet, every city and village, searching for a worthwhile endeavor for the club to work for. Safety programs of all types promoted by women's clubs everywhere in the United States could have a powerful effect in helping to reduce accidents, particularly if the clubs banded together in the community for a common purpose.

FOR WOMEN ONLY

In a New York Safety Conference, a general of the United States Army was quoted as saying "I can keep the boys safe while they are at camp—our safety record is good—but I can't keep them safe when they leave home too late, to drive too far, too fast. It's the mothers of America, the fathers of America, the homes of America that are murdering American boys." Well, a number of telephone women working in the safety field heard that quotation, and it added fuel to the fire.

They had been concerned about the increasing number of off-duty automobile accidents. Too many of our girls are injured while riding as passengers. This seemed to be the time to launch a crusade for safety on the road; a program of "women only," for the working women, of the New York Telephone company.

We needed first of all a plan, and we called that plan "You Are Important as a Woman in Traffic." This was really a clever title since it was directed to telephone operators who work in what is known in our company as the traffic department. Telephone calls are known as traffic in my business.

The crusade was an entirely new thing for us really because it called upon every female talent known to man—charm, tact, ingenuity and love. All these distinctive characteristics were to be concentrated on just one thing—keeping the family together—alive, together— particularly when dad and the son took over the wheel.

LEISURE TIME SAFETY

We in the Bell System have done, and are doing, quite a bit along the lines of leisure time safety. We have published informative and interesting material on the subject of safe vacations because we believe that summer vacation was instituted to refresh and renew, not to exhaust and maim. We cover such subjects as over-exhaustion, poison ivy, sunburn, and other bothers and hurdles in the obstacle course of today's summer living. Furthermore, we have every reason to believe that our people share this information with their families and friends.

But this safe driving crusade is unique in the sense that it changes a potential back seat driver into a convincing safety influence —in other words, a co-pilot. There are more than 31,000 women in the traffic department of the New York Telephone company and that's a powerful lot of influence when properly directed—either in the back seat or the front.

SOME SAFETY DON'TS

Listen for a moment to a bit from the Crusade Leader's Guide. After pointing out to the girl the many roles that she can play to promote safe driving, the Guide notes "Avoid tensions, irritations—these can be translated into an accident behind the wheel of a car. Don't start a discussion at the breakfast table which you know may become heated. Let your husband drive off to work in a happy frame of mind and hold the fire for some other time.

"Don't get your family all fidgety and nervous by always being late to get started for church, the movies or shopping. Don't keep your boy friend waiting 'just for effect;' he may become annoyed, rather than impressed, and if he takes his anger out on the car almost anything can happen."

There's more to our crusade. A series of 12 safety posters were developed. Leaflets associated with these posters are distributed by safety committees to employees on-the-job. One and all are urged to plug safe driving at picnics, ball games, dances, bridge parties, and in their civic organizations, churches and clubs.

We are sure that we are going to get as much safe-driving mileage out of our fathers and sons, nephews and uncles and, incidentally, ourselves, as courtesy and friendly persuasion will allow.

This brings me to a sizable and accessible group of women—the women who work. There are more than 22 million women employed full-time in the United States today holding one-third of all the jobs in the country.

WORKING WOMEN POTENTIAL

The growing importance of women in industry is indicated by the fact that the number of working women has increased about 57 per cent since 1940 while, during the same period, the male working population increased only about 12 per cent. The days when the song, "Heaven will Protect the Working Girl" really meant something are over.

Numerically the working woman is becoming a dominant factor in industry, an important man-power reserve, and a necessary economic participant. I think, therefore, that we must conceive that in the area of industrial safety, women are today an important factor. Are we taking full advantage of this kind of safety interest and safety motivation?

There are probably many people who believe that the type of work women do is not hazardous, therefore, women do not require the same degree of safety education as men. In the Bell System a few years ago, we were rudely jolted by the discovery that lost time on-duty accidents among our women employees were running at twice the frequency of male mishaps. A plan of

co-education was instituted with no lessening of emphasis in its application to women, and, today, there is no such disparity in the accident frequency records of our men and women.

We have found our telephone women to be receptive to fundamental safety suggestions such as, care on stairs, closing file drawers, opening doors carefully, and the like. We believe that specific suggestions on how to be safe on the job are much more effective than slogans and exhortations on the overall subject of safety.

COMPANY SAFETY PRIDE

The average woman in industry is not terribly concerned over office or department safety records in which she is nothing but a statistic. She may experience a vague sort of pride to learn that her company has earned a safety award. She is not likely to be too conscious of her part in winning such an award. The American working girl is a pretty realistic sort of person, a far cry from her ancestors of the smelling salts era.

She responds best to a safety approach that subordinates company banners and records and brings the matter right to her as an individual. I think the average working woman will react readily to the type of safety education which touches upon the unpleasant consequences of carelessness on-the-job or at home. Safety takes on a new meaning when its absence is associated with discomfort, loss of earning power, possibility of disability—yes—even the possible loss of dignity.

One of my own girls asked me with eyes flashing if I'd forgotten what the gals in my own department are doing, and I quote—"Monthly safety meetings, films, posters, pamphlets, discussions of ways and means to keep everyone alerted to the danger and harm that could affect us. The appointment of a 'safety observer' to act for a month at a time to watch and prevent accidents in the office. The final result—the development of a 'safety-eye' for hazards." End of quote. That girl has religion. She believes in the program. She practices it on-the-job and at home. There are 22 million like her that can be reached in industry today.

Her use of the term "safety-eye" struck me forcibly. With a "safety-eye" all women would indeed become the "guardian of safety" for themselves and their families. They'd see the rubbish in the cellar, the toys and packages left on the staircase, the flammable cleaning fluids in the kitchen.

They'd see the danger of a hurried breakfast and a dash to the railroad station. They'd try to control the driving of foolish teenagers. They'd see the danger of the thin spike heel, the backless shoe and the long pointed toe. They'd train their families to keep a "safety-eye" open in the "do-it-yourself" projects, in highway travel, in sports—in all daily living.

I firmly believe that we women can do a tremendous job in public and family safety education. We have the motivation in our basic instincts. We have the numbers to reach millions of people.

I have a firm belief that there is a force that can be put to work for safety. Its effects are scattered now but could be drawn together in one great movement. Women have the time, and the talent, and the cause is of transcending importance. It's up to the men to realize this, to understand that we can work side by side with them. It's up to them to mobilize this force and to call upon us really to do a job, a united job, in the safety field.▲

KEYNOTE ADDRESS

by MAJOR GENERAL B. K. YOUNG

director-general, The Royal Society for the Prevention of Accidents, London, England

The toll of death, injury and suffering—quite apart from economic loss—caused by accidents, can only be reduced by constant and continuous attack. That is our experience in Great Britain, and it is, of course, only from that point of view that I can talk to you.

Personally I think the word "accident" is both overworked and wrongly used. Close investigation of these incidents, be they road, home or industrial accidents, discloses that the main cause has so often been the failure of the human element; failure through ignorance, thoughtlessness, lack of consideration for others, breaking of rules or the disregard of the law.

Putting it bluntly, incidents, or accidents as we all call them, of this kind should never have happened and are totally unnecessary—yet with us they amount to no less than 80 per cent of all accidents.

I believe that most accidents are preventable; the arch enemy of prevention is that attitude of mind that says "it couldn't happen to me." People who think like that are really going about with their eyes shut deceiving themselves into thinking that it is always the other fellow who meets trouble and they themselves need not worry.

The safety worker's weapons are those of education, enforcement and engineering. There are no short cuts to any safety programs. Steady and persistent persuasion, allied to the enthusiasm and energy of the safety worker, will produce results despite the minor set-backs and apathy which he so often meets.

THREE E'S OF PREVENTION

There is no doubt about what the three E's of accident prevention can accomplish if given a chance, but though each of the three can individually accomplish a great deal, they can do far more if they are working continually and in the closest possible co-operation. At home, my Society, generally speaking, confines itself to education and all that that implies, but it doesn't believe in working in a watertight compartment so it maintains close liaison and co-operation with those responsible for enforcement and engineering. May I add that we also believe in a fourth E—Enthusiasm—and a good supply of that is essential.

Reduced to its simplest terms, we believe that the actual implementation of a safety program in any field must be undertaken locally. The local safety worker knows best the local conditions and can add the necessary local color to a national safety program. My Society, in conjunction with the appropriate Government departments, selects the campaign theme and produces and makes available for the local workers the necessary material, posters and leaflets. Special national campaigns are imposed, as thought fit, on top of the steady, all-the-year-round work. These may be of anything from a week to three months' duration.

We have found that by this method central planning goes far to ensure that at the appropriate and same time, all over the country, a simultaneous attack is launched locally using the same material and all directed to one particular and identical aspect of accident prevention. By this means we consider that we have achieved maximum penetration of the public mind. In this we get great help from the press and radio.

MORE MONEY REQUIRED

Before I get tied up with figures and statistics, I want to deal briefly with that other ever-present problem—finance. May I say at once that we never seem to have enough! I think it is really true to a considerable extent that safety can be bought—and it is just because we feel we would like some more safety that we wish we had more money with which to buy it.

In financial matters my Society does work in watertight compartments; each activity, road, home, industrial, agricultural safety is financially separate and funds obtained for one activity or branch of our work are not

available for another. We rely on subscriptions for our income. These come from a variety of sources: local authorities, industrial firms, transport organizations, insurance interests etc. It is only in the field of road safety that we receive a government grant.

To give you some idea of our task we have in Great Britain a population of just 50 million who own some seven million vehicles which they use on about 200,000 miles of roads which were not built for them. Of our population of 50 million there are on the average 11 million employed in those industries which come under our Factories Act and with which my Society is concerned.

FATAL ACCIDENT STATISTICS

On an average in Great Britain 80 people die as a result of some accident every day

(17 in some form of transit)
- 15 on the roads
- 1 on railways
- 1 in air & water transport

(5 in place of work)
- 2 in factories
- 1 in coalmines
- 2 in farms & quarries

- 7 miscellaneous, e.g. drownings, sports, falls
- 21 in the home

The annual toll of accidents averages 700 killed, and injuries to between 180,000 and 190,000. Machinery accidents are much in the minority, only about 16 per cent; the remainder are human failure or error accidents and include falling, handling of materials, being struck by a falling object or tripping over things.

Poor housekeeping is certainly a contributory factor. There is at present an annual increase in transportation accidents within the factory perimeter due to the fact that in many cases the internal traffic system was not designed for power trucks, fork lift trucks or mobile cranes.

Safety standards in industry are fixed by Parliament by means of the Factories Act which is implemented by the Factory Inspectorate. We regard this official standard as the bare minimum and use it as the base from which springs the voluntary accident prevention work sponsored by my Society.

We believe that safety in industry must be the concern of all from top management all the way down the line to the man on the shop floor. A good safety record should be the concern and pride of employer and employee alike. The safety officer is not an executive; his duties are advisory. He should be brought into the first planning stages of the design of a new factory or the expansion or alteration of an existing one.

Safety should be an integral part of any training program for new entry. There is no sense in spending money on a new machine and only training the operator how to use it; it is equally essential to train the operator how to use it safely, if only because an accident to the operator may well cost the employer more than the cost of any damage done to the machine.

SOCIETY'S SAFETY COURSES

My Society holds residential 14 day courses for safety officers and has taken great pride in fathering the birth of the new sturdy institution of industrial safety officers. To retain contact and encourage the vital interchange of safety ideas and experience we have now industrial safety groups operating in all the main industrial areas. The Society produces a technical safety journal *(The British Journal of Industrial Safety)* and an Industrial Accident Prevention Bulletin, together with a series of safety codes and propaganda material.

We plan and initiate an annual campaign, obtaining locally the cooperation of our industrial members and their safety officers, of local civic heads and of chambers of trade and commerce. These campaigns are usually for a week or 10 days; we completed our 1957 special campaign just before I left home, with the theme "Guard Your Hands."

Our annual road fatalities are about 5,250 and the injuries 250,000. I must add that according to the International Road Federation we have a vehicle per road mile density of nearly 21 against your 17, and that does not include the large number of motorcycles (more than 1,250,000).

We take pride that the continuous campaign (1) is holding these figures despite more vehicles on our roads and on increasing population at risk; (2) has reduced the annual fatalities from 7,000 at which figure they were running 25 years ago; and (3) has over the same period reduced child deaths from five a day to less than two.

HUMAN FAILURE

As in industry, an examination of road accidents shows that some 80 per cent should never have happened. They are due to a human breakdown such as ignorance, showing off, breaking the law, drink and lack of courtesy to others. It is a strange reflection on the human character that everyone always claims to be a good driver

If I asked whoever was driving me if he was really competent, that individual would be most insulted! On the other hand, if I asked someone, a stranger, to play golf he would most likely say he probably wouldn't be good enough, in fact he would not claim to be a plus player—but he thinks himself plus in the driving seat

We believe most sincerely in road safety education from the moment the child goes to school at about five years old. A start is made with the Kerb Drill (how to cross a road) and progresses to cycle training and a proficiency test. Through motorcycle clubs we are trying to teach and train the young motor cyclist. In all this we have the most excellent help of police and teachers.

I believe the child cyclist and the young motorcyclist are greater problems with us than with you. We are most anxious to carry on this progressive training so that the young teenager can be properly taught how to drive. If the next generation is properly trained in road sense, and taught to be defensive drivers, surely they will be better and safer road users than our own generation which did not have such good start.

PLANS CAMPAIGNS

Campaign planning and the production and provision of the necessary material is my Society's job. The actual campaign is carried out locally by the Road Safety committee of local authorities who in many cases employ a road safety officer who comes to our training courses. The government subsidizes approved road safety programs of local authorities to the extent of 50 per cent. I must emphasize that I am referring to the educational aspect, training and propaganda.

The Society, in collaboration with the Ministry of Transport, selects an annual campaign theme. This we break down into quarterly periods for which we issue an appropriate planning guide containing sample materials and suggested plans for local campaigns. On top of this we produce a special Christmas pack and material for the bank holidays at Easter, Whitsun and in August. It is a sad commentary on our civilization that holidays should mean more accidents and that Christmas Eve should be our worst day of the year.

At RoSPA House, in the center of London, we maintain our permanent Road Safety Training Center and Exhibition. With its staff of instructors, this center, by the use of all the visual aids, gives instruction which can be modified to interest children and experts.

OLD, YOUNG FATALITIES

Though faced with some 8,000 or more fatalities a year and an unknown number of injuries, this side of our work is the most backward and meets the greatest apathy, though I am glad to be able to add that it is really moving forward a little now. The victims are predominantly the old people and the under five's. The principal causes, so often due to carelessness, ignorance or thoughtlessness, are falls in the case of the old, and suffocation, burns and scalds in the case of the young.

Slowly but surely we are setting up local committees which will put in action what is really a major educational campaign. We enlist the help of medical officers of health, district nurses, health visitors, clinics and indeed, every kind of women's organization which we can interest.

My Society produces the educational and propaganda material for local committees to use and we are now issuing a regular quarterly planning guide.

Our own home provides us each with our own background. What happens in it affects our attitude and frame of mind, not only when going to and from our place of work but also when at work. If we could really get to the bottom of every accident we might well find that some minor accident at home

had set off a chain of reactions which became the primary cause of our accident on the road or at work.

NOT CLOSED SHOP

The moral is, I suggest, that accident prevention is not a closed shop and that there must be a real overlap when dealing with the different kinds of safety work.

From a close study of your Congress program, from the titles of the many interesting papers and addresses that will be given, even more so from noting just who your speakers are and what they do, I am convinced that our problems are similar to yours. I have come here to learn and to take new ideas back home with me. We are happy that in Great Britain we are assured of the closest possible contact and co-operation with your Air Force units stationed on our Island; we believe in an interchange of ideas and methods.

It was for that reason that we were so glad to have Mr. Ned Dearborn with us at our annual Congress. I am both proud and delighted to be here as the representative of my Society and would like to say here and now a most sincere thank you to you all and to wish you a most successful Congress.

ANNUAL BANQUET

BANQUET ADDRESS

by HONORABLE WILLIAM G. STRATTON
Governor of the State of Illinois

The opportunity to talk to this meeting tonight is one I have been anticipating for some weeks. It is good to be here in this atmosphere of dedication to a cause most important to every American—the cause of safety on our highways.

I am certain you know the intense interest the national Governors' conference has in this subject, and I bring you the greetings and best wishes of that conference, along with the welcome of the people of Illinois to your congress.

It would be encouraging if we could talk of nothing but progress in the drive to end the killings on our streets and highways. It would, however, be shortsighted indeed, even tragic, if we accepted what we have done with a complacent pat on the back, and said it is enough.

It is far from enough—remotely far from enough.

TOUGHER LAW, ENFORCEMENT

Here in Illinois in 1957 we took giant steps toward reducing the highway toll—through new and tougher laws, through heavy increases in our police force, through advanced planning for the education of younger drivers, and through better local enforcement.

It is true we did this, and it is true it seems to be having a salutary effect, but it is not enough.

In most of our other states the subject of traffic safety received close legislative and administrative scrutiny, and progress was made, to be sure—but it wasn't enough.

Truly, 1957 has been a year of action on the safety front, but our figures and our studies show it is still not enough.

Thus we must not talk of success, but of what must be done in the future. We must talk of the tremendous job ahead—the challenge facing all of us here and all people in this rapidly expanding, constantly motorized, economy.

I conducted a conference with department and agency heads who direct various phases of the traffic safety program here in Illinois. Representatives of the National Safety Council sat with us in the meeting. We discussed, analyzed, and dissected what we are doing to reduce traffic toll in human loss and economic cost.

We learned we are making progress, that things are moving ahead in this war for safety, that results to date have been good, as has been pointed out here tonight.

MUST INCREASE ATTACK

We learned something more important, however. We learned that what we have done is not enough, that much, much, remains to be done, that the attack must truly be stepped up. We left that meeting, I am convinced, with new drive and desire to accomplish our goal—the reduction of traffic toll to the irreducible minimum—and with the conviction that it can be done quickly.

Then a few days later we opened our newspapers to read the sickening news that five teen-age boys had died in one instant on a road in northern Illinois. We learned that they died in the shattering crash of a car which a second before had been going 100 miles an hour.

Any satisfaction we had experienced, those of us in that conference, was wiped out in that tragic instant. Some way, for some reason, this message of safety had not sifted through to the boy who was driving that car, or to his companions.

Certainly, we are making progress, but our new laws, our added police, our inven-

tories, our expensive advertising campaigns, missed the mark in that case, and five were dead.

We missed the mark. So it is that we should not talk of success, but of what is wrong. Where is our failure? Why are we not getting through to all the people this crucial message of traffic safety?

I note that your programs in this congress have sought some of the answers to that question, and I believe sincerely the solution to the problem lies among you here tonight. You are the persons who have the know-how for action.

Your firms daily call upon the boundless energy of American ingenuity to operate this nation's business and industry. If we can channel your knowledge, your experience, and your enthusiasm, into the field of traffic safety, the greatest killer and crippler in our time would be well down the road to defeat.

We need your help. Government and law can go only so far. Public support—(and the support we have received in Illinois is one of the most gratifying aspects of our safety program)—can do only so much. This emergency calls for skill, for adroit and effective appeal to the individual driver's conscience.

It is one of the most perplexing human behavior problems facing our states today. We can set speed limits, and we have done so in Illinois. We can enforce those limits, and we are doing so.

ILLINOIS' EFFORTS

We can enact stringent driver license requirements, with strong penalties, and enforce them—and we are doing that in Illinois. We can appeal through our media for support, cooperation, and caution, and we are doing that. We can exhibit the horror of auto tragedy, attempt to frighten dangerous people into sanity on the road. But it is not enough. The bitter fact is—it is not enough.

We need something further to produce a better driver, a more aware driver. We must make our drivers alert to the constant danger, the continual hazard they face when they sit behind the wheel. We must do this in the field of engineering, through the effective employment of the knowledge gained from our social scientists.

We must divert to our use the skill and techniques of modern marketing, to sell our product—safe driving.

Much attention has been given of late to the powers of persuasion which marks modern advertising techniques in creating expanding markets. The key to the effort, in many keen advertising minds, is to obtain the knowledge of what motivates people, and how their behavior can be changed by changing the motivational forces working upon them. The use of this mass psychoanalysis to guide campaigns of persuasion has become the basis of a multi-million dollar industry.

NEED MOTIVATIONAL RESEARCH

What these advertising people are learning about us could be useful in the field of traffic safety. Perhaps our answer is to have the motivational research specialists turn their attention to our problem.

A basic theory advanced by these subconscious salesmen in their work is the building of images that should arise before a person's inner eye at the mere mention of a product's name. The images the experts attempt to build into these products resemble something in the person's general make-up—a quality or trait to be admired—an expression of one's achievements.

Perhaps one of the most spectacularly successful image building performances has been that of the automobile industry.

The automobile has become more than only a method of transportation. It now tells people who we are, or who we want to be. One man said, "It is a portable symbol of our personality and our position." One research report even went so far as to place certain brands and colors of cars in buyer personality groups.

If this research is effective in telling manufacturers who are buying their cars, and why, it is quite possible that the same kind of research might tell us what quirks among the purchasers of automobiles lead to traffic violation and accident. Certainly there is potentiality of this modern advertising technique developing into an important tool for our purpose.

Like the hucksters, to be successful we must sell safety much the same way they sell soap, toothpaste, and automobiles. We are competing for the attention of the American public in a busy world. Even though we have finally sold the idea that a license to drive is a privilege and not a right, much remains to be done to create an improved climate for traffic safety through improved salesmanship.

We must search again to create in the mind of the public the proper image or symbol to associate accident prevention and traffic safety with all that is good and necessary. We must probe to find what the symbol is, and we need scientific knowledge and help to do it.

Some of your discussions here have posed this same possibility in the field of home safety, but accident proneness is not limited to step ladders.

We know now that constant hammering at the fact a person might be killed or maimed in an automobile accident is not a powerful enough deterrent to irresponsible driving. We must revamp our approach. We must find or create a more meaningful symbol than death to drive our point home.

Loneliness, scientists tell us, is perhaps the most unbearable of human emotions. Perhaps this is the peg for traffic safety in our advertising and educational efforts.

IS IT WORTH IT?

Imagine the loneliness and despair of a wife who loses her husband in a traffic accident, or of a man who is hopelessly confined to bed as he continues to relive the horror of highway tragedy and brood on the emptiness he must face because his family was slaughtered in an accident of his making.

We know so little, really, about people and why they are involved in accidents. We list surface reasons—excessive speed, for example—but we don't know why the driver was speeding in the first place. We need to know with certainty what prompts that driver to fly in the teeth of disaster, and how we can reach him in time to prevent it.

I propose that the leaders in motivational research conduct extensive studies to depth probe the underlying reasons for some persons' irresponsible action on the streets and highways of this nation. What we learn from them would be extremely valuable in developing an effective educational campaign on matters of traffic safety needs and progress.

It is encouraging to note that Northwestern university at Evanston recently announced the inauguration of a three year research program in which the social scientists will assist in a study to determine the nature and causes of traffic accidents.

While this is being carried out, we on the official side of the traffic accident prevention picture will do whatever is in our power to carry out the recommendations for state and local government improvement.

MOVEMENT NEEDS LEADERS

We must, however, look to you—the leaders in industry and business—to provide our states and municipalities with the citizen support so necessary to conduct an effective and continuing program for life saving action. We will improve our engineering, our enforcement, and the education of drivers. You must back us, and I know you will.

We long ago passed the point where traffic safety was considered only an official duty, with no role for the citizen other than passive acceptance of laws and regulations. All of us now realize the importance, the vital importance, of public support through acceptance of the laws and regulations, and the value of the backing of public spirited organizations such as those which have made such marked inroads on traffic deaths here in the city of Chicago.

Business and industry can provide the sinews for that support. We seek from you that strength, and I do not believe I am presumptuous if I point out that it is to your best interests, to back this attack.

A recent study by the Citizens Traffic Safety Board of Metropolitan Chicago showed more employee time is lost to Chicago's industries through traffic accidents and traffic law violations than from any other single cause, with the possible exception of the common cold.

ACCIDENT FACTS

Lost time means lost money and reduced production. Industrial safety people are well aware of this. Their work was a direct outgrowth of management's desire to reduce on-the-job lost time accidents. How well that work has progressed and how successful industrial safety has been, is graphically presented in one of the National Safety Council's publications called *Accident Facts*.

The Council has compiled no-injury records in 36 different industrial classifications ranging from chemical to mining, from iron and steel products to meat packing . . . totalling millions of man hours without accident. It is a sad commentary on the ability of America's driving public to compare a record of one person seriously injured or killed about every 30 seconds on roads and streets, against this record of millions of injury-free industrial man-hours.

The study I referred to earlier also revealed that although traffic accidents and violations account for a big share of the absentee problem in industry, traffic safety education ran a poor second or third to other company-conducted off-the-job accident prevention education . . . and lags far behind industrial safety programs in emphasis and expenditure.

If all of you will go back to your companies armed with the knowledge that industry can reduce its absentee problem by taking a greater interest in community traffic accident prevention programs, then this nation will see the greatest strides in traffic safety improvement we have ever known.

ILLINOIS ENFORCEMENT

Traffic safety training in industry will pay dividends, not only to industry itself, but to all the public. Consider this when you return to your firms. I do not expect, incidentally, any company to become as strict in this matter as we have in the state of Illinois government. I have issued orders to my department heads that willful violation of traffic codes on the part of any employee is grounds for dismissal, and this order has been incorporated as part of our personnel regulations.

Needless to say I find fewer state-owned vehicles passing my car on the roads of Illinois than in the past.

I want to avoid technical discussion of the various facets of traffic safety solution. As I have emphasized, we have reached the stage where we must go into the theoretical aspects of traffic safety to brace up the accepted techniques of engineering, enforcement, and education.

I know, however, this group is interested in the work the governors' conference is doing in this matter. This month, our staff is forwarding to the president's committee for traffic safety a series of studies for its consideration. These studies include the concept of intergovernmental cooperation, the reporting and filing of accident records, the stress on coordinating meetings such as the one I mentioned earlier, a study of laws and ordinances, and the general problem of traffic information.

This fight is going forward on all fronts of government, from the president down to the local law enforcement agency. It must continue, because we are a growing nation. Our employment is growing; our wealth is increasing; our knowledge is expanding.

That expanding knowledge has given us an apparent answer to the dread disease of polio. It has apparently conquered tuberculosis. Pneumonia is no longer a certain killer. Smallpox is virtually a forgotten disease.

We know these advances have been made, because the rates of incidence, and of fatalities, are down. Mind you, the rates are down, in the face of expanding populations. *That is the criterion we must use in assessing our success or failure in the traffic safety fight.*

Let us look at the traffic situation in the light of that criterion. Here the numbers of deaths nationwide are increasing. That in itself might not be a bad trend in the face of booming mileages and increased numbers of vehicles. But the tragic fact is the rate is not decreasing. The death rate, after a few years of heartening decline, appears to have levelled off.

MUST PROTECT AMERICA'S SAFETY

In our race to launch satellites, to create new machines for war and for peace, we must not lose sight of the duty to protect the health and safety and welfare here at home. Only the Almighty knows what potential for scientific progress, cultural advancement, for the good of all, was snuffed out when five boys died at 100 miles an hour. We must find the way to stop this killing.

Personally, it is my determination to maintain Illinois in a position of leadership in this program. Everything on an official level will be employed—strict enforcement of sound law; education; better highways; total use of all our resources.

This we can do, but it is not enough. If we could spark in each motorist the intense interest and desire to save lives which pervades this room tonight—if we could transmit to all the zeal which marks the National Safety Council . . . there would be no traffic safety problem. I thank you, the workers and members of the council, for your help and for the programs you have devised, but I remind you that the success of your programs—and mine—rests with our ability to sell those programs to all the people. We have only partially succeeded.

Our sense of achievement must be tempered by realization of areas of failure. We fail when there is one needless injury, when one careless accident destroys our resources, either human or economic.

I know we have the overwhelming majority of the public backing us in this fight. It is up to us—in government, in civic groups, in business and industry—to justify that faith.▲

AWARD PRESENTATION

by PAUL G. HOFFMAN

chairman of the board, Hoffman Specialty Mfg. corp., Indianapolis, Ind.

(former president and director, Ford Foundation)

The annual Safety Congress has long been a Mecca for the safety leaders not only of the United States but of many other lands. This year is no exception. The presentation of this new highway safety award could not have a more appropriate setting, or a more sympathetic audience than the guests assembled here at this banquet. I am delighted that you can all join me in paying tribute not only to this year's winner, but through him to all the dedicated men and women who make their careers in highway safety.

In my many years of association with the safety movement, I felt that the amateurs in *this field have always received ample recog*nition, but the professionals far too little. It is the day-by-day work of these career people, with their know-how and steady application, that has been responsible for the substantial reduction in the accident rate.

Being of this mind, I was happy that there was a Beecroft Award in other years to honor such great professionals as Commissioner MacDonald of the Bureau of Public Roads, Chief Justice Vanderbilt, Sidney Williams, Frank Kreml, Ame Neyhart and others. It was men of this caliber *who shaped the course of the traffic safety* movement as we know it.

It was men like Williams and Kreml who said from the first that there could be no *simple remedy for traffic accidents—that* only a balanced program of education, enforcement and engineering could cope with a problem which is as complex and dynamic as traffic itself. As against a quest for magic panaceas, they urged the development of scientifically trained specialists. They counseled—and helped to chart—rational measures solidly based on facts.

REQUIRES BALANCED PROGRAM

Of course the concept calling for technical direction of the safety program by experts does not in any way exclude the amateur—the volunteer. On the contrary, the support of laymen individually and in the mass is imperative. Without the backing of an informed public, even the best-laid official plans are futile. Volunteers must assist the duly constituted authorities charged with the responsibility for doing the job.

Acceptance of this philosophy, for instance, led the automobile industry in 1937 to create the Automotive Safety Foundation, an organization which I had the privilege of heading for several years.

Later reinforced by other industries, the Foundation regularly has made grants of

funds available for the professional training of enforcement, engineering and other specialists, as well as for research. It also has provided funds or staff services, to a number of great national organizations active in this field, in the interests of a more coordinated effort.

HIGHWAY SAFETY GROUPS

The cooperative work of many official and volunteer groups resulted in the formulation of the Standard Highway safety program for states, embodying the general principles I have mentioned. Out of this subsequently evolved the Action Program of the President's Highway Safety Conference—now the recognized charter for traffic accident prevention in America.

The record shows unequivocally that we are on the right track. It proves that the rational, not the emotional, approach to highway safety pays off. In 1935—the year that J. C. Furnas tossed a bomb into the nation's complacency with his sensational article about traffic accidents, titled "And Sudden Death"—the national fatality rate stood at 15.9 deaths per 100 million vehicle miles. Last year the rate was only 6.4, a decrease of 60 per cent.

The organized safety effort the past 20 years has saved 500,000 lives, prevented 17 million injuries and curtailed economic losses by approximately $45 billion.

We should do even better in the future. For one thing, the Federal-aid Highway Act of 1956 offers an opportunity to bring into full play the Engineering E of the basic Three E's of safety. Heretofore, as we all know, ability to get the most out of this phase has been severely limited by lack of funds for roadbuilding. The experts predict that completion of the Interstate System alone will save 3,500 lives a year.

FUTURE'S ENCOURAGING

We may also assume added impetus the next few years from expanded research, from stepped-up professional training in our colleges and universities, from extension of high school driver education and adult safety education, from better licensing procedures, from refinement of selective enforcement and upgrading of traffic courts. We can expect, too, a constant broadening and deepening of organized public support.

Granting these plausible assumptions, there is no logical reason why the fatality rate cannot be pushed down to three within the next 15 years. This rate already has been reached or approached by more than one state. The public interest, the welfare of all of us, demands that all the states try to achieve this goal. I am convinced they can—given, on the one hand, the necessary determination; and on the other, the benefit of the knowledge and zeal of such professional leaders as the one we salute here tonight.

The recipient of the 1957 Award was chosen by an able board of judges: General Alfred M. Gruenther, president, American Red Cross; Dr. John A. Hannah, president, Michigan State University; Mrs. R. I. C. Prout, president, General Federation of Women's Clubs; and W. Earl Hall, editor, Mason City (Iowa) *Globe-Gazette*.

Theirs was no easy task. Almost without exception, the many candidates nominated for the Award are individuals of stature and high professional attainment in their respective fields. From among them the judges selected one of the foremost safety educators of our time, a great planner and organizer for the dissemination of safety knowledge, the man who headed New York University's famed Center for Safety Education from its inception in 1938 until his retirement from the post last month—Dr. Herbert J. Stack.

DR. STACK'S ACHIEVEMENTS

Citing Dr. Stack's great contributions to the cause of highway safety is doubtless superfluous, since most of them are already known to everyone. I limit myself, therefore, to just a few highlights.

More than 11,000 persons trained under his direction at the Center are now serving as leaders and teachers in colleges and universities, in elementary and secondary education, in commercial and industrial organizations devoted to safety, in commercial fleets, in governmental agencies, national, state and local safety groups and private safety organizations.

He has been instrumental in setting up teachers' institutes and special safety programs in numerous colleges throughout the country; and has helped to organize state safety education programs in many states.

He has written or edited more than 100 books and articles on safety education, some of them widely used as text material. He has guided significant research in such vital areas as driver behavior.

No less important have been his indefatigable efforts in behalf of teamwork in the attack on accidents and other traffic problems. For five years Dr. Stack has served on the Board of Directors of the National Safety Council. He has always stood for the closest possible coordination of safety education with the other basic disciplines and activities. In this role, he has been a pillar of strength in the organized safety movement of America for a quarter of a century.

Fortunately his period of service to safety is by no means at an end. He remains as chairman of the Department of Safety Education at the Center and as program associate will continue to supervise its research program. He will also continue as consultant and faithful co-worker with many major groups enlisted in highway safety.

It gives me great pleasure to present this plaque, symbol of the first annual Paul Gray Hoffman Award for outstanding professional services to highway safety, to Dr. Herbert J. Stack.

WOMEN'S ACTIVITIES

OUR ROLE IN SAFETY LEADERSHIP

Outline of Introductory Remarks

by MRS. RAYMOND SAYRE

vice chairman, Women's Activities Conference, N. S. C., Ackworth, Iowa

Our role is to promote effective safety programs. Traffic problems do not have genders.

1. What we can do through our organizations (not specific activities but general principles)
   a. Determine projects on the basis of greatest need after studying your local inventory or making a local survey.
   b. Be sure the safety activities of your group are tied into the overall balanced program for safety being carried on by official and other voluntary groups.
   c. Help build a strong local safety organization or work in one already established and give assistance to its program. (not money—but voluntary leaders and workers)
   d. Make all possible use of services available to you— highway safety department, National Safety Council, Extension Service, governor, mayor, and police department.
   e. Do everything possible to train yourself and your leaders to be qualified in the field of safety.
      (1) Understand all of the problems
      (2) Know your own laws relating to safety
      (3) Know services that are available
      (4) Know solutions that are effective so you can be for something (driver training)
      (5) Know how to measure what you have against accepted standards (Inventory—Uniform Code)
2. What you can do as individuals
   a. *Citizens*—Support law enforcement
      Support needed legislation
      Support community programs for safety (go to meetings)
   b. Accept positions of leadership
      (1) Be a leader who can be counted on
      (2) Be a trained leader
      (3) Be an enthusiastic leader—the job can be *done!*
      (4) Be a leader who is willing to work—even though you do not always get credit
   c. As creators of attitudes
      (1) In the community (citizens)
      (2) In the home (training of children)
   d. Safety problems, basically, have moral and *spiritual* values
      (1) Life is precious
      (2) We have a duty to others as well as ourselves—"We are our brother's keepers" "Watch out for the one behind you"

TIME FOR DECISION

by **WILLIAM G. JOHNSON**
assistant general manager for programs, National Safety Council, Chicago

The traffic situation today is a product of what was done and what was not done yesterday.

During the past 30 years agencies of the national accident prevention movement working with public officials and civic leaders, have developed a balanced comprehensive program which, when applied with reasonable vigor and intelligence, has produced marked reductions in traffic fatality and injury incidence.

The program agreed upon and reduced to writing, began with the Hoover Conference of the early '20s and has continued through White House Conferences and other meetings. It is represented by such books as the Action Program and Regional Conference workbook of the President's Committee for Traffic Safety, a Business Advisory Panel brochure on state organization, and the excellent report prepared last year by the Governors' Conference.

The immediate problem has gradually become one of applying known principles. We stress a balanced application of a comprehensive program because the general public seeks panaceas.

If three-fourths of the cities and states had applied these principles as well as the one-fourth with the best records, accidents in 1956 would have been one-third fewer, and not even those best cities and states fully applied the program.

REDUCED DEATH RATE

Results were achieved even though application has lagged behind the growth of the basic problems of increased population, car registrations, and travel.

From 1925 to 1940 the national death rate per one hundred million miles of travel was reduced 36 per cent and available data indicate that the non-fatal injury and property damage accident rate also declined. During that period motor vehicle travel was steadily increasing—it almost tripled. As mileage went up and the death rate remained constant traffic deaths rose steadily. The first major break in the traffic death toll occurred when the motor vehicle death rate took a sharp drop shortly after 1935. It was at that time, through the Automotive Safety Foundation and other agencies, that the first real impetus was given to the application of recognized programs.

From 1946 until 1954 the national death rate dropped another 36 per cent, but available data indicate personal injury and property damage incidence rates did not parallel the decrease in death rates. We see mileage rising sharply—mileage almost doubled from 1946 to 1954. The death rate had shown a sharp drop in the early part of the post-war period, and deaths remained about constant. Then as the death rate leveled off, deaths began to rise, almost keeping pace with travel. I re-emphasize that the non-fatal accidents which account for 97 per cent of accident-cost did not parellel this death rate decrease. Non-fatal accidents were rising.

NEED MORE PREVENTION WORK

Detailed program reports made as a part of the Annual Inventory of Traffic Safety Activities and other inventories reflected increased application of standard programs, but not at the same rate of growth as vehicle use and population. Thus, the additional prevention work needed has steadily increased. For example, 1953, data would be reported and analyzed in 1954; then perhaps in 1955 approximately one-third of these increased programs needed would be authorized by the state legislature or the city council.

The result, in 1955, we were no better off than we had been in 1953, and by 1956, with travel still rising, we were somewhat behind where we had been. However, reductions in accidents have continued to be reported from states and cities which have applied the balanced comprehensive program with sufficient strength to control a growing problem.

Today enough is known about traffic accident prevention so that reasonable attainable application of the program can cut accidents in half. And we emphasize that we are talking about reasonable and attainable application of the program, not about an utopia. Reasonable, attainable application can cut traffic accidents in half.

Yet traffic accidents hit an all-time high in 1956. Forty thousand dead, one million four hundred thousand injured, ten million accidents, and four and three-quarters billion dollars lost. Accident rates rose in 1955 and stayed up in 1956. That's the first such two-year set back since 1941. Travel has almost doubled in 10 years. Accident prevention programs are being swamped by the cumulative effects of more and more people, more vehicles and more travel.

THE PREVENTION PROGRAM

What is the action program? What are these standard programs? What are the objectives of the program? Let me read them.

Sound uniform laws—the responsible agencies are legislators and city councils.

Adequate accident reports used to guide programs— official record bureaus.

Good instruction for children and youth—in the schools.

Traffic supervision and firm enforcement—by the police.

Dispense justice and create respect for law—the courts.

I hardly need point out that objective has sweeping implications for many of our other social problems.

Strict requirements for obtaining and retaining driving privileges—license authorities.

Increased safety of existing roads and streets, through engineering, and construction of additional streets and highways to carry traffic safely—objectives of street and highway departments.

Vehicles progressively easier to operate safely and minimizing injury potential—the manufacturers.

Vehicles maintained in safe operating condition—inspection authorities.

Citizens, two objectives: informed and safety minded, and supporting accident prevention — the agencies: the media — press, radio, and TV; citizen groups such as service clubs, veterans organizations, PTA, Chambers of Commerce and safety organizations.

Last but far from least, coordination of state and local programs—the people responsible: governors, mayors, county officials, and citizen leaders.

NEEDS BED-ROCK SUPPORT

We emphasize a balanced program, with a structure which somebody said is several thousands of years old. Perhaps balance and soundness kept it standing. It's a structure to support our objective of good traffic—good traffic which is safe, smooth, and economical. We show the elements of that program—roads, traffic engineering, vehicle, public education, school, driver licensing, police, courts, accident records supporting the whole program, a foundation of sound laws, and all this tied together by teamwork and leadership. But you see that the structure would not stand up, it would not be substantial, unless it was on a bed-rock of citizen support.

How does our structure stand? The state accident prevention activities for 1955, and the results for 1956 are not much different: in the status of preventive activities, the average performance of 47 states was 66 per cent of the minimum program. I emphasize the minimum program. The average performance of 875 cities with more than 10,000 population was 50 per cent of the minimum program.

Now let's look at some of these elements in terms of our balanced structure.

HIGHWAYS, ROADS

From 1946 to 1956 we did not build enough additional roads to park the additional cars we were operating. Now, as a matter of national policy, we have created the Federal Highway program on an expanded basis to take care of the interstate road system. If we are alert to preserve against certain pressures the safety features, such as planned access, on that interstate road system, we will get substantial safety benefits. What about the cities which have lagged behind? Are they going to plan on that same basis to handle tomorrow's traffic?

What about the existing roads and streets? Traffic engineering on those is woefully inadequate. We do not have enough manpower to study the high accident locations. We do not have the budgets to

correct those locations after the studies are made. We do not have sufficient state staffs to give the proper assistance, the kind of assistance they need, to small communities.

The vehicle. Today we have a vehicle which is extremely easy to drive safely. Unfortunately, it is also extremely easy to drive dangerously. Until recently we felt that the automobile advertising programs would encourage the use of this potential in an unsafe way. The recent change in advertising policy of the motor vehicle manufacturers is a tremendous step forward. We do need to make additional progress in designing vehicles which minimize injury potential.

ADEQUATE ENFORCEMENT LACKING

Public education. We know that the quantity's enough—you hear enough, and read enough in all of the media—but what about the quality? Is this information effective in preventing accidents? Do we know enough about working with groups? I think not. We have a lot of enthusiasm in groups, such as the service clubs and veterans organizations, but how do we use that enthusiasm?

Elementary education is pretty good. Driver education in the secondary schools is woefully inadequate. Last year we trained approximately one-third of the eligible students in driver training. Safety in the colleges and universities? In many respects, this is just getting started.

Driver licensing. Examinations are good in some states, poor and inadequate in others. Driver improvement programs—calling in drivers for corrective treatment when their records so indicate—do not have enough manpower to study the records, to work correctively with drivers, and do not have a firm enough attitude on enforcement to take off the road the incompetent, unwilling driver, who will not drive safely.

The police. Inadequate manpower, inadequate training and administrative practices leave much to be desired.

Courts. Do we give dispense justice? I think not. Are the courts conducted with dignity, or do we still have the horse and buggy justice of the JP system prevelant throughout much of the country? Do we have integrated administration of state courts from the supreme court down? No, in most states.

Accident records. We do not have spot maps necessary to diagnose the trouble spots; we do not have the location files necessary to study them; and we do not have the manpower to use the records we do have.

Laws. We have non-standard hand signals; we have differences in rules of the road; and we have wide differences in attitudes on speed.

Teamwork and leadership tie this thing together. Often these are not even recognized as necessary ingredients of a program. And when they are recognized, often the tremendous trifles, the details of getting that teamwork and leadership are not recognized.

What about the foundation of citizen support? Unorganized. In many cases it has inadequate leadership, poor direction, and faulty technical information. Often we throw away our books and settle for supposedly cheap panaceas, special campaigns, shortcuts, and gimmicks. I wish I could tell you that there was a cheap panacea for this problem, but there isn't, and we must all recognize the need for a fully balanced, comprehensive and adequate program.

Now that we've marked up our current status, it's a pretty "ratty" looking structure. No wonder it won't support our objective of good traffic.

TOMORROW'S FORECAST

What about tomorrow? This nation will continue to grow: by 1966 one hundred ninety three million people, up 17 per cent; ninety million drivers, up 25 per cent; eighty two million cars, up 34 per cent; eight hundred twenty five billion vehicle miles of travel, up 47 per cent. It is anticipated that growth in travel will be the same in the next 10 years as in the last 10. If accident rates continue unchanged, 54,000 people will die in 1966, one million nine hundred thousand or more will be injured and 6.3 billion dollars will be lost.

In fact, the situation is becoming progressively worse. Rates will continue to rise, accidents will skyrocket if prevention programs lag behind travel. The results will be deaths, injuries, damage, congestion and a stunted economy—not only because of the accident and congestion waste, but because motor vehicle travel limitations impose a limit on economic growth itself.

What are we going to do? One element of the balanced safety program— building new roads and streets—will be doubled, comparing the past with the future. What about the other elements of the comprehensive program?—Laws which have been substandard—are we going to have sound, uniform laws? Uses of accident records.

INCREASE DRIVER TRAINING

Youth education—One-third of the students eligible for driver education in high schools were trained last year. We know that every youngster today for all practical purposes is going to drive a car. How long are we going to wait until we give those drivers the training that they need? At the present rate of progress it will be 1985 before we are training 100 per cent of the drivers in the schools. Can we wait that long?

Police supervision. I emphasize first that we are not just talking about more. We are also talking about better enforcement. We are talking about the non-fixed ticket. We are talking about selective enforcement at the times and places where violations cause accidents.

Court effectiveness. Will we have an integrated court system in each state comparable with the fine system in New Jersey?

Other areas of improvement are:

Driver licensing
Engineering on existing streets
Vehicle design
Vehicle maintenance

Public education. Will we have research work to give us the information we need to make better use of group enthusiasms? Will we have better aim in our public education program?

What are we going to do? What now? There is an alternative to these hard facts. It is federal control of traffic. The American people have exported to the national government many of their problems which were not solved at the local and state level. There have been rumblings in that direction already. The Roberts committee of the House of Representatives was told by many witnesses that the federal government ought to take federal driver licensing authority on the interstate highway system.

Fortunately, in our view, the Roberts committee does not see it the same way. But how long can that go on? How long can the states and the communities fail to live up to their responsibilities and still expect the federal government to stay out? The people will ask the federal government to come in I'm afraid.

The answers to these questions rest with citizen leaders who will help build public support for these official measures and will help imbue each driver and pedestrian with a sense of personal responsibility.

There are several questions that each of us has to answer. These questions are: first—Do you have influence in your community and your state? and second—Are you part of the problem or are you part of the solution?

I hope that you will definitely determine that you will be part of the solution. If you decide to be part of the solution, the people of America will owe you a debt of eternal gratitude. These days are truly the time for decision.▲

THE TRAFFIC PROBLEM

by JAMES D. HILL

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The traffic problem is our mutual interest. I think before we go too far into the matter of deciding how to use this tool of accident prevention, it might be well to dwell a little bit on what the traffic problem is . . . what it constitutes.

What kind of problem is the traffic problem? We get so busy sometimes I think in trying to solve the problem, we are on the run (it has us on the run) and we don't analyze the problem adequately before we try to do things to solve it. The question

arises whether we run into some lost motion in this procedure, so let's in some detail examine this thing that we call the traffic problem.

We can describe the traffic problem as a problem of knowledge. We have had automobiles 50 years, 50 years in history is a short time. People haven't learned how to drive . . . right. That is more or less obvious. I think we can all accept that description of the traffic problem.

WE JUST DON'T KNOW

Something that is not quite as obvious is that as civic workers trying to prevent accidents, and as officials working at the job of trying to prevent accidents, we too, are suffering from the impact of a new problem. We too, are delinquent in the knowledge of how we might do our job to prevent accidents. We are just as subject to it as the driver is to lack of knowledge. As we must be tolerant of the driver and understand him and the problem that he lacks basic knowledge of how to do his job of driving, so that driver must be tolerant of us too, and understand that we are still trying to find out how to do our job best.

When I say "we," I mean it very broadly; the National Safety Council doesn't know nearly so much about doing its job of accident prevention as it ought to know. If we knew all the answers to the problems, we wouldn't be having 35,000 to 40,000 people killed in the United States every year. One of the essential components of any kind of a successful and a defensive problem must be humility. We must admit we don't know.

IGNORANCE IS MISTRUST

We can call the traffic problem a problem of ignorance, an unprejudiced ignorance, perhaps, an ignorance that can't be helped, but an ignorance that should be recognized. People just don't know, just don't know. Now then, one of the characteristics of ignorance is mistrust. One of the almost constant corollaries of ignorance is mistrust. This is easy to recognize.

Some of you know what happens when you go into a small area, an area in a city where everybody is underprivileged about everything. People in such an area don't know who to follow; they don't know who to trust; they are loathe to accept what anybody says about anything. Leadership is irratic and frequently dishonest among such people. That we all recognize. It is easy to recognize because in most ways these people are ignorant or underprivileged.

It is not quite so easy to recognize when you find a bunch of people who are smart in most ways, well-informed in most ways; but, ignorant in one way, which is the situation we are in, in our so-called traffic problem. You can get a bunch of people together who are what we would call up-and-coming people of the community, well-informed, well-cultivated and well-motivated. You can ask them what to do about the smallpox epidemic and they operate at once with a minimum of lost motion.

You can get these people together and ask them what to do about polio, about cancer, about any problem of public health, and in general they waste a minimum of time deciding what to do about it and they get about doing what they have decided to do about it.

NO ORGANIZED THOUGHT

But you get these same people together at a meeting and let them decide what to do about motor vehicle traffic accidents, and they remind you of a man that jumps on his horse and tries to ride off in all directions. Everybody has a different idea, nobody likes to follow anybody, nobody wants to accept what anybody else says.

The chances are if I make a safety speech, there are people listening to me and wondering how fast I drive after I make my safety speech. They wonder how much of what I preach, I practice. Isn't that a characteristic of this thing we call the traffic problem? Don't we have the mistrust born of ignorance among otherwise well-informed people permeating our thinking about the traffic problem?

I recognize this sort of thing as an occupational hazard to me. There is abroad in the mind of the people a cult of unbelief. We in so many cases don't really think that much can be done. We don't like to follow what people suggest to us because we aren't really well sold that what we undertake will prevent accidents. I believe we can describe the problem in terms such as that.

I believe we can also describe the traffic problem as a psychological problem. You know the psychologist studies the behavior of individuals, and like most people who specialize in one thing or another, he comes up with some terms that are not familiar to laymen, but which laymen can perhaps use to benefit. So let's explore what this psychologist talks about and how it might apply to traffic.

DESIRE SELF-EXPRESSION

The psychologist describes a thing which, perhaps, we call the well spring of desire to be heard, to express one's self. The psychologist calls this two things; he calls it the id in one form, and the ego in another form. Suffice to say, but he tells us and we recognize, that within each individual there is a desire to consort with his fellows, a desire to speak and be listened to.

There is a desire to act and to influence others. As long as there is life in a human being this desire is present. However, it is subject to certain things that the psychologist calls repressions, or inhibitions. An individual when he is born, when he is an infant, has no repressions. Eventually, when he gets up to where he can walk around, he may run into a prohibition that eventually will turn into a repression.

Take, for example, a ceramic piece or something that must not be touched; he tries to touch it and he has to be physically restrained. As time goes on and he is restrained repeatedly, he gets to the point where there is within him a built-in inhibitor. He starts to reach for this piece of Dresden and he decides not to because he has been told not to so much, there is a repression against it.

But, as we go through life, the psychologists tell us, we gather and set up a regular system of repressions. As long as these repressions are in order, and as long as we are in order and reasonably well-adjusted, we get along all right because there is still ample outlet for our urge for self-expression in socially approved channels.

There are lots of ways man can express himself. Doing his job, playing a game of golf, playing a game of canasta, reading a book; there are just any number of ways we can do this all right, it is constructive. But, every once in a while all of us, during a great deal of the time some of us, get to where we rankle at all these repressions that society imposes on us. We may even do an overt act or revolt against them.

We may decide we are going to break the law just to see if we can get away with it. Now when I say "the law," I mean the code or rule, not necessarily the written law. When that happens, the psychologists tell us it is an escape mechanism, a way that we have of revolting against the system. It is kind of like when a boiler builds up a head of steam, and it breaks out at the weakest point when the steam is too much for the boiler to contain.

Now what is an example of an escape mechanism in traffic? One is the fellow that loses an argument with his wife at the breakfast table and tries to win it back driving downtown. Another example is the person who is a paragon of politeness in the living room, but who is a "heel behind the wheel." He sees here an opportunity to violate the code and get away with it. He can escape from this corral of inhibitions and repressions and at the same time escape social pressure, so he does it.

Another escape mechanism is the teenage boy, whose parents are very strict on him and he can't get away with a thing, but he gets behind the wheel of an automobile and lets off steam there. Somehow or another Pop has forgotten to lay down the law on that too, or maybe he laid down the law but the boy still thinks he can get away with it.

A young fellow has an argument with his girl and he sticks his foot in the carburetor all the way home . . . escape mechanism. I think, perhaps, here is a valid description of this thing we call the traffic problem. It attaches itself to individual behavior, individual psychology, and individual expression.

GROUP BEHAVIOR PROBLEM

We can also describe it as a phenomenon of group behavior. Now the sociologist is a fellow who studies group behavior; a psychologist studies the behavior of the individual; the sociologist studies the behavior of a whole group of people and he, too, has some terms that probably we can use.

The sociologist talks about culture. What he talks about is the sum total of the way people live and do things. He talks about the instruments of culture. Anything that man invents to make his life more gratify-

ing in one way or another may be described as an instrument of culture . . . a chair, a table, a tray, an ash tray, an automobile, all instruments of culture. The sociologist talks about folkways; the way folks do things. If I am a guest in somebody's home and a picture falls off the wall, I don't stand on his overstuffed furniture to hang the picture back up. There is no law against it, but folkways are against it.

The sociologist tells us that the strongest group motive we have is to get along with the group. The strongest hunger we have is to stand well among our fellows. We have individual hungers, but insofar as the group is concerned or two or more people are concerned, we want to be well thought of. So, if the fellow wouldn't think well of us for walking on his overstuffed furniture, we ask him if he has a ladder. That is what sociologists call folkways. Obviously, folkways build up around all instruments of culture.

LAWS REFLECT MORES

There is a thing to do or a group of accepted things to do with any instrument of culture. Now the sociologist says that as these folkways have more and more time to develop, people have more time to exchange thought and ideas about them; they solidify or they get more firm and definite and they become mores. Mores is a Latin or Greek word, I'm not sure which, meaning laws. Now the sociologist comes up with this term mores, and then he tells us something that gives the policeman, lawmakers, and all people in general, I think, some pretty good reasons for cause.

He says that a law passed by a legislature or an ordinance enacted by a city council is not original, it . a reflection. He says that these laws are valid, they are effective in controlling peoples' behavior only insofar as they reflect the mores. The only real law is what people think about it, says the sociologist.

Well, police officers know that there is a practical translation of this. There are some laws that are extremely popular and easy to enforce. There are some laws that are difficult to enforce. The sociologist says that the popular laws are the ones that coincide with the mores, and the mores preceded them. The laws then, only reflected the mores.

The sociologist says that the unpopular laws are the ones that vary or deviate from the mores. If you press him, he will cite you an example of a Constitutional Amendment of the United States Constitution that was destroyed because it was in contradiction to the mores, and that was prohibition. When I was a young fellow, I couldn't walk into a schoolroom without seeing some vividly colored charts on the wall showing my liver, my kidneys, my stomach, my lungs, my heart, and everything else would look like if I took a drink of alcoholic beverage. I was thoroughly convinced that anybody who would take a drink of alcoholic beverage was crazy.

EDUCATION BROUGHT LEGISLATION

The church was a part of a 20 years or longer campaign of education on the evils of alcohol. The educational campaign culminated in this condition of the folkways and the mores in this country to the extent that it was possible to pass the constitutional amendment prohibiting the sale or transportation of alcoholic beverages.

Now at that time, the mores were against the law. Then what happened? The people who had been carrying on this education for 20 years congratulated one another and went home. They said, "Now our job is done, we have legislated it and therefore made it so. It is now a police matter." The people were then left to their own voices and not subjected to education on the evils of drink or anything of the sort, and they went back to their old mores, which said that a man can transport it, or sell it, or do anything else with it as long as he doesn't unduly impose it on anybody else.

It then became smart, of course, to fool the cops about this prohibition. We didn't have force of the pressure of this educational campaign any more, and the mores and the law grew apart. Well, we all know the result of the thing. The mores won. The amendment was repealed. If we had had a continuing educational campaign after the amendment had been adopted, the chances are that today we would have a law of the land against selling or transporting alcoholic beverages. But the mores didn't say so. Well, that's pretty strong medicine.

While it was becoming the smart thing to do to fool the cops about this alcoholic beverage law, we had a new phenomenon developing called "traffic" that nobody had their minds well made up about anyway; so it more or less, by a process of osmosis, became the smart thing to do to fool the cop about traffic too. And we had a lot of comment about speed traps and the police mistreating the people, the disadvantage, the death-dealing disadvantage which is persisting, of course, to the present day.

TRAFFIC PROBLEM AROSE

These things I think we can use to describe the traffic problem. It's a problem of sociology, of folkways, of mores, and the like. The sociologist comes up with another term that I think is an interesting one, and it gives us a nice close application in traffic. He said that the traffic problem is a problem of culture lag . . . how far culture lags behind the lead . . . the difference between the way an instrument of culture is used, and the way it ought to be used.

He draws this comparison: If I was feeling pretty exuberant from one reason or another, natural or artificial, and decided I wanted to make a little noise to express myself, and I take my six-shooter and go out into the street and point it up in the air being very careful that nobody gets hurt and shoot it. A perfectly predictable series of events takes place. My next door neighbor calls the police, who come out and grab me and throw me into the jail. Before they have hung up the key, somebody is congratulating them for doing a wonderful job. The fellow might have killed somebody.

CULTURE LAG

But, let's say I'm more discreet. Let's say I feel the pressure of the folkways and the mores against using the gun in that way; let's say I get into my automobile and I go 50 mph down main street. Well, does anybody call the police? Chances are, not. Maybe they are a little upset, but nobody calls the police. If a policeman happens to come along, he pulls me over to the curb. He is not as unceremonious with me as if I were using a gun. he handles me rather gently.

He says, "You're violating the law, you were exceeding the speed limit and it is my duty to give you a summons." I am, of course, the soul of innocence. I say, "Officer, what did I do? I didn't hit nobody did I? Did I do something wrong? There wasn't anybody on the street." Maybe 10 people will walk by and nine of them will say, "Why doesn't that speed-crazy cop leave that poor fellow alone. He didn't hurt anybody. Why doesn't he go catch himself a burglar, or do something important. Why do they have to pick on good people for?"

Which is the most dangerous instrument of culture to misuse, the gun or the automobile? A gun kills six people without reloading, and an automobile kills 30 people at one shot. It's been done. The automobile is at least five times as dangerous misused. Yet, we condemn the misuse of the gun and condone the misuse of the motor vehicle. Why? The sociologist tells us it is culture lag. He explains it this way. We have had guns 400 years, and we have had cars 50. We haven't had automobiles long enough to make up our minds about the right way and the wrong way, and come to a unanimous agreement about how they should be used, and how they should not be used.

PROBLEM SOLVED IN 400 YEARS

Well, if we ask the sociologist then what we should do about it, he may in a detached and academic way say there is nothing really to worry about; by the time we have had cars for 400 years like we have had guns, that probably will have taken care of itself. We won't have a traffic problem any more than today we have a gun problem.

If I hand a gun to you, muzzle foremost, loaded, you say, "Don't point that thing at me!" And everybody standing around says, "Don't point that thing at him!" I loose face. But, if I go 70 mph between here and Fort Worth and you know darn well that 60 is just as fast as you can safely drive, what do you do? The chances are, you keep quiet. So we haven't got our folkways and our mores developed. We have a case of culture lag.

And in another 350 years it will have disappeared because people will have had time to think it over and talk it over, and come to an agreement. Of course, while all this is happening we will be killing 35,000 to 40,000 people a year. So why are we holding safety meetings, staging state safety conferences, publishing all this literature,

taking an annual inventory of traffic safety activities, and everything else?

What are we trying to do? We are trying to cover in 10, 15, or maybe 20 years the social development and group thinking that ordinarily would require 350 years to cover? But how do we do this? But how do we stimulate the rate at which concepts evolve concerning the use of the motor vehicle and concerning the control of its use? We stimulate it the only way, we accelerate it the only way it can be accelerated, by accelerating the rate at which people think and talk about it.

INVISIBLE ESSENCE

I think we can describe the traffic problem as a social problem. I think we can describe it in all of these ways. I think we can describe it as a problem of ignorance, a problem of sociology, and a problem of psychology. I think there is one other way to describe it . . . invisible essence. A couple of years ago I was reading the *Birmingham News*, and on the editorial page I read a parable written by Dr. Norman Vincent Peale. This was kind of an unexpected way to find some light on the traffic problem, but I would like to tell you this parable and my thinking following it.

Dr. Peale was telling about a game of golf he played one time. He was out in the woods looking for his ball and there was a young fellow out there raking leaves on the golf course. This young man knew Dr. Peale and approached him rather hesitantly and he said, "Dr. Peale, I need some help. I don't like my life and I've been aiming to come see you for more than six months."

Dr. Peale said, "Why did you wait so long?" He said, "Oh, I just haven't got around to it. I do need help. I want to get somewhere. Some time I would like to come see you and talk to you. Some time." Dr. Peale said, "Well, why don't *you* start talking to me now while I'm looking for my ball?"

So the boy poked his rake in his leaves and started. He said, "Dr. Peale, you see what kind of job I've got here, I'm raking leaves on this golf course. I want to amount to more than that and I want you to help me. You've helped other people. I want to get somewhere. I don't like my job, my situation, or anything about it. I want to get somewhere." Dr. Peale said, "Well, that's fine. Where do you want to go?"

The boy was taken back a bit, and said, "Well, I don't know." Dr. Peale said, "What would you like to do?" To which the young man replied a little bit defensively that he just had never thought about it definitely like that.

So then the good doctor was a little bit hard on him and he said, "It seems to me you have your mind made up a lot better about what you don't like than what you do like, about what you don't want than what you do want. You tell me you want to get somewhere, and I ask you where you want to get and you can't tell me. I ask you what I can do to get you there, if you had your mind made up, and you can't tell me. I ask you what you would like to do and you can't tell me. Now you must decide this thing for yourself, and until you do all the help in kingdom come will roll off you just like water off a duck's back. When you decide, then whether help comes your way or not, you're still on your way."

NEGATIVE THINKING

I reflected on that a while and it occurred to me that he was talking about the traffic problem. Dr. Peale went on to say the young man did make these decisions and eventually did get somewhere, was constantly and quietly failing himself. He was failing himself, and that is the traffic problem. Man's failure of himself.

Fundamentally, the problem is "no," isn't it? The problem is the negative mind-set: the propensity of people to say and act negatively, instead of positively. It came to me as a revelation; and, perhaps, I shouldn't be proud of it because at the time I had been in traffic safety for 17 years. It came to me as a revelation that traffic was not a new problem at all. It was a new kind, a new manifestation, a new form of a problem as old as man. The problem of man's failure of himself.

DESPAIR FACTOR

We've recognized it in lots of ways. This General Motors research director, Charles Kettering, expressed it this way: he said it is the despair factor. One of his favorite stories is about the time he invented the self-starter. Everybody agreed that something should be done to relieve people from having to crank automobiles; but, everybody agreed also that on the set-up that was available at that time on the motor vehicles, it was impossible to invent a self-starter so Kettering invented it.

Shortly afterward, an eminent electrical engineer accosted him and said, "Dr. Kettering, I resent your inventing that self-starter thing." Dr. Kettering said, "How so?" "Because you violated the laws of electricity." What he really meant was, you violated my hide-bound, negative mind-set that it couldn't be done. You violated the laws of electricity.

Shortly after that happened, Dr. Kettering called in all the research engineers. He had quite a number of brilliant, well-educated men who were extremely capable. Education doesn't seem to have anything to do with this negative mind-set. There doesn't seem to be much correlation. Ignorant people seem to be able to surmount it, and extremely well-educated people seem to be enslaved by it.

Well, anyway, Kettering called his research engineers together and told them to all bring their slide rules, so they did. He said, "Now gentlemen, we have just finished inventing the self-starter that everybody said couldn't be done. When I proposed the thing a few years back, a lot of you undertook to prove to me that it couldn't be done. Now I've asked you to bring these slide rules here today because I want to warn you something about them.

DON'T DISCOURAGE PROGRESS

"I want to give everyone of you fair warning that the next time I come to you with an idea that needs developing, and one of you pulls out one of these slide rules to prove to me it can't be done, we are going to burn them all up. If you want to prove to me it can be done, I'll listen; but don't start out on the premise that it can't be done and undertake to prove it to me, because I'm not interested . . . the despair factor."

Menninger, the famous psychiatrist in Topeka, Kan., has a way of saying it. He says that every man contains the seed of his own destruction. We recognize it in our everyday comings and goings. We talk about it colloquially; we say John, or Joe, or Jim, or Tom, or Dick, or Harry is his own worst enemy. He works against himself. And the payoff, of course, is that it is John, or Joe, or Jim, or Tom, or Dick, or Harry that does that. You never hear anybody say, "I'm my own worst enemy."

The traffic problem in its fundamental essence is a moral problem. It is the same kind of problem that the Master was sent here a little over 1900 years ago to do something about. It is the problem of negativism, of despair, of "no." The fact that it involves motor vehicles, the fact that it involves streets, traffic lights, pavements, and all that, is purely incidental. There is nothing new about the problem of man's failure of himself. Now then, do you need proof of that? I can sight you proof that is self-evident, like the things you read about in the Declaration of Independence. When an accident happens, somebody fails himself.

MECHANICAL PROBLEM?

I think the most striking proof of the fundamental nature of this traffic problem can be found in the fallacies that we professionals burden ourselves with as we go about our jobs trying to correct them. What are some of these fallacies? Let's nail some of them to the wall. Well, the first one is that traffic is a mechanical problem. You hear people on all sides talking about their grammis adjusters, grammis indicators, hayseed polishers, and incriminator filters, and so on. If we can just get enough gadgets, if we can just get enough policemen, and enough motorcycles, and enough traffic lights, and enough jail sentences; if we can just get enough mechanical things done, we can solve this problem.

Do we really believe that we can pile on these mechanical correctives deep enough that we can relieve ourselves of the necessity of facing out some of the seemy moral necessities in this business? Do we really think we can hire enough policemen to stop accidents if a judge turns loose people without justification that the policeman brings up? Do we really think that chemical tests will help us stop accidents if you can fix a DWI case?

Do we really believe that a fraud payment or an extremely complex signal system at an intersection will stop accidents when we will listen to this real estate promoter that says make it a night rate intersection so I can sell filling station locations on this corner, don't make it a clover-leaf intersec-

tion. Do we really believe we can solve the traffic problem mechanically? No, I don't think we do. Yet, we talk about it all the time, and we promise the world with a ring around it if you will just give me a $100,000 signal system, or just vote for this new bond issue to get all these streets paved. Aren't we deceiving ourselves, aren't we failing ourselves when we do that?

AGE OLD PROBLEM

Another fallacy is that there is anything new or different about the problem. There isn't. We, therefore, need experts to solve the problem. We don't. And fortunately we don't, because there aren't any. There has been one traffic expert in the history of the world, and that was the Man of Galilee. What the Man from Galilee told us 1900 and some odd years ago is all we need to know about traffic safety; nobody needs to add anything to it.

Whether we are operating as an individual driver, an official, a civic worker, or anything else, traffic is nothing more or less than applied Christianity. Traffic safety . . . applied Christianity. We need only to use our God-given intelligence to interpret and apply what is there, and what we know, and what we have been told until it is a part of our frame and bone and sinew. Yet we look for experts. Yet we look for some way around moral necessity.

Now then, here is a real tricky one, a real tricky fallacy that we professionals work under; that is the fallacy of public approbation. The public tells us we are doing a good job of accident prevention. How does the public know? They kill 40,000 of their own kind every year. How do they know? I make a speech at the Lions club, and they come up and shake hands with me. They are pretty conscientious folks, some of them have lots of money, some of them are successful businessmen; they come up and shake hands with me and say, "Mr. Hill, you are doing a very wonderful job."

LET SLEEPING DOGS LIE

Well, I want them to think so because that puts them in a receptive frame of mind, but I'm not kidding myself. I'm not doing a wonderful job just because they tell me I'm doing a wonderful job, they don't know. If I let myself be satisfied with public approbation of the kind of job I'm doing, I'm liable to get into any number of mantraps. One of them is the sleeping dog blind alley. If the public is happy, let them go ahead and kill 40,000 of their own kind as long as it isn't me. Let sleeping dogs lie. We are liable to get into a super-serious, cheap character building routine. If the public thinks I'm doing a good job, then I'll say the things the public enjoys hearing.

I go to the Kiwanis, Rotary, Civitan, or what have you; and I tell them what a wonderful safety program they have when I know darn well their safety program stinks. I please the public so the public will tell me how good I am, and the first thing you know I'm as phony as a three dollar bill, and they are too. That is the terrific mantrap we get into and we end up with an insecure feeling of walking on quicksand.

There are more fizzles, fallacies, phonies, and dreamers in the safety movement today than any other movement I know of. And one of the big reasons is because they depend on the public to tell them whether they are doing a good job or not. The public doesn't know. That is one of the things that makes it difficult. Where do I find out whether I'm doing a good job? I never know really, but I keep asking myself is this the best I can do, is this sound thinking, is this sound action?

TALK DOES ACCOMPLISH

A fallacy that we professionals succumb to from time to time, is the fallacy that a lot of talk accomplishes nothing. You hear it in any sort of meeting, take your choice, someone draws up very profoundly and they drop their voice an octave or two and get a hollow sound in it and they say, "Well, it is all very good, but it is a lot of talk that won't amount to anything. Everybody gets religion about it here today, and then we go home and forget about it. A lot of talk accomplishes nothing." I reject that as a fallacy.

I cite you again the first safety expert, the last, and the only one in the history of the world; the Man of Galilee, who lived about 34 years and did nothing but talk, and we are still listening. It took a lot of talk to make the Bill of Rights, the Magna Charta, the Declaration of Independence, the Constitution, all of the things that distinguish free men from slaves obviously had to be preceded by a lot of talk. So a lot of talk does accomplish something. This fellow who says a lot of talk accomplishes nothing means that a lot of talk with no more faith than I've put into it, accomplishes nothing.

Well, the problem is an old one, the problem is man's failure of himself. The corrective is an old one too, the corrective is faith. Unless we believe that something is reasonably intelligent and reasonably well-directed to prevent accidents, it won't prevent them. Unless we believe, we can't operate or act intelligently or in unity with anybody else. We will still be flocking around the tower of Babel, we will still be mistrusting our leadership, we will still be ignorant; and, as long as we persist in not believing, we will still kill one another and ourselves.

Traffic is a moral problem. Only its manifestations are mechanical. It is a new expression of an old problem and the same corrective will apply as it has applied to these old problems through the centuries. Well, I ask you then, to have faith in the efforts to solve this traffic problem. Can I give you justification for this faith? Yes, I can. I can give you a little bit of historical justification.

MORAL QUESTION

Back in 1925 we came out with our first records. They were admittedly incomplete, but they were our first records of a motor vehicle title in this country. Fatal accidents and those sets of records produced a rate of 19 people killed for every one hundred million vehicle miles traveled. Today it is six and two-tenths. I take that as fuel for faith and that what we do to prevent accidents, prevents accidents. Especially when we can relate directly and traceably what was done and how the rates came down through those years.

Here is that picture: from 1925 to 1932 we had our first national concerned cry about accidents. The legislatures passed laws, newspapers raised cane, and the police bought motorcycles and started arresting people, and we had a great deal of to-do about it. In 1932 the death rate had dropped from 19 to 16⅞ per one hundred million vehicle miles.

Then we had a wave of reaction and we had a lot of yammering about speed traps. We even had some laws passed that a policeman had to be dressed a certain way, and in a motion on a certain kind of a motorcycle on a public street or highway before he could arrest anybody for speeding. We also had the situation of a depression back in those days. Jobs were hard to get in 1932, and policemen had families in the habit of eating. Well, there was a let-up and the death rate increased from 16⅞ in 1932 to 18⅛ in 1934. Then the conscience of the American people began to catch up again, and in 1935 four significant things happened.

ESSAY HITS HOME

J. C. Furnas wrote an essay called *And Sudden Death* and finally got through the thick hide of the American automobile driver with that essay. He is the one that first so graphically described the brains on the fender, the blood on the streets, the scream of a child in the night, *the curious flopping* efforts of the injured, the moans and the screams of the oil-soaked body on the pavement, the apologetic expression of the face half gone away, and Brother Furnas got it through the heads of a great many people that unless they changed their driving habits, that was what they were headed for. That article reprinted five million copies out of the *Readers Digest*. It had an impact.

In 1935 something else was done to prevent accidents. The National Safety Council set up a five year accident prevention *publicity campaign* significant two ways: first, we can advertise safe conduct like we advertise cigarettes, and toothpaste, and automobiles, and all the other things we do. There is a potential here in publicity. We can advertise and sell safe conduct. We are also going to do it for five years, and we are not going to do it for a couple of years and quit. That was significant, too. Even today we have people who think that we can get this thing done in a couple of weeks and then forget it.

We have a lot more today who know that we must *live with it from now on.* The Council also started the National Traffic Safety Contest, which was a precedent or a granddaddy of our Annual Inventory of Traffic Safety Activities . . . a relating or pooling of experiences between cities. Also, the Northwestern University Traffic Institute was established in Evanston, Ill. . . . a step made toward scientific traffic policing.

All those things added up to something done to prevent accidents. The result, the death rate dropped from 18⅟₁₀ in 1934 to 12⅟₁₀ in 1939, five years later.

Now then, for the next seven years we had no more reduction. Why? We fought a World War, we didn't do anything about traffic safety. In 1946 the death rate was 11-5/10. In that year the war was over, everybody was getting concerned again and the President of the United States got into the act. He called the First Annual President's Highway Safety Conference. This conference has been held annually since.

PRESIDENT'S CONFERENCE

This President's Highway Safety Conference adopted an action program for voluntary implementation by cities and states. The death rate that year was 11-5/10, and three years later it was seven and five-tenths. Something had been done to prevent accidents. The rate is still going down and is now six and two-tenths. Those people who used to have the audacity to dream of a national death rate of six today are thinking of a national death rate of two or three in somewhere between five and ten years, if we don't get into a war or some other major national distraction.

Is there fuel for faith in that history? I think so. What we do to prevent accidents, prevents accidents. As further fuel for faith, on any Annual Inventory of Traffic Safety Activities we put a specific percentage evaluation score on what a state or city does to prevent accidents. Our national death rate currently is six and two-tenths. In some states, however, it is as high as 10-5/10.

In some states, as low as two and four-tenths. Invariably, the states with the low death rates are the states with the highest scores in the Annual Inventory of Traffic Safety Activities. The states that are doing the most to prevent accidents, are preventing the most accidents. The states with the high death rates are the ones with the low performance in the Annual Inventory.

We made a five year study of 32 cities in Wisconsin; we portrayed the results on a graph, in the beginning the total deaths in these 32 cities stood high on the graph, the inventory low, the lines crossing in the middle of the period. At the end of the period, the situation was reversed. The total inventory scores were high, the deaths were down about 40 per cent. They were the low point on the graph.

What we do to prevent accidents, prevents accidents. This I take as fuel for faith.▲

FUNDAMENTALS OF HOME SAFETY ACTIVITIES

by MISS EUNICE HEYWOOD

assistant director, div. of home economics programs, federal extension service, U. S. Dept. of Agriculture, Washington, D. C.

Over the years much has been said about home safety, but unlike the weather, much has also been done about it. However, not until 1955 had any attempt been made to find out "who was doing what"—or how much. That year a trial run of a Home Safety Inventory was made under the sponsorship of the National Safety Council. More than 600 reports were received, and for the first time we had some reliable information about home safety activities being conducted on local, state, and national levels.

Believing that home safety programs, to be effective, should be cooperative, we wanted to know what groups and organizations were interested and active in such programs. The results were most gratifying.

In 1956 the Home Safety Inventory was developed with two major objectives: first, to add to our knowledge of "who is doing what" in home safety; and second, to stimulate further home safety program activities. The Inventory sought answers to the following questions:

1. What organizations generally were most actively concerned with the problems of home accidents?
2. What types of activities were most frequently conducted by these organizations?
3. What community groups cooperated?
4. What determined the types of activities undertaken by an organization?
5. Who did these organizations attempt to reach through their efforts?

More than 4,100 program reports were received and analyzed. A summary has been published and sent to all state and local centers that assisted in making the Inventory.

The findings indicated that large numbers of people were being reached by a home safety message and that most of the organizations promoting home safety were attempting to make their efforts part of a continuous, long-range program. Some apparent gaps, however, were uncovered:

1. More attention than was reported could be directed at safety for young children and for the elderly;
2. More effective use than reported could be made of mass media, such as television and radio;
3. More inter-agency cooperation might be achieved than reported.

No national Home Safety Inventory will be made in 1957 but one is planned for 1958. The long-range objective of the Home Safety Inventory is to contribute to the reduction of accidental home injuries by helping those conducting state and local home safety programs to:

1. Stimulate the development, expansion, and coordination of home accident prevention programs in their respective areas.
2. Establish standards and norms which will encourage officials, voluntary agencies and business organizations to accept responsibility for home accident prevention.

Information gained through the Inventory serves as a valuable guide to those of us who are concerned with planning safety programs and activities or with the production of materials for use in safety programs. For example, a booklet on old-age safety is in process which we hope may stimulate more widespread attention to the special needs of our older citizens. Another publication planned for early 1958 will offer program ideas illustrated by examples of interesting projects gleaned from the 1955 and 1956 Home Inventories.

In 1958, more selective advice of organizations will be sought in developing a questionnaire tailored to fit organizations.▲

THE PHILOSOPHY OF THE BEADED SHOES

by CHARLES W. FERGUSON
senior editor, The Reader's Digest, Pleasantville, N. Y.

One good thing about conventions is the opportunity they afford to stand off and look back and decide whether the work done is worth while or might be better done.

To appraise accurately is one of the hardest jobs on earth; the very act of trying puts us in a critical mood toward our efforts and we usually end up with the mullygrubs. And because this is the case I have decided to tell three stories. These stories are so short that in each case I will have to reverse the usual process for a Digest editor and make a short story long. All the stories are designed to give you some consolation and some brightness of mind in the assessment of your work.

DRESS MORE PLEASING

The first concerns a woman, a writer who has done some wonderful articles for *The Reader's Digest*—Elise Miller Davis. Once on a trip to Mexico she took a fancy for a pair of beaded shoes. They looked exquisite as a piece of work and while she had no immediate or anticipated need for them, they caught her eye and held it—so she bought the shoes. When she got home she didn't know quite what to do with them; they didn't work in with any ensemble. But a friend saw her predicament and with skill made a beaded dress. That's not the way to describe the dress, but it had sequins on it and it was pretty fancy and she had something to go with the beaded shoes.

Came the evening when Elise Davis decided to wear the dress and the shoes. She got diked out and then started off to a dinner. The dress was a honey, but when she got outside in the early evening light she noticed that the beaded shoes were not as pretty as she had thought. In fact they just wouldn't do. So she went back into the house, much pleased with the dress, and changed her shoes.

Now the moral of this story is too plain to need elaborate emphasis: our final accomplishment may be far greater than our original objective. We may fail or discard, but what we have our hearts set on in the first place not uncommonly leads to something that is far better than we had planned.

I have found this repeatedly true in my business and could cite instance after instance to prove the point. Once in London Paul Gallico told me the story of the time he as a young sports writer just out of college got into the ring with Jack Dempsey. It was an amazing story: Gallico was mauled unmercifully by the Manassa Mauler. I tried to sell it to my associates by mail but nothing happened. Later Gallico came to Pleasantville and told the story again at a luncheon. It did not take an editor to see that this was a story worth telling but there was no excuse for bringing it up in the magazine.

On my way back from lunch I suggested that Paul do it as an art-of-living article, it being an art to live in the same ring with Dempsey. The emphasis and the argument would be placed on the fact that Gallico never took second-hand experience or hearsay evidence. He went in for the real thing. He wrote the story with this point and argument. It was accepted, but when I saw the proof I discovered to my dismay that the argument had been dropped. What led to the results had been discarded, but without this argument as a means, we would have no story at all.

FIND IMPROVEMENTS

So it goes in the experience of all of us. We cannot say with precision what will come of our efforts and often the thing that is dropped leads to something vastly better. Arthur Schopenhauer has a passage which states this principle beautifully:

"We often find something else, nay, something better than what we are looking for; and what we look for, we often find on a very different path from that on which we began a vain search. Instead of finding as we expected, pleasure, happiness, joy, we get experience, insight, knowledge—a real and permanent blessing instead of a fleeting and illusory one."

The next story I want to tell is the story of a word: *serendipity*. This is a word coined by Horace Walpole in a letter to Horace Mann written about 1754. Walpole felt the need of such a word and he based it on a 16th century fairy tale called *The Three Princes of Serendip*—Serendip being the ancient name for Ceylon. In this story the princes were "always making discoveries by accident and sagacity of things which they were not in quest of." Serendipity then has come to signify the detours and unexpected benefits of any journey, of any course of action.

The goal may not always be achieved but something better may bob up—as for example when Columbus, seeking a new passage to India, came across evidence of a land mass that proved later to be the Americas. Science is full of instances where the incidental discovery has outweighed in importance the real goals of the researchers —penicillin being a recent case in point.

We need to think of this story and remember this word in our evaluations. Norman Damon once defined safety as a by-product of doing things the right way. In the safety movement itself we may often get down in the mouth over the futility of our efforts to make people stay alive against what seems to me their own wishes. But we cannot appraise our efforts without seeing that there are values and experiences we encounter that may be good in themselves. The next time you wonder about your efforts, keep your eyes open for side results. Keep yourself on the line of discovery with a mind alert to the immeasurable value of incidental accomplishments.

LOST NIGHTINGALE

My last story is the story of the nightingale as told by Hans Christian Anderson. The Emperor of China had a beautiful nightingale which sweetened his life and his court with unsolicited melodies. The Emperor of Japan heard of this nightingale and, to please his brother ruler he sent the Emperor of China a marvelous mechanical nightingale. It sang with zest when it was properly wound and all at the court commented at the wonder of it. But the excitement over the mechanical nightingale was so great that in the midst of it hardly anyone noticed that the real nightingale had flown out the window.

In a push-button age that worships efficiency and progress, that forgets George Bernard Shaw's dictum that progress is merely the exchange of one inconvenience for another, we are likely to worship the mechanical, to think that if we but get properly organized and squared away, all will be lovely. But we must beware in a human thrust like the safety movement lest the real thing fly out the window. And in the appraisal of our efforts, let us examine this possibility and realize that there is no substitute for the heart and spirit. This can come only from dedicated personal interest. ▲

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Safety Exposition Exhibitors

Acme Protection Equipment Co., South Haven, Mich.
Industrial gas masks, chemicals and accessories.

Advance Glove Mfg. Co., Detroit, Mich.
Work gloves.

Aetna Casualty & Surety Co., Hartford, Conn.
Safety educational aids and services including Aetna Drivotrainer.

Akron Brass Mfg. Co., Inc., Wooster, Ohio
Fire hose nozzles and accessories.

Alan Wood Steel Co., Conshohocken, Pa.
Abrasive rolled steel floor plate.

American Abrasives Metals Co., Irvington, N. J.
Abrasive stair treads, threshold, door saddles and non-slip coatings.

American Allsafe Co., Inc., Buffalo, N. Y.
Drybrow the Nation's Sweat Band and Greenline Emergency Release.

American Biltrite Rubber Co., Chelsea, Mass.
Rubber, composition and neoprene safety soles.

American Chain & Cable Co., Inc., Bridgeport, Conn.
Sling chains and Kuplex sling chain assemblies, wire rope slings and assemble-your-own wire rope slings.

American Industrial Safety Equipment Co., Inc., Cleveland, Ohio
Face shields, goggles, gloves and mittens.

American La France Corp., Elmira, N. Y.
Fire apparatus and fire fighting equipment.

American Optical Co., Southbridge, Mass.
Head, eye and respiratory protective devices; safety clothing and safety specialty products.

Ampco Metal, Inc., Milwaukee, Wis.
Non-sparking, corrosion-resistant safety tools.

Ansul Chemical Co., Marinette, Wis.
Dry chemical fire protection equipment.

Arcadia Mfg. Co., Birmingham, Mich.
Plastic coated gloves and aprons for industry.

Award Incentives, Inc., New York, N. Y.
Safety incentive award programs, emblems, plaques and trophies.

Ballymore Co., West Chester, Pa.
Rolling safety step ladders, movable work platforms, mobile access lifts and hydraulic lift work platforms.

Bashlin, W. M., Co., Grove City, Pa.
Linemen's and industrial safety equipment.

Bausch & Lomb Optical Co., Rochester, N. Y.
Safety glasses, Ortho-Raters and "Titan" safety frame.

Beltone Hearing Aid Co., Chicago, Ill.
Audiometers, hearing aid tests.

The Beryllium Corp., Reading, Pa.
Safety tools.

Best, Alfred M. Co., Inc., New York, N. Y.
Safety publications.

Bethlehem Steel Co., Bethlehem, Pa.
Wire rope slings, standard and braided slings.

Bil-Jax, Inc., Archbold, Ohio
Tubular steel scaffolding and equipment. Portable steel bleachers.

Bomgardner Mfg. Co., Cleveland, Ohio
Emergency stretchers, cots, first aid equipment, resuscitators and respirators.

Bone Dry Mfg. Co., Neosho, Mo.
Outdoor footwear.

Boyer-Campbell Co., Detroit, Mich.
Safety equipment for industry—individual protective equipment.

Brady Co., W. H., Milwaukee, Wis.
Self-sticking safety products, Perma-Code pipe makers.

Breck, John H., Inc., Springfield, Mass.
Industrial hand cleaner; hair and scalp preparations.

Brett-Guard Co., Englewood, N. J.
New saw-guard combining safety with full work visibility.

Brossard, Lester L., Co., Chicago, Ill.
Klear-Vu traffic mirrors and Klear-Vu traffic lane markers.

Browne, Stewart R. Mfg. Co., Inc., New York, N. Y.
Electrical safety equipment, explosion-proof and vapor-proof portable inspection lites, explosion-proof flashlites, grounding devices.

Brulin & Co., Inc., Indianapolis, Ind.
Floor treatments, cleaners, disinfectants, insecticides.

Buffalo Fire Appliance Corp., Dayton, Ohio
Portable fire extinguishers and fire department accessories.

Buhrke, R. H., Co., Chicago, Ill.
Occupational safety equipment and products for construction and maintenance.

Bullard, E. D., Co., Sausalito, Calif.
Industrial safety equipment.

Cambridge Rubber Co., Taneytown, Md.
Non-slip safety soles, Vul-Cork and Vul-Cork Neoprene.

Chance, A. B., Co., Centralia, Mo.
Hot line maintenance tools and line construction tools.

Charleston Rubber Co., Charleston, S. C.
Lineman and industrial gloves, sleeves, aprons, safety devices.

Chemical Corp., Springfield, Mass.
Protective hand creams, cleaners and lotions.

Chicago Eye Shield Co., Chicago, Ill.
Head and eye protective equipment.

Chrysler Corp., Detroit, Mich.
"Chrysler Corporation—The Forward Look in Safety."

Clark, J. R., Co., Spring Park, Minn.
Industrial ladders.

Columbus Glove Mfg. Co., Columbus, Ohio
Coated gloves and aprons.

Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Alloy steel sling chains.

Cunningham, M. E., Co., Pittsburgh, Pa.
Safety marking tools.

Daisy Mfg. Co., Plymouth, Mich.
Air rifle.

Davids Gloves, Inc., Springfield, Ohio
Safety gloves.

Davis Emergency Equipment Co., Inc., Newark, N. J.
Respiratory protection, combustible gas indicators, safety and first aid equipment.

Detex Watch Clock Corp., Chicago, Ill.
Watchmen's clocks.

AMF DeWalt, Inc., Lancaster, Pa.
Radial arm woodworking equipment and safety features.

Dockson Corp., Detroit, Mich.
Welding helmets, face shields, cup and spectacle type goggles, respirators and eye savers.

Dow Chemical Co., Midland, Mich.
Safety solvents, germicides and insecticides.

Dow Corning Corp., Midland, Mich.
Sight saver cleaning stations, shoe saver, safety shoes.

Doyle Vacuum Cleaner Co., Grand Rapids, Mich.
Industrial vacuum cleaners, scrubbers and polishers.

Dunn Products, Chicago, Ill.
Protective clothing for industrial workers made from asbestos, leather, rubber, Neoprene and fire-proofed duck.

Du Pont I. E., de Nemours & Co., Inc., Wilmington, Del.
Flame retardant for fabrics and paper, anti-slip floor waxes, protective creams, *Neoprene products.*

Eagle Mfg. Co., Wellsburg, W. Va.
Safety cans, oilers, oil and gasoline containers.

Edmont Mfg. Co., Coshocton, Ohio
Coated fabric work gloves.

Elkhart Brass Mfg. Co., Inc., Elkhart, Ind.
Fire extinguishers, municipal and industrial brass goods.

Elliott Service Co., Inc., Mount Vernon, N. Y.
Accident prevention displays, safety conference programs, Supervisor's Weekly Bulletin, suggestion system service.

Emerson, J. H., Co., Cambridge, Mass.
Cotton, jersey, leather palm, all leather and plastic work gloves.

Fendall Co., Chicago, Ill.
Head and eye protection equipment.

Fibre-Metal Products Co., Chester, Pa.
Eye, head, and face protection and welding accessories.

Fine Organics, Inc., New York, N. Y.
High flash, low toxicity safety solvents.

Ford Motor Co., Dearborn, Mich.
Ford automobiles, featuring Lifeguard steering wheels, sun visors, seat belts instrument panel padding, and door latches.

Frommelt Industries, Dubuque, Iowa
Portable welding shield and protective heat cloth.

Fyr-Fyter Div., Fyr-Fyter Co., Dayton, Ohio
Fire extinguishers, resuscitators and respirators.

General Fire Extinguishers Corp., St. Clair Shores, Mich.
Quick-Aid fire extinguishers and allied products.

Glendale Optical Co., Inc., Valley Stream, N. Y.
Chippers and welders goggles, face shields, safety spectacles.

Globe Co., Grip-Strut Div., Chicago, Ill.
Grip-Strut grating, stair tread materials.

Grinnell Co., Inc., Providence, R. I.
Fixed pipe fire protection systems.

Gro-Cord Rubber Co., Lima, Ohio
Gro-Cord, Raw-Cord and Neo-Cord soles, heels and taps.

Haws Drinking Faucet Co., Berkeley, Calif.
Emergency eyewash fountains, emergency showers and goggle wash fountains.

Hild Floor Machine Co., Inc., Chicago, Ill.
Explosion-proof vacuum cleaners and floor machines.

Hy-Test Safety Shoes Div., International Shoe Co., St. Louis, Mo.
Safety footwear; also conductive and special types for atomic usage.

Hygiene Research, Inc., New York, N. Y.
Protective ointments and mistproofing cloth for goggles, welding masks, windshield.

Industrial Gloves Co., Danville, Ill.
Leather, asbestos, duck, wool, Woven-Gard, Permaproof, and aluminized duck and asbestos finger guards.

Institute of Industrial Launderers, Washington, D. C.
Industrial launderers and cleaners.

Insto-Gas Corp., Detroit, Mich.
Torches and furnaces.

Interstate Rubber Products Corp., Los Angeles, Calif.
Safety Trafficones for traffic control.

Iron Age Div., H. Childs & Co., Inc., Pittsburgh, Pa.
Linemen's and women's leather and rubber industrial safety footwear.

Jackson Products, Air Reduction Sales Co., Div. of Air Reduction Co., Inc., Warren, Mich.
Insulated electrode holders, cable connectors, face shields and goggles.

Jomac, Inc., Philadelphia, Pa.
Industrial work gloves, safety sleeves, hand guards, North P.V.C. gloves, North protective clothing.

Jones & Co., Rumford, R. I.
Full vision visor goggles.

Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Wire rope slings, wire rope.

Jumkin Safety Appliance Co., Inc., Louisville, Ky.
Power press guards, grinding wheel shields, stretcher equipment.

Justrite Mfg. Co., Chicago, Ill.
Safety cans, oily waste cans, safety electric lantern, flashlights and fire extinguishers.

Karel First Aid Supply Co., Chicago, Ill.
Industrial hospital equipment and medical supplies.

Kelley Paint Co., Louisville, Ky.
Convoy skid-proof safety enamel, Halt-fire barrier paint.

Keystone View Co., Meadville, Pa.
Occupational and driver vision tests, lantern slide projectors.

Kidde, Walter & Co., Inc., Belleville, N. J.
Fire detecting and extinguishing equipment, ultrasonic burglar alarm.

Kimball Safety Products Co., Cleveland, Ohio
Personal protective devices for industrial workers.

Mathias Klein & Sons, Chicago, Ill.
Linemen's safety equipment and tools.

Knapp Bros. Shoe Mfg. Corp., Brockton, Mass.
Safety shoes.

Kunz, J., Glove Co., Chicago, Ill.
Linemen's, bridgemen's and welders' quality gloves.

Leader Mfg. Co., Inc., Briarcliff, N. Y.
Pressurized dry chemical extinguishers.

Legge, Walter G., Co., Inc., New York, N. Y.
Safety floor maintenance materials, conductive coatings, static eliminators.

Lehigh Safety Shoe Co., Emmaus, Pa.
Leather and rubber safety footwear.

Lighfoot Co., Inc., The, New York, N. Y.
Shin cleansers—powdered, liquid, bar and waterless.

Logan Emergency Showers, Glendale, Calif.
Industrial emergency showers, eye-wash fountains.

Lowery Brothers, Inc., Chicago, Ill.
Wire rope splicing service.

Maico Co., Inc., Minneapolis, Minn.
Maico audiometers for industrial hearing testing.

Marsh & McLennan, Inc., Chicago, Ill.
Insurance broker and agencies.

Martindale Electric Co., Cleveland, Ohio
Protective dust masks, eye protectors, face shields, safety electric test instruments.

Masury-Young Co., Boston, Mass.
Floor maintenance materials.

McAn, Thom, Safety Shoe Div., New York, N. Y.
Safety shoes.

McDermott, Julian A., Corp., Ridgewood, L. I., N. Y.
Warning and safety lighting for municipal, industrial, utility and aviation use.

McDonald, B. F., Co., Los Angeles, Calif.
Industrial safety equipment.

Medical Supply Co., Rockford, Ill.
Flexible unit aid, snake bite first aid, burn first aid.

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Useful materials for use in community health and safety programs.

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GREEN CROSS FOR SAFETY

AVIATION

AERONAUTICAL INDUSTRIES SECTION
AIR TRANSPORT SECTION

Transactions of the
45th National Safety Congress
(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL
425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

AERONAUTICAL INDUSTRIES SECTION
THE AIR TRANSPORT SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Aeronautical Industries Section and the Air Transport Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Aeronautical Industries Section and the Air Transport Section carry on in behalf of their members, and for the benefit of accident prevention work in the aviation industry. These Sections give guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of aviation.

The activities of these Sections are under the direction of their executive committees, the members of which are listed at the close of this volume.

Aeronautical Industries Section

COST OF OFF-THE-JOB ACCIDENTS TO INDUSTRY

by R. WILKINS
safety administrator, North American Aviation Inc., Los Angeles, Calif.

At a recent meeting of the 17th Annual Congress on Industrial Health, Dr. Dwight H. Murray, President of the American Medical Association, stated that "from 1940 to 1945, the accidental death rate in industry dropped 30 per cent, making most work places safer than the home and highways." From this statement it would appear that the industrial safety job has reached the stage of "a good job well done" but it certainly points to the necessity of added efforts in the off-the-job safety field.

Quoting from the 1957 edition of "Accident Facts," we find that off-the-job accidents cost the American public $4,850,000,000 as compared to costs of work accidents of $1,950,000,000, or a ratio of 2.5 to 1. This does not include indirect costs but reflects wage loss, medical costs, and insurance.

To get into the area of how much of this tremendous off-the-job accident cost is being borne by industry, one must reflect on the direct cost of group and disability insurance programs which are borne by industry, and under such programs, employees or their dependents draw benefits while disabled or hospitalized as a direct result of off-the-job accidents.

The cost of most disability insurance programs to industry is in direct relation to the amount of benefits paid under these plans, so it is fairly obvious that by reducing off-the-job accidents, there would be a direct result of lowering the cost of disability insurance to industry.

CONTRIBUTORY PLANS

While most group insurance plans are contributory in nature, that is, the employees and employers both contribute, the same premise as stated above would be true to a lesser degree. In a recent one-year period, a large aircraft company in the State of California showed the following cost experience in the three fields of so-called fringe benefit insurances.

Group Insurance .....$2,868,000.
Disability Insurance .....$1,352,000.
Workmen's Compensation ...$ 313,000.

These figures show that the ratio of group insurance to Workmen's Compensation is 9.2 to 1 and disability insurance is 2.3 to 1. The previous ratio as reflected from the figures quoted from "Accident Facts" is almost identical to the ratios of disability insurance to Workmen's Compensation noted here.

Throughout the safety engineering profession during the past years, the most often heard comments are the need for upgrading the profession and ways and means of effecting it. Certainly, in the present period of increasing austerity, the most fertile field for a safety engineer to develop as an important part of good management would be in decreasing the cost of doing business, and, without question, from the figures shown, much can be done in the field of reducing costs of fringe benefit insurance programs through the development and active participation in off-the-job safety programs.

INDIRECT RETURNS

Up to now, we have only been talking in direct dollars and cents costs with no thought being given to the indirect returns of off-the-job safety programs from the public and employee relations standpoint. A couple of years ago, during a most active phase of our off-the-job safety program, an attitude survey among a small, scientifically selected sample of employees was made, to determine which of our many fringe benefits our employees were most familiar with and which they most appreciated. They were not asked to comment on any specific benefit but were asked what they thought were the most important advantages to them in working at North American.

The results showed concretely that our safety program had made a bigger impression on our employees than any other single fringe benefit that North American offered. This is especially significant when you consider all of the fringe benefits furnished by industry these days. Certainly, this attitude reflects the good feeling brought about by doing something on off-the-job safety for the employee and his family.

There are many tangible returns from a sound safety program in the area of better employee relations, public relations, and more efficient production. We attempted to reach the people who make the man on the job "tick" through a joint on-the-job—off-the-job safety program. This program has been continuing for the past several years and it is called the "Good NAAbor Program." The most recent phase of this program was typified by direct mail into the homes of all employees at the Los Angeles, Downey, Canoga Park, and Fresno, California plants, representing some 23 geographic locations and fitting into 14 separate communities.

OFF-THE-JOB-PROGRAM

Special letters were mailed, accompanying a safety booklet or bumper sticker, playing up items of safety that had some specific appeal at the time of the mailing. The five most recent gimmicks we used in this program were:

1. the Good NAAbor Safety Show,
2. a Bumper Sticker Campaign,
3. "Dennis the Menace on Safety" Booklet,
4. Post Cards, and
5. Lifesavers.

The first project, the Good NAAbor Safety Show, incited employee interest and participation in *Doing* for Safety. A theater was reserved for North American's exclusive use for one day, with second shift employees being invited to the matinee performance. Attendance at the theater was limited to employees and their wives or husbands, who had been recognized by their supervision as having done something "extra" for their own or their fellow worker's safety.

At the time he was observed, he was given a pair of tickets to the show, plus tickets for free popcorn and Cokes. The program consisted of a presentation by North American's choral group, followed by a short subject comedy on safety, and a major studio feature preview.

Next, a traffic safety letter was mailed to the homes of all North American California employees, with the enclosure of a bumper sticker which was designed with the Good NAAbor Safety Insignia and bearing the wording, "When in Doubt—Play it Safe."

PROGRAM FOR CHILDREN

The next project, "Dennis the Menace on Safety," was especially well received by the children in the homes, and requests for additional copies of the booklet were received from schools and PTA groups. This booklet, a National Safety Council publication, was imprinted with our Good NAAbor insignia, and was mailed to the homes of our employees together with a home safety newsletter.

Next we mailed jumbo post cards with a full color picture of products built by North American Aviation, such as the atomic energy reactor and the Saber jet. The card carried an appropriate safety message or slogan on the reverse side.

The final phase of this campaign took place on the job. Miniature Lifesavers were obtained with a safety slogan imprinted on each package, "Good NAAbors are Lifesavers." These Lifesavers were given to our plant safety committeemen who passed them out to employees in their area on a given day. Interest in this project, as well as all other phases of the program, was incited by articles in the company newspaper.

Several weeks before the Lifesavers distribution, small brighteners, such as "Lifesavers are Coming." "Lifesavers—A Safety Treat," appeared in the newspaper, to arouse curiosity and interest in the program.

As in past phases of our Good NAAbor Program, we are allowing a lapse of several months before embarking on other phases. These are presently in the study stage.

It seems readily apparent to me that increasing activities in the off-the-job safety field are indicated, and, as a means of making the safety job a more important tool of management, it would behoove all of us to increase all of our activities in this field and thus continue to do a worthwhile service for employers, the community, and the nation.

EPOXY RESINS AND CATALYSTS HAZARDS

by PAUL LANGE

industrial hygiene engineer, Employers Mutuals of Wausau, Milwaukee, Wis.

During the last few years, a relatively new group of synthetic resins has been introduced into the aircraft industries. They are called the epoxy resins and are also referred to as epoxide and ethoxyline. These names are derived from the functional OXIRANE group and partially from the basic material epichlorohydrin. Chemically, these resins are condensation products formed from epichlorohydrin and bis-phenol or other polyhydric compounds.

The resins were first introduced in this country under such trade names as "Epon" and "Araldite." Needless to say, there is a large variety of epoxy resins on the market today under various trade names. It is estimated that about 90 million pounds of epoxy resins were used in 1956.

Because of their extensive range of desirable characteristics, epoxy resins have a wide application. Aside from good mechanical and electrical properties, they have excellent adhesion and insulation qualities, plus a remarkable resistance to corrosion. In short, their application appears to be unlimited. A speaker addressing a recent American Foundrymen's Society meeting, heralded epoxy resins as "perhaps the most important development in our life time."

APPLICATION OF RESINS

Typical industrial applications include aircraft fabrication; electrical components, such as transistors, capacitors, rotors and small motors; proofing of electrical splices; fabrication of foundry patterns; lining materials for detergent and paint cans; drill and checking fixtures; glass cloth laminates; bonding for milk tank fabrication; and even repair of metals such as automobile bodies and fenders.

Basically, epoxy resins are supplied in two reactive components, the resin and the hardener, which is also referred to as the catalyst, curing or setting agent. In some cases it is desirable to preheat the components, and in other cases tht components are mixed at room temperatures. Likewise, curing may occur at room temperatures or is hastened by additional heat in curing ovens. Shrinkage is small during curing, indicating that the amount of volatile material released is small. Depending upon the results desired, fillers plasticizers, diluents and flexibilizers may also be added.

HARDENER HAZARDS

The chief health hazard associated with epoxy resins lies in the handling of the hardener and the catalyzed uncured resin.

The hardeners are most often one of the aliphatic or aromatic amines. Occasionally, one of the organic acid anhydrides is used. As a group, the amines, substituted ammonia compounds, are caustic materials.

Human experience and animal studies have shown that the amines are not only primary skin irritants, but can also become generalized sensitizers with whole body reactions. From our knowledge of human experience it has been demonstrated that anyone with sufficient exposure to the amine catalysts or their vapors will develop a skin reaction. Frequent exposures to relatively low concentrations of amine catalysts will produce a sensitized-type dermatitis which becomes more extensive with repeated exposures.

The skin reaction generally appears on the exposed skin areas such as eyelids, hands, forearms, neck and face. The dermatitis generally appears as an inflammation progressing to edema, later vesiculation with weeping, crusting, and finally scaling. Continued exposure may propagate the dermatitis to other parts of the body.

SENSITIVITY VARIES

Developing a sensitivity to the amine catalysts is extremely variable. Some hypersensitive individuals develop a sensitivity after short exposures, while others may be exposed for years before becoming sensitized. In the case of a sensitized individual the mere inhalation of low concentrations of the amine catalyst may be sufficient to produce real symptoms.

The prognosis of most epoxy resin dermatitis cases is for the most part fairly

rapid recovery after medical treatment and complete removal from the exposure. Experience has shown that affected personnel must be completely cured of their skin irritation before returning to their previous exposure.

We were again reminded of this just recently with an epoxy resin dermatitis case in Milwaukee. An affected worker was removed from his original exposure and after proper medical treatment was permitted to return for work in another part of the plant where there was no epoxy resin exposure. Unfortunately, the newly assumed position was also on a lower pay scale. The employee's dermatitis had healed fairly well and was in the final stages of healing. The man clamored for immediate return to his old job.

RETURNED TOO EARLY

The Union representative thought he had the best interests of his fellow worker at heart and lent his support. The superintendent was pressured, against his better judgment, into returning the employee to his old job. The story is short. The man worked just one day. That night his dermatitis broke, covering not only his previous hand skin area but radiated up his forearms finally reaching his shoulders. The final report on the employee was that he was again on his old job but a very careful worker.

The hazards associated with the other catalysts such as the organic acid anhydrides vary from moderate irritation to the eyes, nose, and throat, to extreme irritation to the same organs.

UNCURED RESINS

The plastics industries were among the first to learn that the catalysts for epoxy resins were dermatitis producers. They extended research efforts to find less hazardous materials. It has been found, for example, that the hydroxyalkyl derivatives of diethylenetetramine do not produce sensitization and are equal to or better than the commonly used cross-linking agents. As a result, a low order toxicity amine catalyst is on the market.

While most of the uncured resins may in themselves produce skin and eye irritation, they are considerably less reactive than the catalysts. Some sources indicate that there is a relationship between the ability of the resin to produce dermatitis and the resin's molecular weight. It is believed that the irritant potential decreases with the increasing molecular weights of the resins. The theory is that with an increasing molecular weight resin there are fewer molecules per unit area for reaction with the skin.

The catalyzed uncured resin will have irritant properties dependent upon the reactiveness of the resin and catalyst used and the state of polymerization.

Once the resin becomes fused, there is little sensitizing danger except when performing grinding or other mechanical operations whereby small amounts of vapor may be regenerated. This may become significant if such work is carried out in confined unventilated spaces.

Likewise, there is also a possibility of generating considerable dust during the sanding of the hardened resin. There have been a few cases where sensitized individuals have experienced difficulty from the sanding dust when not protected with a respirator. Ordinarily, the dust is considered fairly inert. It is an organic material and under proper conditions may present a fire and explosion hazard.

PLASTICIZERS AND DILUENTS

The use of these materials may further increase the hazard of handling epoxy resins. For example, a diluent such as phenyl glycidal ether is an irritant affecting both the eyes and the skin. Plasticizers and diluents also increase the potential fire hazard.

Most of the fillers, with the notable exception of silica flour, present few health hazard problems. Likewise, the flexibilizers such as the organic polysulfides even with their foul mercaptan odor are considered less hazardous.

The handling of epoxy resin materials presents no unusual difficulty providing a comprehensive safe practices program is instituted and rigidly enforced. The principal objectives of the program are much the same as with the handling of any other hazardous material. Experience has shown that the following safe practices are effective.

EDUCATING FOREMAN, WORKERS

It is of prime importance to train the foremen and workers how to work safely with the epoxy resin components. They must know and be keenly aware of the potential hazards and how to cope with the reactive materials. The basic need for strict personal hygiene must be fully appreciated. It is not uncommon to hear plant safety directors remark that after men have been working with epoxy resins they develop better basic personal hygiene habits than they had before they started such work.

Even small items, such as keeping the finger nails short, not wearing rings or wrist watches while working, not wiping the perspiration from the face with a contaminated hand, using clean rags or paper toweling to remove excess resin, and wearing clothes not contaminated with resin or catalyst are of significance.

Frequent washing of the hands is necessary whenever the worker leaves the resin area before smoking, eating, or drinking. Care must be exercised not to contaminate door knobs and other common articles. Foot-activated water valves are desirable at the drinking fountain and in the wash room.

WATCH SKIN CONTACT

It is most desirable to keep the reactive epoxy resin components off the skin. Process mechanization is one effective method in minimizing skin contact, for example, mechanical mixers and mechanical pouring devices.

In many instances the operation is such that manual handling of the components is required. It is during these operations where gross skin contamination may result. Impervious gloves (preferably lined), aprons, sleeves, face shields, vapor-proof chemical safety glasses, respirators approved by the U.S. Bureau of Mines for protection against toxic vapors, and barrier creams are all valuable in minimizing skin contact.

There are some manipulations which require acute manual dexterity and gloves cannot be worn. In such cases it is desirable to use a barrier cream. There are many barrier creams available and generally any cream providing good protection against alkalies will provide some protection. Application of barrier creams to all exposed skin areas is advisable where there is a danger of the uncured epoxy resin or the catalyst vapors reaching the skin.

In cases of sensitized individuals this is extremely important. We frequently hear production people state that just walking through a curing area when small amounts of amine vapors are present will cause the face to break out with an urticaria condition if they had forgotten to apply their barrier cream.

SUPPLY REFATTING CREAM

Since workers must wash their hands many times during the day, it has been found worthwhile to supply the workers with a refatting cream such as the lanolin base type for use after the final clean-up at the end of the shift. This facilitates the replenishment of the natural skin oils and prevents the hands from becoming dried and cracked, conditioning them so they are less susceptible to infection.

Plastic gloves and tools contaminated with epoxy resin components should be washed in some suitable solvent such as acetone or alcohol, followed by soap and water. Since most of the solvents which may be used for this cleaning action are flammable, the solvent washing is best done by a worker protected with impervious gloves in a container equipped with a self-closing safety lid. Only tools contaminated with epoxy resin components should be cleaned in this container.

Face shields are helpful in keeping droplets off the face in many operations, for example, applying the catalyzed resin as an adhesive coating on a tank with paint rollers. Once the resin material falls on the skin, it should be removed as soon as possible with soap and water before the resin sets. Should the resin become set, care must be taken to use only clean solvent for removing the resin. There are also products now available for removing epoxy resins from the skin. These are said to be free of solvent.

RESPIRATORS SUGGESTED

Respirators approved for protection against toxic catalyst vapors have a place where ventilation is impractical. Likewise, chemical safety goggles are necessary under similar circumstances to prevent eye irritation.

Good housekeeping is essential in keeping the resin components off the skin. Sloppy handling of the reactive materials and allowing them to become spilled on the floors, benches and tools generally means that some of the material will eventually contaminate some worker's skin.

With some operations it is desirable to cover the work benches and other possible drip locations with a disposable material such as paper. This covering material may then be removed at the end of the shift or as the situation demands and disposed in suitable closed waste containers.

VENTILATION

One of the first controls an industrial hygienist considers when dealing with a toxic material is ventilation. We have placed ventilation as the third control since it in itself is not as importan. • education and keeping the skin contact to a minimum. Sensitized workers may argue this point but had they not allowed themselves to become sensitized, they perhaps would also concur.

It is desirable to apply local exhaust ventilation at weighing, mixing, and curing areas. Where oven-curing operations are utilized, it is also necessary to ventilate the ovens. The need for ventilation is somewhat dependent upon the type of epoxy resin and hardener and the temperatures used since some epoxy resin components have low vapor pressures.

MEDICAL CONTROLS

In some operations if the amount of epoxy resin used is small and the plant area large, good general ventilation is adequate. As mentioned previously, there are some operations where because of the mass of the material involved, local exhaust ventilation is impractical and general ventilation is inadequate; therefore, approved respirators must be worn to protect the workers.

One of the chief functions of the medical control is to assure prompt medical treatment of all skin irritations. This requires a close watch by foremen and supervisors so that a worker does not develop a full "bloom" dermatitis before reporting to the medical department. If the plant does not have a medical director, services of a dermatologist should be sought.

The treating physician should be supplied with complete information regarding the epoxy resin used. The worker should not be allowed to return to his job without a directive from the medical department and then his preventive measures become extremely important.

An attempt should be made in the preemployment physical examination to screen allergics and asthmatics so that these workers are not exposed.

Proper fire precautions should be observed with the resins, flexibilizers, catalysts and diluents. As mentioned before, dust control measures should be considered for sanding operations.

MANUFACTURERS' RECOMMENDATIONS

For interstate shipping regulation reasons and others, products are labeled with the manufacturer's recommendations for safe handling and use. This information should be studied and followed carefully as it contains a wealth of information.

Most manufacturers will gladly supply additional information at your request, and it is only reasonable that they know their products best.

The epoxy resins are finding wide application throughout industry. The main occupational health hazards associated with their use is contact dermatitis and sensitized dermatitis in some individuals.

Experience indicates that epoxy resins can be worked with safely provided basic safe practices are exercised. These include education, keeping the skin contact to a minimum, adequate ventilation, medical control, proper fire precautions, and following the manufacturer's recommendations.

AERO SAFETY EXCHANGE QUESTIONNAIRE RESULTS

The AERO Safety Exchange Questionnaire was submitted in advance of the program, summarized after returns were received, and in part, discussed at the program. Other matters were also discussed, but not recorded.

Members replying to the Questionnaire:
AiResearch—Division of Garrett Corporation—Los Angeles, Calif.
ARO, Incorporated—Tullahoma, Tenn.
Boeing Airplane Company—Seattle, Wash.
Boeing Airplane Company, Wichita, Kan.
CONVAIR—Division of General Dynamics Corporation, Fort Worth, Tex.
Douglas Aircraft Company, Inc.—Long Beach, Calif.
Douglas Aircraft Company, Inc.—Tulsa, Okla.
Hughes Research & Development Laboratories—Culver City, Calif.
Lycoming—Division, AVCO Manufacturing Corporation, Stratford, Conn.
McDonnell Aircraft Corporation,—St. Louis, Mo.
Orenda Engines Limited—Toronto, Ontario
Rohr Aircraft Corporation—Chula Vista, Calif.
Ryan Aeronautical Company—San Diego, Calif.
Solar Aircraft Company—Des Moines, Iowa
Wright—Patterson AF Base—Dayton, Ohio

A. *EMPLOYMENT OF PERSONNEL*

1. X-Rays taken of all Backs?
   No: 16* Yes: 0
   * 1—On ages over 30
   1—New hire past 40 (4 views)
   a. If not, are they taken on questionable cases?
   No: 2 Yes: 14
   * Questionable under 40
   b. Are records kept of individual X-Ray exposures?
   No: 2 Yes: 14
2. Is safety orientation given at time of employment?
   No: 2 Yes: 14
   a. If so, state length of orientation.
   1—40 Minutes
   5—60 Minutes
   1— 2 Hours
   2— None
   3—45 Minutes
   2— 5 Minutes
   1—20 Minutes
   1— 1 to 2 Hours
   b. Are safety rules given employees?
   No: 1 Yes: 15
   c. Are safety rules given employees at time of employment?
   General: 8
   Departmental: 1
   Both: 6
   None: 1
3. Are medically restricted cases checked by Safety Department for approval before actual employment?
   No: 6 Yes: 10
   a. Does Safety Department check include all restrictions, even to color blindness?
   No: 5 Yes: 11
   b. Are medically restricted personnel periodically checked by Safety Department?
   No: 4 Yes: 12
   * Every 6 Months (1)
4. Submit example of report on type medical restrictions which cause rejection of applicant.
   *1—Drill press operators
   1—Man with one eye
   1—Former back cases
   1—Not available for release
   1—Color blind person cannot work in stores, bar stock. Polio cripple cannot work in second floor departments because of stairs.
   1—Backs, respiratory, hearing, sight and some physically handicapped.
   1—See complete record on file.

B. *MEDICAL*

1. Are medical restrictions placed on employees who are given permanent disability awards?
   No: 1* Yes: 15*
   * Depends on case.

a. Does this include cases where company or company authorized physician does not find any disability, but employee given award?
No: 7 Yes: 8

2. Are cases considered industrial, where
a. Employee bends down, cannot straighten up, and disc results?
No: 3 Yes: 13
b. Stoops to plug in electrical plug-back strain-lost time only?
No: 3 Yes: 13
c. Dermatitus condition—No positive reason?
No: 9 Yes: 7

3. No reports.

C. *SAFETY DEPARTMENT*

1. Are tabulating cards prepared on all dispensory calls, broken down by type of injuries and reports made?
No: 11 Yes: 5
a. Are monthly reports also made by tabulating unit and printed off of master?
No: 11 Yes: 5
Note: One company reports that medical makes monthly report.

2. Do you keep accumulated record of manhours worked by each department?
No: 3 Yes: 13
a. Where do you get figures?
1—Accounting—15
2—Tabulating—1

3. On what basis are Safety Personnel Employed?
1—Direct labor hours—1
2—Two years or more of Safety Engineering experience.
3—No written procedure.
4—Salary for male safety engineer—hourly for clerical.
5—No comment—3
6—Qualifications, work background, personality, etc.
7—U. S. Government Standards
8—Education and Experience
9—Experience—2
10—Roughly one per each 750 employee
11—Basis of need.

a. (1)	7 Safety Engineers 1 Steno	$ 396.00—$ 665.00 1.71— 2.25		24,500 Personnel
(2)	1 Safety Engineer 5 Safety Inspectors 1 Steno	Salary Not Disclosed $ 98.00—$ 113.00 Week 82.80— 94.80 Week		30,000 Personnel
(3)	1 Safety Engineer 1 Steno	6400.00— 9800.00 Year 128.00— 260.00 Month		2,900 Personnel
(4)	1 Safety Engineer 5 Safety Analyst 1 Clerk 1 Safety Supervisor	Salary Not Disclosed Salary Not Disclosed Salary Not Disclosed Salary Not Disclosed		17,258 Employees
(5)	1 Safety Engineer 1 Safety Administrative 1 Safety Representative 1 Steno-Secretary	$ 800.00—$1100.00 Month 664.00— 932.00 Month 580.00— 806.00 Month 1.73— 2.33 Hour		5,500 Personnel
(6)	Safety Engineer Steno-Secretary	500.00— 600.00 Month 260.00— 290.00 Month		Personnel Not Mentioned
(7)	No Comment—2			
(8)	1 Safety Engineer 7 Safety Inspector 1 Safety Analyst 1 Steno-Secretary 1 Clerk	$5440.00—$8645.00 Year 4080.00— 6250.00 Year 3415.00— 4890.00 Year 2960.00— 3925.00 Year 2960.00— 3925.00 Year		80,000 Personnel
(9)	3 Safety Engineers 1 Steno-Secretary	123.00— 176.00 Week 1.76— 2.08 Hour		12,317 Personnel
(10)	2 Safety Engineers 1 Steno-Secretary 4 Clerks	94.00— 141.00 Week 1.85— 2.08 Hour 1.49— 1.89 Hour		28,000 Personnel
(11)	1 Safety Engineer 2 Safety Inspectors 1 Steno-Secretary	Salary Not Disclosed $ 410.00—$ 525.00 Month 240.00— 320.00 Month		5,000 Personnel
(12)	1 Safety Engineer 1 Safety Engineer 1 Safety Supervisor 1 Steno-Secretary	5400.00— 6300.00 Year 6700.00— 8400.00 Year Salary Not Disclosed $2700.00—$3800.00 Year		2,200 Personnel
(13)	1 Safety Engineer 2 Safety Analyst 1 Safety Inspector	Salary Not Disclosed $ 450.00—$ 636.00 Month Hourly		8,500 Personnel
(14)	8 Safety Engineers 1 Steno	$ 375.00—$ 665.00 Month 1.71— 2.15 Hour		28,000 Personnel

4. Does safety approve all tooling prints where safety involved?
No: 3 Yes: 13

5. Does safety approve plant engineering prints?
No: 2 Yes: 14

6. Does plant lay-out tie safety in on all moves, additions, etc.?
No: 2 Yes: 14

7. Does safety have monthly meetings with all unions?
No: 6 Yes: 10

8. Does safety check all additional safety requirements to all process standards?
No: 4 Yes: 12

9. Are all standard practices involving safety coordinated with safety?
No: 1 Yes: 15

10. Does safety check employee suggestions regarding safety?
No: 0 Yes: 16

11. Are safety standards added to engineering standards?
No: 1 Yes: 15

12. Are safety check sheets made out for departments?
No: 7 Yes 9

13. Do you have safety rules for each department?
No: 5 Yes: 11

14. Are awards other than Safety Plaque for department given each employee for a given number of no lost time hours?
No: 16 Yes: 0

15. What departments, or job classification, have a compulsory safety shoe requirement.
(1) No safety shoe program—9 companies
(2) Foundry, drop hammers, tooling & material handling
(3) Steel Foundry—3 companies
(4) Drop hammers, die yard, foundry
(5) Foundry, warehousing, machine shops & plant maintenance.

16. What departments have goggle areas?
(1) Fabrication & tooling
(2) All departments in shop—5
(3) Departments having grinding, welding, etc.
(4) Machine shop, fabrication & chemical processing.
(5) Machine shops, maintenance, burring, aluminum foundry, plating, sheet metal, spot welding, grinding, heat treat and Experimental Laboratory
(6) Welding, machine operations—maintenance
(7) All hazardous areas such as machine shop & sheet metal fabrication, etc.
(8) Plant wide, except final inspection & final assembly
(9) Grinding room
(10) Tool grinding
(11) Production machine shop, Tool & die, Tool grinding, etc.

17. Makes of goggles used
Spectacle type—14
Coverall type—13
a. Are they repaired?
No: 2 Yes: 14
b. Salvaged when repair needed?
No: 13 Yes: 1
c. Do you standardize on coverall type only?
No: 12 Yes: 4
d. Is goggle cart used?
No: 16 Yes: 0
e. What kind of goggle cleaning used:
Paper & fluid—11
Treated Paper—10

18. Do your safety personnel have a certain area for which they are responsible?
No: 8 Yes: 8

19. Have you tried to employ specialists or engineers for the various requirements, such as: chemical, structural, mechanical and electrical?
No: 14 Yes: 2

20. Is safety responsible for all proof-testing of handling fixtures, cranes, hoists, jacks, tri-pods, etc.?
No: 8 Yes: 8
a. Does safety maintain records & issue requests for proof-testing?
No: 7 Yes: 9
b. Does safety witness new or reworked proof-testing?
No: 7 Yes: 9
c. Are more important fixtures magnafluxed?
No: 4 Yes: 12

21. To what division head or executive dies safety report?
(1) Personnel or industrial relations—12
(2) Management—1
(3) Public relations—1
(4) Chief-general services division
(5) Plant engineer

22. Are compensation payments reported to top management?
No: 1 Yes: 15
a. Individually—23
b. Monthly—8
c. Yearly—12

23. Can employees purchase safety shoes through the company on time basis? (Payroll deduction)
No: 6 Yes: 10

24. Do you carry home-safety activities other than through your weekly news?
No: 7 Yes: 9

D. *TESTING EQUIPMENT*

1. Are all testing fixtures, including gauges, hoses, safety valves and operations periodically checked?
No: 2 Yes: 14

2. Are operating instructions posted on each fixture?
No: 4 Yes: 12

3. Are operators specially trained, certified, and authorized to operate most equipment?
No: 3 Yes: 13

4. Are assigned operators names posted on equipment?
No: 13 Yes: 3

5. Does safety approve design of each?
No: 5 Yes: 11

6. Do you have a special certification department for this equipment?
No: 8 Yes: 8

7. Do you have a special hose with safety pop-off valve for airing tires from nitrogen carts?
No: 6 Yes: 9

E. *MISCELLANEOUS*

1. Does all towed equipment, except that which has a mercury trailer hitch, have safety chains?
No: 3 Yes: 1

2. Do you use a substitute fluid for JP-4 fuel (such as Sol-Trol) for testing fuel system, including tanks, valves, fittings, tubing, boost pumps, etc, in aircraft under static test load or pressure?
No: 0 Yes: 8

3. What type protection is used to keep down skin scratches?
(1) Gloves—4
(2) Padded or sheared off corners—gloves—aprons, etc.
(3) Paper—2
(4) Spray-Lac
(5) Protective equipment—6
(6) Corregated paper coverings
Note: This question mis-understood. It was intended to concern keeping surface scratches from aircraft wings, etc.

4. Type ear plugs used:
(1) Rubber—3
(2) Plastic—1
(3) MSA—10
(4) Not used—2

5. Type ear muffs used:
MSA—6 AO—5 Other—4

6. Do you have protective guard in front of engine intake?
No: 2 Yes: 9

7. Do you have an emergency evacuation program?
No: 4 Yes: 12

8. Do you use electric eyes on:
Hydraulic presses? No: 13 Yes: 3
Shear machines? No: 14 Yes: 2
Vehicle doors? No: 12 Yes: 4

9. Are all punch press dies individually guarded?
No: 11 Yes: 5

10. What type cleaning solvent used to clean aircraft?
Turco 2851—2
Various—1
Alkaline type cleaner—1
Stoddord solvent-also trichloroethylene—2
Tect-safe solvent—1
Trichloroethelene-stanisol—2
Trichloroethane—1
Menthyl alcohol—1
Company compounded—1
a. Is trichloroethylene used in spray method?
No: 11 Yes: 3
b. Is trichloroethane used?
No: 5 Yes: 6
c. How are hydraulic line breaks cleaned up?
Oil sorb—3
Wash down by fire department—rags
Trichloroethlene
Wipe or spray

11. What type of substance that cannot be tracked on aircraft causing scratches or corrosion are used on icy and slick surfaces around doors and walkways?
(1) Pea gravel and employees wear shoe socks—1
(2) Floor sweep—1
(3) Abrasive strips—1
(4) Sand—11
(5) Mats

12. Do you have special device on tugs, fork lifts, eac, used in buildings to reduce carbon-monoxide concentrations?
No: 13 Yes: 3

13. Do parking lot stalls have:
Bumper stops—5
Post-wire stops—3
Wheel stops—6
Painted stall marked—3
a. If only painted stall marked, does it work out alright?
No: 0 Yes: 3
b. Would you rather have stops?
No: 3 Yes: 3
c. Are better parking spaces given those with riders?
No: 12 Yes: 4

14. Do you have test equipment for sampling all types of chemical and dust fumes which are toxic or irritant?
No: 6 Yes: 10

15. Do you have a standard practice where employees are sent home when humidity and temperature reach a critical level?
No: 14 Yes: 2

16. Are drop hammers periodically checked, "dogs" and bolts magnafluxed?
No: 2 Yes: 12

17. Do you have compulsory wearing of ear plugs around drop hammers?
No: 2 Yes: 10

18. How often are wing jacks proof-tested?
(1) Every 6 months—2
(2) When repaired —1
(3) Monthly —2
(4) Daily —1
(5) Every 3 months—1
(6) Yearly —1
(7) Every 2 months—1
a. Proof tested to:
(1) 1½—1 —6
(2) 2—1 —3

19. How often are overhead cranes proof-tested?
(1) Every 60 days —2
(2) Monthly or when reworked—5
(3) Inspected nightly only —1
(4) Every 6 months —2
(5) Yearly —1
(6) Every 3 months —1
a. Proof-tested to:
(1) 1½ —1
(2) Capacity, plus 10%
(3) Capacity, plus 11.1%
(4) 3 —1
(5) 2 to 1 —1
(6) 1¼ to 1 —1

20. Does safety check all vehicles?
No: 12 Yes: 3

21. Method of disposal of radio-active tubes:
Bury—4
Dumped in sea—7
a. Are standard TR and TRT tubes (slightly radio-active) treated as plain tubes?
No: 8 Yes: 1

22. What type of slings used in overhead crane work?
(1) 6 x 37 hemp center, preformed, improved plow steel—3
(2) Steel—braided type—2
(3) Tuffy—braided slings
(4) Cable
(5) 6 x 37 hemp center & aircraft steel core cable
(6) Hemp, wire center
a. Are chain slings used in general?
No: 11 Yes: 0

23. Maximum PSI (above sea level) employee allowed under for air pressure tests?
(1) 3½ PSI—1
(2) 6 PSI—2
(3) 2# PSI—1
(4)10 PSI—1
(5) Individually determined—1
(6) 2.8 PSI—1

24. Are electricians given a complete set of safety rules which include wiring of various plugs, splicing cables ,etc.?
No: 7 Yes: 10

25. Do you have an emergency disaster plan, including evacuation of employees?
No: 3 Yes: 10

Potential Hazards of Fuselage & Component

PRESSURIZATION TESTING

by FRANK W. STARR

safety and conservation administrator, Douglas Aircraft co., Inc., Long Beach, Calif.

In the development of pressure vessels, the prime concern of the design engineer is that the vessel be constructed to withstand the ultimate load pressures and stresses applied to the unit. In initial calculations, the design engineer will usually refer to the American Society of Mechanical Engineers Pressure Vessel's Manual as a guide to safety requirements of the vessel in considering the size of the unit, gauge and tensile strength of the material, type of construction and the installation of pressure relief valves. Adverse past experience resulting in numerous failures of fired and unfired pressure vessels has developed this caution and respect.

Approximately three years ago, the safety department at the Douglas Aircraft company, Long Beach division, was informed by the engineering department that the newly designed C-133 cargo airplane would require exhaustive fuselage, component, and static pressurization tests. At the time this did not cause any undue concern to the safety department.

When we were appraised, however, that the C-133 would be the largest cargo airplane ever developed in the United States, and that the fuselage tests would require ultimate loads of 13 psi, we were staggered by the magnitude of accident prevention problems which would confront us.

Following this initial notification, representatives from the engineering department attended a meeting with the executive safety committee at the Douglas Long Beach Division.

COMMITTEES SET UP

The safety committee decided at once to appoint a pressurization safety sub-committee to plan a pressurization program for the maximum safety of personnel and structures. This newly appointed committee was comprised of personnel from the engineering and test division, facilities department, materials and process group, tooling section, sealing, manufacturing and safety department.

One of the first questions considered by the committee was the advisability of conducting production tests in the manufacturing buildings. Considering the tremendous size of the C-133 fuselage—an overall length of 140 feet and a capacity of 25,000 cu. feet—it was obvious that to assure the safety of employee personnel and building structure in the event of failure, it would be necessary to isolate the fuselage during all pressurization tests. This was advisable because under ultimate pressure loads, the energy within the fuselage against the cargo door was approximately 60 tons. We now were confronted with a pressure vessel safety problem of first magnitude.

WATER TANK BUILT

Weekly meetings and concerted committee planning finally resolved in a program of controlled pressurization testing. At this point, after an evaluation of engineering data, Douglas Long Beach Management decided to construct a water tank large enough to isolate and test the C-133 fuselage while completely submerged. The construction of this tank, which is isolated by distance from any building structure, required considerable time.

The hydrostatic tank was 170 feet in length, 30 feet wide, and 27 feet deep. The lower section of the tank is steel reinforced concrete construction, 15 feet of which is below ground level. The upper 12 feet of the tank is ½ inch boiler plate. The tank has a capacity of approximately one million gallons.

In order to accomplish all testing on schedule, work proceeded on other fuselage and component pressure testing while the tank was constructed. The engineering and test personnel conducted five separate pressure tests:

1. C-133 nose cockpit pressure test.
2. 300 inch fuselage pressure test.
3. Hydrostatic test of entire fuselage.
4. Fuselage component panel tests.
5. Engineering static test of the airplane, with and without air pressure.

Various precautionary measures were used during these extensive tests. In testing the C-133 nose or cockpit section with air and no filler, the sub-assembly was placed in a large tank in an isolated section of our plant property. After anchoring the specimen, we attached a double mesh cyclone fence canopy at the top of the tank to trap or deflect any possible fragmentation in the event of a failure. Synchronized motion picture cameras and television equipment were installed at a port hole of the tank to observe and record the results of the test.

FAIL-SAFE TEST BEGUN

We were now prepared to proceed with our initial "Fail-Safe" pressure tests. Although maximum air pressure loads were applied on numerous occasions by our testing personnel, ironically it was finally necessary to cut the specimen with a remote control hydraulic saw in order to induce a failure. In this manner, engineers could ascertain the structural strength and integrity of the fuselage component and provide required reinforcements. There were also tests made of the nose section under water for ultimate pressure and for cycled "life spectrum" pressure.

In pressure testing the 300 inch fuselage section, on the recommendation of our engineering department, phenolic foam filler (balsa light) was used. This filler with paper barrels in the fuselage section provided a 95 per cent displacement of air and insured a maximum reduction of energy in the event of failure. As an additional safeguard, a canopy type cyclone fence enclosure was also installed over the entire 300 inch fuselage section as a precaution against possible fragmentation during the initial test. From results of these and subsequent tests, our Douglas design engineers provided a fuselage structure. If a crack developed in the pressure vessel a small leak type failure, non-catastrophic, would result, not an explosive type failure. The C-133 airplane does include this "Fail-Safe" design feature.

After completing the hydrostatic tank, the engineers tested the entire C-133 fuselage. This particular test stimulated considerable interest because of the tremendous size of the assembly and the problem of proper rigging, lifting, balancing and placing the unit safely into the tank. For this the engineers used several large automotive cranes directed by qualified riggers who supervised handling and placing the fuselage in the tank.

FUSELAGE SUBMERGED IN WATER

The tank was then filled with water which completely covered the entire fuselage assembly. At specified periods, a team of experienced skin divers studied the fuselage structure, seeking out leaks and inspecting for possible weaknesses or distortion in the assembly. This series of tests proved successful and was completed without incident. With the removal of the fuselage from the tank, the unit was ready for its final and most important test.

After joining the fuselage with the wing structure and empennage sections, the airplane was placed in the static test building for major testing. In essence, the static testing of an airplane subjects the entire plane and its components to the critical loads and stresses to guarantee strength and integrity, and to ascertain future performance of the product.

In preparing for this test, which must be performed in the building, the facilities engineers, in coordination with the safety department, provided extensive precautionary facilities to protect employee personnel and other aircraft stationed in the building. The task of cutting and fitting the plastic foam filler into every opening and crevice within the fuselage was a time consuming factor. In connection with use of the foam filler, the engineers also used large fiber drums in effecting a 95 per cent displacement of air prior to the static test.

A large shielded test room was installed in the building to house engineering test personnel and equipment. The dual type walls of the room were approximately 10 inches thick, the sections reinforced with an inner layer of sand. Dual bullet proof observation windows, 1 inch thick, were installed at strategic points in the observation and test equipment room.

In addition, cyclone wire type fencing completely enclosed the airplane. This cyclone guard was suspended from overhead building structure beams and rested loose on the floor during the static pressure test.

After draining the hydrostatic tank, the engineers used the unit for additional component pressurization tests. Separate and numerous fuselage panel sections were air pressure tested in the facility, the upper section was also shielded by cyclone fencing. The concussion from several of the induced "Fail-Safe" fuselage panel tests was comparable in intensity with the detonation of a dynamite charge. The tearing effects of this explosive decompression on the panels was quite severe.

NEAR-ACCIDENTS IN TESTING

Although all pressure tests were conducted without accidents, they were not free of incidents. Two rather humorous incidents occurred during the fuselage panel testing program conducted in the tank. During lunch period, one employee assigned to this program mounted the catwalk on top of the tank. After removing his shirt and stretching out on the walkway to enjoy a sun bath, he apparently dozed off. Unaware of this, two plumbers were attempting to repair an air leak in a pipe line connected to the panel specimen in the tank. The plumbers inadvertently turned on the air pressure and a full charge of air was forced into the panel section. This was followed by an immediate failure of the specimen and an intense explosive concussion. After this, none of the employees assigned to the testing function used the tank catwalk for sun bathing.

The second incident occurred when one mechanic saw a leak in a fuel line of a C-47 airplane parked near the tank. As he walked away from the ship to get a tool, one of the panel sections in the tank "Failed-Safe." The first reaction of the mechanic was to duck, run, and then drop to the ground with his hands over his head. He later said he heard the explosion and was positive the leaking fuel line had caused the airplane to explode. He was prepared for a shower of debris to engulf him, and he instinctively ducked and dropped to the ground.

In the pressurization of airplane fuselages and components, we are concerned with relatively low pressures when compared with the ultimate high loads and stresses which are applied to industrial type vessels. The aeronautical engineer is conscious of, and concerned with the responsibility of designing a structurally sound product, exhaustive tests which will insure the integrity of the airplane.

The success of the "Fail-Safe" C-133 cargo airplane pressure tests at the Douglas Aircraft company, Long Beach division, was a result of long range planning and coordination of activities.▲

ARDC GUIDED MISSILE SAFETY TECHNIQUES

by HARRY F. BOONE

Colonel, USAF, Deputy Assistant for Guided Missile Systems, Deputy Commander Weapons Systems, Hq. Air Research & Development Command, Baltimore, Md.

Since 1947, some 3,685 guided missiles and rockets have been launched at Patrick AFB, Florida, and Holloman AFB, New Mexico. During this time, we have had one fatality and three serious injuries from handling or operating the missiles and rockets. Although this record is not perfect, the Air Research & Development Command is proud of it. Moreover, as we gain experience, our record is improving. This is borne out by the fact that we have had no fatalities in this category since 1947 and no major injuries since 1951.

The purpose of this paper is to discuss safety techniques used in storing, handling, and flying guided missiles. In covering these subjects, we will touch briefly on safety responsibilities of a missile test range commander, and general planning for safety. We will then cover in more detail specific missile safety techniques used at Air Force Missile Test Center, Patrick AFB, Florida. Finally, we will discuss future missile safety problems.

Under the weapon system concept, ARDC contracts with industry to provide a guided missile and all necessary supporting equipment. Concurrently, we work with the contractor to develop training techniques and equipment to train Air Force personnel in employing the missile. At the end of the R&D, the Air Force conducts unit training. The training techniques and equipment developed during R&D assist in bringing units to an operational status. After this training, we have, a true weapon system: the missile, all necessary support equipment, and trained personnel.

PLANNING SAFE MISSILE TEST RANGES

To assist industry in developed missile systems, ARDC provides instrumented test ranges. The contractor operates on these ranges under safety regulations prescribed by the test range commander. These regulations cover every conceivable aspect of safety: personnel, vehicular, launch pad, aircraft flight and missile flight. The test range commander has special staff officers to insure compliance with safety regulations by all personnel—Air Force and civilian contractor.

A good safety program starts with good planning, particularly with missile test ranges. These ranges have expensive facilities and equipment for safe operations. All of the former and most of the latter are firmly hooked to the earth. Both the former and latter must be located to satisfy present and future requirements. A base master plan which separates hazardous and nonhazardous operations, places safety instrumentation where needed now and in the future, is the first step in missile range safety planning.

The next step in safety planning concerns personnel training. This involves basic safety indoctrination for all personnel and specialized training in first aid, fire fighting, fuel and booster handling, check out and operation of range safety instrumentation, and many other personnel skills required to operate a missile test range.

Ground and airborne range safety instrumentation must be developed. The complexity of this equipment increases as missile performance increases. In fact, the complexity of safety instrumentation approaches the complexity of guidance systems currently in use. Obviously a missile must be designed to provide space and power for the airborne safety instruments. Necessary data are provided to missile contractors, and design and configuration problems are left up to them.

Then the range commander publishes safety regulations and safety plans. The regulations prescribe general range safety policies, procedures, and responsibilities governing missile flight testing, and delineate responsibilities for the control of all personnel. The safety plans are more detailed. They are published for each missile program and specifically apply the broad policies in the regulations. It may be seen that the missile safety battle is pretty well won or lost before the missile arrives at the test range.

AIR FORCE MISSILE TEST CENTER

Up to this point we have talked about planning for range safety. It is now appropriate to examine a specific missile test range and observe the implementation of safety planning. The Air Force Missile Test Center (AFMTC) is located on the east coast of Florida. This is the only instrumented range for the Department of Defense to flight test long range missiles. The range extends southeast over the Atlantic Ocean about 4,400 nautical miles and is used by the army, navy, and air force. Some of the missile programs undergoing tests at this location are Atlas, Jupiter, Thor, Polaris, Vanguard, Snark, Navaho, and Bomarc. All except the last three are ballistic missiles.

The Air Force divides missile safety into two parts; ground safety and flight safety. The line of demarcation is not as definite as one would think. From launch until impact, we are in the realm of flight safety. However, prior to launch, we are in both ground and flight safety. This is because development, installation and check out of flight safety instrumentation, is a flight safety function even though this takes place before launch. Those activities definitely in the

realm of ground safety are installations, planning, and storage and handling of missiles, fuels, and boosters. Overall safety planning and personnel training cut across the board.

SAFE SIDE AND HAZARDOUS SIDE

Safety starts with a good facilities master plan so let's examine AFMTC from that point of view. The Center was two major parts: Patrick AFB proper and Cape Canaveral. The former houses administration, maintenance, supply, the airfield, aircraft, and personnel housing. The latter houses hazard items such as the launch complexes, fuels, and boosters, and also has the missile assembly buildings, missiles, and a considerable quantity of instrumentation. The 20 mile separation of the Base and Cape isolates the hazard area from the support area. The safety aspect of this separation is enhanced by a policy which restricts the number of personnel on the Cape to an absolute minimum.

As for the Cape itself, hazard isolation is again followed. Launch complexes are grouped *according to the type of missile* launched. Separation between elements of each group and between the groups is based on the danger radius generated by the fully fueled missile in question. The industrial area which consists of missile assembly buildings to house unfueled missiles is a safe area. It is placed on the Cape because it is not practical to haul R&D missiles for many miles before launching them. Finally, suitable areas store propellents and boosters, and site instrumentation.

Missile ground safety techniques for storage and handling are quite similar to industry's storing and handling hazardous substances and handling heavy equipment.

Storing the average missile poses no safety problem. An unfueled missile with no boosters or destruct packages attached is as harmless as an unfueled automobile. Storage and handling missile propellents, boosters, and explosives does pose a problem. Industry stores and handles vastly larger quantities of these items, and we follow principles used by industry. The test range commander receives guidance on this subject through Air Force publications. For example, *Air Force Manual 32-3* now includes the latest methods and techniques for handling and storing liquid propellents. Similar guidance on the storage and handling of boosters and explosives is provided through other manual and regulations.

The remaining ground safety area, missile handling, is complicated by the size of the modern missile. We have now reached lengths of 60 to 90 feet and dry weights up to 16 tons. These large masses must be handled tenderly. It is important not to mar the missile skin, and undue shock or jolt might damage installed electronic gear. The missiles are delivered directly to Cape Canaveral, either by air or ground transportation. In either event, they arrive on roadable trailers, and are taken to a missile assembly building.

PRE-LAUNCHING TEST SAFETY

The missile remains in a missile assembly building until ready to be launched. During this time, it is thoroughly examined and checked out. Several days prior to the launch date, the missile is moved to the launch complex or pad and a count down is initiated. This count down is a time phased series of events which leads to complete preparation of the missile for firing. All electronic, electro-mechanical, and mechanical sub-systems are checked out. The missile is fueled, boosters when required are fitted, and range safety destruct packages are attached. When all is ready, the missile is fired if the firing is cleared by the Range Safety Officer. (RSO).

What ground safety problems exist, and what precautions are taken during count down? The first problem involves movement around the ballistic missiles while servicing them. These missiles are in a vertical position and are surrounded by a missile servicing tower 100 feet high. People work from the tower at several levels. Safety techniques here are like those used on high steel work, and include wearing hard hats by all personnel. Aerodynamic missiles do not pose this particular problem.

As any missile is fueled, it becomes a fire and low order explosive hazard. From this time on, the number of personnel around the launching pad is strictly controlled. In addition, fire trucks and ambulances stand by at a safe distance. As the count down proceeds, adjacent launch complexes are evacuated. Finally, at launch time, remaining personnel involved in the missile launch retire to the block house, and ground safety gives way to flight safety.

As previously stated flight safety measures start prior to actual missile launch. We will now return to the count down and discuss those measures. Each missile flown on the AFMTC range must carry two separate and independent means of emergency flight termination. Both means must be capable of being energized by the RSO, who must have duplicate and independent energizing facilities on the ground. In the case of ballistic missiles, emergency flight termination results from cutting the engine and/or rupturing the fuel tanks.

Aerodynamic missiles have explosive packages installed for the RSO to sever a wing. A second fail-safe system will blow the wing off automatically if radar track is lost for a certain number of seconds. Most aerodynamic missiles have a third safety [illegible] for the RSO to control the missile [illegible] ground in the event the self contained [illegible] mous system fails to operate properly. [illegible] ing the count down, necessary explosive destruct packages are installed, and each safety circuit is carefully checked out. Each of these operations is double checked by personnel responsible to the Commander, AFMTC.

MISSILE CHECK-OUT FOR SAFETY

Another flight safety operation during the count down is the check out of the missile and all of its associated equipment. The best possible safety technique is to have the missile function perfectly. A perfect missile flight also contributes most to our R&D effort. In this case the pure R&D effort complements the flight safety effort. A missile is never lamched if the count down indicates that it will not perform properly.

During the count down, other actions contribute to flight safety. A five-mile area out to sea from Cape Canaveral is cleared of all surface vessels. Visual warning signals are displayed at the north and south Cape boundaries. Military and civilian air traffic is diverted from danger areas. Ground radars maintain continuous air surveillance to insure diversion orders are obeyed. Impact areas are visually checked. In some instances, airborne radar is also used for this purpose.

Airborne and ground receiving equipment record all electromagnetic radiation an its strength. This insures that stray radio frequencies are not present to endanger the flight by false signals in guidance systems. All communication systems, tracking radars and plotting boards are checked. The RSO receives reports on all of the foregoing and if all is o. k., and the missile is ready, he gives permission to fire.

The usual purpose of flight safety is to insure that a missile does not endanger life or property. The problem is complicated at AFMTC by diplomatic considerations. Most of the down range stations belong to foreign governments. Violation of their real estate or air space, even though no damage is done, could cause serious political repercussions. It is mandatory therefore that missiles be destroyed the instant they deviate from a planned flight path. This is the AFMTC policy.

ON BALLISTIC MISSILES

It is necessary to discuss ballistic missile and aerodynamic missile flight safety separately. Once a ballistic missile engine shuts down, nothing can change its point of impact. On the other hand, the impact point of an aerodynamic missile can be affected any time.

For ballistic missiles, the most dangerous portion of the flight is the first seconds after launch, because the missiles rise relatively vertically and accelerate slowly. It is difficult to determine initially if the missile will head down range at the proper azimuth, and a thrust failure brings the missile crashing back to the Cape even though guidance is functioning properly. An optical skyscreen is used to keep track of the missile trajectory during this difficult period. The optical screen is backed up by an electronic skyscreen which becomes the primary system when visual contact is lost. Operators of both skyscreens track the missile from launch and provide the RSO with instantaneous trajectory information on the missile's progress.

Once the ballistic missile gains altitude and speed, the RSO makes decisions about terminating flight with the aid of an impact predictor. This is an electronic computer device which receives missile position and velocity data as inputs (these data are measured by radar and radio) and computes the point the missile would impact if thrust

were lost. The RSO can cut the missile engine any instant. If a missile becomes dangerously erratic, and must be cut down, he chooses a time to cut thrust which the impact predictor shows will land the missile in a safe area. This system is of no value after engine burns out, and is not used with aerodynamic missiles.

From the safety point of view, problems posed by an aerodynamic missile launch are less than those generated by a ballistic missile. Generally speaking, an aerodynamic missile obtains flying speed with the aid of reliable boosters. This practically guarantees that the missile will clear the Cape and land in the water, if propulsion or guidance failures occur in the first few seconds.

Skyscreens are also used as a safety measure for these missiles. However, the basic safety system consists of a chain of tracking radars extending down range and a communications system which links the radar positions. For aerodynamic missiles, a RSO is at each radar site as well as at the Cape. Each RSO receives the X, Y, Z coordinates of the missile when it is within range of his radar, and these coordinates are transmitted by the communications system to all other RSO's.

AERODYNAMIC MISSILE LAUNCH

Responsibility for keeping the missile within range boundaries is passed from RSO to RSO as the missile progresses down range. Each RSO has ground equipment to transmit a missile destruct signal. The same radars used for range safety purposes are concurrently used to collect R&D trajectory data. This dual use is true of much of the instrumentation which is used for range safety.

Missile safety is a big and expensive business at a test center, and is an integral part of missile R&D and training taking precedence over all other factors. Safety, of course, would not take precedence during the operational use of missiles, but would remain an important consideration.

The personnel to implement safety are trained in various ways. Military and civilian schools provide some training. Civilian contractors sponsor training on material which they produce. Test range commanders provide on-the-job training within their capability. A fresh, modern outlook on safety is maintained at all times by a constant interchange of ideas with civilian organizations which face the same, or similar, safety problems.

The primary problem now and of the future is reliability. If we had 100 per cent reliability in each missile we flew, we would have very few safety problems. This is a difficult goal, but with the help of industry we can closely approach it. We must approach it in order to provide effective operational missiles for national defense.

MISSILE SAFETY PROBLEMS IN FUTURE

The next immediate problem concerns training with missiles. Operational units, equipped with aircraft or missiles, must train to reach and maintain combat proficiency. In aircraft, we have no problem. Aircraft flight over populated areas is accepted by the public. Therefore, manuever space is virtually limitless, and short range airborne armament can be exercised over relatively small restricted areas. Contrast this with firing a strategic missile for training. The popular concept now is that an unmanned vehicle must be flown on an established test range. Only one of two deviations from this concept have been granted to date.

When the missile age finally arrives, strategic missile sites will be scattered throughout the United States. The missiles will be reliable, and the most efficient way to conduct training would be to fire from the sites and impact in instrumented ocean areas. Except for those cases which involve booster fall off and impact, operational missiles over-flying the public would pose no greater hazard than manned aircraft.

Boosters would be impacted in restricted areas. Our problem is to educate the public and cause it to accept missile over-flights as a routine event. The alternative to this is expensive test ranges, unrealistic training, and weakening our defense when we pull troops from a missile site and move them to a test range.

Another future missile safety problem concerns propellents which possibly will be used. Nuclear fueled rockets are a possibility. Radiation hazards resulting from nuclear fission are well known. High energy fuels could pose similar problems. This is a new field, but quite possibly exhaust from some of the exotic fuels of the future will be toxic to animals and/or plants.

Finally we come to the acoustic problem. As engines become more powerful, acoustic energy produced will become more harmful to man than that produced by our present engines. Structures, particularly windows, might damage at great distances under proper atmospheric conditions. Another acoustic problem would result from shock waves formed by a low altitude missile flying at hypersonic velocities. These shock waves would definitely damage light structures. There are other safety problems, but these are typical of matters which must be considered and solved.

To conclude, the Air Research and Development Command plans and implements an aggressive missile safety program. We take every reasonable precaution to preclude personnel injuries and property damage. Reliable equipment is the keystone to missile safety as well as to an effective operational missile arsenal. We rely heavily on industry to help in attaining our reliability goals.

Missile safety is costly. It delays R&D firings, and necessitates procurement of expensive equipment. Fortunately, much of the equipment can be used for dual purposes. Finally, the missile safety problem is dynamic. Safety techniques are constantly reviewed and modified to meet changing requirements and to insure maximum safety at minimum cost.▲

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where ere we go
Regardless of amounts,
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

Air Transport Industry Section

JET GROUND HANDLING HAZARDS

by J. T. DYMENT

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The purpose of this paper is to outline a few of the new hazards that will be encountered with our future transport aircraft. The new hazards are due chiefly to two things: the use of the turbo jet engine, and the larger size of the airplane. The most dangerous characteristics are invisible ones, namely, those associated with the jet intake and weather radar.

Strictly speaking, radar is not peculiar to jet transports as it is now being installed in a number of our current airplanes. However, as it is still relatively new and will be a part of all future jet operations it will be included in our review.

As we know, accidents do not occur without cause. Less than two per cent can be attributed to "Acts of God," that is, accidents over which we have no control. Since there is an avoidable reason for almost every accident, one of the many jobs confronting the airlines is to study every phase of its future operations and identify probable sources of accidents, and then control the situation so that an accident will not occur. The latter is no mean task because people will be people. Regardless of the care taken in the design of equipment, the human element will remain the weak link against which we must always guard.

JET ENGINE INTAKE

The greatest hazard associated with the new aircraft will probably be the danger to personnel who come too close to a jet intake. It is possible to approach a running jet engine from an angle at which its noise is practically inaudible.

Since a person can be drawn into an intake with fatal results, and since loose objects can be sucked into and severely damage a $¼ million engine, two things must be done. Personnel must be imbued with the utmost respect for a jet engine regardless of whether or not they believe the engine is running; and everyone must consider it as part of his job to keep the ramp and intake cowling clean at all times.

As long as there is one engine running at a terminal ramp, it is difficult to tell whether or not others are also running, or even which engines are the ones that are running.

No one should ever pass within 10 feet of the intake of a running jet engine and caution should be exercised if within 25 feet. The Air Force insists on the use of some means to warn personnel of the danger of approaching within a radius of 25 feet throughout an arc of 220° of the intake opening during ground running.

USE TWO MEN

At least two persons should be used for running jets on a ramp. One person should be stationed on the ground where he definitely has a clear view of anyone approaching the front of the airplane's engines and, at the same time, be in clear view of the person in the cockpit operating the engine. The person controlling the engines must maintain an alert watch of the ground man—particularly before increasing power.

The engine operator should be responsible, at least to a certain degree, for the safety of personnel regardless of the use of warning flags and/or a ground assistant. This we believe will ensure a more continuous alertness during his operation of the engine.

Loose fitting clothing or head gear should not be worn by service personnel who have to perform duties near the intake of jet engines when running. Similarly such personnel should not carry loose items in large pockets of their clothing.

Considering that one of the larger turbine engines costs close to a quarter million dollars, anyone who leaves tools lying around in an inlet duct should be asked to earn his livelihood elsewhere.

Hazards associated with the exhaust end of the engine are not generally as serious as the intake end. One simple statement might sum up the situation by saying that "the exhaust will blow you out of the way before it will burn you." The question is "what happens during the process of being blown out of the way?"

JET ENGINE EXHAUST

The temperature at a point about 25 feet from the rear of a jet engine producing power sufficient to start the airplane rolling may be around 250°F and the exhaust velocity around 300 mph. Both dissipate rapidly however so that at a point 100 feet from the rear of the engine (that is just back of the tail of a transport) the temperature will be down to around 80°F and the velocity down to 50 mph, which latter differs little from the slip-stream of a propeller driven airplane.

Normally, the start-to-roll power, which need only be applied for a few seconds, will be the maximum encountered on the ramp at an air terminal as lower power is required for starting, idling and manœuvering.

Engine checks requiring higher powers should only be done at special locations away from the terminal ramp. Itinerant personnel not aware of what is going on would not likely be around such a location to get into trouble. At a point 100 feet behind an engine developing take-off power, the temperature could be 100°F and the velocity 100 mph, sufficient to do considerable damage if not diverted upwards by a blast fence or into an exhaust silencing duct.

NEVER SHORT CUT

Personnel should be warned never to take a short cut between the rear of a jet and a blast fence in case someone is in the cockpit and about to apply high power.

Although a blast fence is not required for normal engine starting, rolling away, and taxiing, insofar as ramp personnel are concerned, it might still be desirable at the terminal to prevent debris being blown toward nearby aircraft which might be either loading passengers or have their engines running and thus suck the flying debris into the intakes.

It is evident that while the blast will generally be felt by a person in time for him to keep out of trouble, personnel can be injured by equipment being blown around unless great care is always exercised to have nothing within 200 feet of the rear of a jet engine that can be moved by jet blast.

No person, vehicle, or aircraft should be permitted to pass behind ground operating jet engines closer than 200 feet. The danger area behind the engine covers an arc of about 60 degrees.

A periodic visual examination is required of the compressor and turbine blades as part of routine maintenance. Therefore, the utmost care is required to ensure that the engine cannot be started when someone is inside a turbine intake or the tail pipe.

It might be advisable to tie a rope around the person making the inspection, with an assistant to help pull him out quickly should he get stuck in the duct or the engine be started through someone's negligence.

The Air Force requires personnel who enter the tail pipe of a jet engine to wear special clothing over their regular clothing. Frequent inspections of the protective clothing is made to check for harmful lead particles and it is washed frequently with soap and water.

TWO TYPES NOISE

There are two distinct types of noise associated with the jet engines; the high pitched piercing scream of the compressor and the powerful low-frequency rumble of the exhaust. Insofar as ground personnel are concerned, the former creates the real trouble. From the standpoint of the airport neighborhood, the latter is the problem.

The noise level that may cause temporary or permanent deafness has not been established but it could be as low as 100 db for prolonged exposure.

The threshold of discomfort is about 120 db and at 130 db discomfort is supplemented by an unpleasant tickling in the ear. At 140 db the discomfort may be further complicated by sharp pains in the ear and above 140 db the noise is usually so intense that it cannot be accepted voluntarily. At these latter intensities, eardrums have been punctured.

Since taxiing turns may be accompanied by a sound level of close to 100 db at 100 feet from the engine (37.9, 9600 cps overall) the noise associated with the start-to-roll power will be even higher, reaching possibly 110 db.

Earplugs or more efficient ear muffs are therefore essential for all ramp personnel to protect them from the high frequency compressor noise. Readily accessible soundproofed enclosures are also desirable for ramp personnel who do not have to remain outside on the ramp all the time.

The service personnel of the Boeing Company are equipped with earplugs and a helmet, and receive periodical medical checks. So far with these precautions they have experienced no loss of hearing from the jet engine noise. The Boeing personnel are also rotated to reduce the time of exposure to any one person. They have also developed equipment so that the trimming of the engine is now done remotely from the cockpit by electrical means and hence no one need be close to the engine under full power conditions.

Noise suppressors have also been designed to reduce the exhaust noise of the civil jet to a level less objectionable to the neighborhood or an air terminal than many of today's propeller driven airplanes.

The compressor noise, for which no suppressor has yet been developed, dissipates rapidly with distance so it should not create any nuisance insofar as the neighborhood is concerned. The remaining problem is for the airline to provide adequate ground equipment to suppress engine noise during full power maintenance checks.

Adequate equipment is being used today by the Air Force so once again need not be a nuisance to the neighborhood or a hazard to maintenance personnel. The precautions to protect personnel from the harmful effects of such noise must be much more elaborate than those required for terminal ramp personnel.

KEROSENE FUEL USED

Although the Air Force and a few of the airlines will be using PJ4 wide cut gasoline for their turbine engines, the vast majority of civil operators have selected kerosene as the fuel they will use.

While kerosene improves safety under certain conditions, it will create new hazards under other conditions. For instance, because it does not evaporate as quickly, spilled kerosene can create a hazard for a longer period than spilled gasoline.

Because freshly spilled kerosene is not nearly as likely to ignite from a spark or an open flame in the vicinity as gasoline, personnel might become careless and overconfident in handling it.

This would be bad because kerosene is equally as dangerous as high test gasoline when the ambient temperature exceeds 80°F. It will also ignite should it come in contact with a hot object at a bit lower temperature than required to ignite gasoline. It will also produce an ignitible mixture in the air space inside a tank over a wider temperature range.

MORE STATIC ELECTRICITY

The larger quantities and high rates of flow during fuelling that will prevail with the new big airplanes should generate more static electricity than heretofore. Kerosene will be a greater hazard than gasoline in this respect although this characteristic is still being debated. To be on the safe side, the need for adequate bonding and grounding techniques are even more essential regardless of the type of fuel used.

Accumulation of fuel in the combustion chamber or in pockets in some tail pipe designs, can result in a long flame being ejected from the tail pipe when the engine starts. This is more likely to occur with kerosene as it will not evaporate as quickly when lying in a pocket. Personnel and inflammable materials should therefore be kept well away from behind the tail pipe during engine starts.

Since certain parts of the engine, such as the turbine wheel, will reach temperatures as high as 1700°F, they can retain this heat for a considerable time. Care is therefore required both to avoid touching them and spilling fuel on them.

For instance, turbine wheels have remained hot enough to ignite JP4, 30 minutes after engine shut-down. The period would be a bit longer for kerosene. As the tail pipe is exposed and at a convenient height to grasp, care is required not to touch it until it has cooled down.

Because of the high rates of flow and large quantities involved in fuelling the large transports, the sudden stopping of the flow must be guarded against or hydraulic surge pressure might result in the bursting of the refueling hose with serious consequences. Automatic shut-off devices should be provided in the re-fuelling system so that dependence is not placed upon human action to shut down the system in the event of a bursting of a fuel hose or line.

To avoid stopping a bit short and having to gun the engines to bring the airplane into its final position on a ramp, the pilot will probably taxi in a bit faster than today and depend more upon the use of his brakes to stop him on his mark. The increased speed of maneuvering will require greater care in the location of equipment or personnel to avoid being run over should the pilot misjudge his distance.

This increased hazard over today might be counteracted by the fact that the visibility from the cockpit of the new airplane will be generally better than today. On the other hand we must not forget that around a third of the fatal ground accidents is due to collisions with objects or other aircraft.

If we had a machine capable of earning $50 to $75 per minute as compared with the earning capacity of your present machine of $13 per minute, and if you could not help but remember that your new machine had cost you over five million dollars as compared with a bit over two million for its predecessor, what would you do?

I believe you would do the same as the airlines will have to do with their new turbo jet aircraft; that is, they will have to work them harder and longer than ever before. Ground personnel will therefore be under greater pressure to shorten station stops and servicing times.

SPEED COULD CAUSE ACCIDENTS

Since the majority of ground accidents today are not due to the design of the airplane but to the inadequacies in the design of the airplane ground servicing equipment and to poor operational procedures, the speeding up of the work might lead to carelessness and more ground accidents unless a concentrated effort is made to avoid it.

Most airlines today are continually plagued by damage incurred through mishandling ground servicing equipment. Damage to fuselage skin will be much more important than heretofore because of the much greater pressure differential being encountered when flying at 30-40,000 feet altitude in routine service.

Much greater care will therefore be required in the use of fork-lifts to raise galley equipment, and service the airplane. Because minor damage incurred in ground handling can cause a subsequent accident in flight, it must always be reported, no matter how trivial, to permit some qualified person to pass judgment as to whether or not the damage is sufficient to require immediate repair.

Since the new transports will be considerably heavier than today's, weighing up to 300,000 pounds when loaded as compared with less than half that amount today, it is essential that equipment used in towing, jacking, slinging and mooring, be adequate. Similarly, new and special servicing equipment will be required for lifting heavy objects such as wheels.

EDUCATE SERVICING MEN

Personnel will be required not only to examine the servicing equipment carefully before using each time, but must be taught to employ the proper physical attitudes when they are lifting anything manually.

Servicing personnel will be required to be even more conscious of good housekeeping than they are today because misplaced tools or loose equipment can damage an engine and if undetected it could subsequently cause a serious situation should the final failure occur in flight.

The connection and disconnection of 115 volt 60 KVA ground power units must be considered hazardous, particularly under wet weather conditions. This can be overcome by provision of an interlock circuit in the ground power unit which will only permit excitation of the unit when the ground and aircraft receptacles are fully mated.

Ground servicing personnel should be taught to stand clear of the plane of the turbine wheels when a turbine engine is running at high power, just as it is advisable today to stand clear of the plane of a propeller. Neither should fail but it is safer not to be in the way if one does.

The installation of weather radar in airplanes requires no special precautions as far as the airplane itself is concerned. However, if the weather radar is operating, definite precautions are required to avoid fire and other hazards with nearby objects within the beam of the antenna.

For example, radar can ignite dry steel wood at 100 feet. It can explode gas vapor from the sparking of aluminum chips at 250 feet. It can set off photo flash-bulbs at

850 feet and has set off photo flash bulbs when tossed in the air, up to 2500 feet. It can kill animals in front of, and close to the antenna.

Although some of the above are merely tricks for demonstration purposes to illustrate the hidden power of a radar beam, such a beam must be treated with greatest respect.

I understand that United Airlines has adopted a policy of not turning on their radar within 100 feet of a ramp because of the possibility that a photo flash bulb being carried by someone could be ignited by the beam. During tests, it was found if one bulb in a photographer's utility bag went off, all the bulbs in the bag went off.

There is a difference of opinion as to the degree of hazards involved on the basis that 75 KW output is actually by pulses of only two micro second duration, thus making the average power output about 60 watts which is not likely to ignite fuel or flash bulbs.

DON'T FUEL NEAR RADAR BEAM

To be on the safe side, however, fuelling and defuelling should not be conducted within 300 feet of the radar antenna along its beam. This may be reduced to 130 feet provided the set is operated at a power not to exceed 1.8 megawatts.

Warning signs and flashing lights should be placed in conspicuous spots as a warning that the radar is being checked or operating. All fuel trucks and other unauthorized vehicles should be kept at least 130 feet away.

Since the radar beam will not penetrate metal, the hazard is not the ignition of the fuel within the truck's tank but from a fire starting from oily rags around the truck.

It has been found that N.E. 51 Neon bulbs provide a very effective warning light to show that the radar is operating when located in the beam close to the airplane. It has also been found that a fine mesh metal screen set at a 45° angle to the ground could be used to deflect the radar beam upwards and away from equipment and personnel.

It is evident from what has been said that the radar should be turned off before the final approach of the airplane to the airport. We understand the USAF do not operate radar below 3,000 feet during a landing.

Insofar as personnel are concerned, they should not look directly into a radar antenna with the equipment operating but not rotating. Prolonged exposure such as five minutes could be dangerous.

The pathological conditions induced by the thermal effects of absorbed microwave energy should be noticed first in those parts of the body having poor heat-regulatory mechanics such as the eye-cornea, the gastro-intestinal and genitourinary tracts and in the effect on the various blood cells.

HAZARDS WILL BE REDUCED

We have mentioned a number of hazards associated with the forthcoming jet transports. We should not, however, forget the fact that many hazards with existing transports will be reduced. For example, there will be better visibility from cockpits so there should be less likelihood of taxiing into an obstacle. There will be no need for walking about on top of a wing during routine station servicing because the airplane will be fuelled from below.

The cockpit controls and displays, and engine and auxiliary installations, will all be simplified and thus reduce the human element which might create a subsequent hazard to the airplane personnel in flight. Too often today, ground personnel can preset a situation so that an accident becomes inevitable in spite of everything the flight crew might subsequently do.

This fact must never be forgotten and everything possible should be done to simplify every situation so as to reduce the human element to a minimum. The new jets make this possible. Let us not complicate it because we are accustomed to complexity today.

We believe that safety records will continue to be broken year by year. A possible exception could be in 1959 and 1960. History indicates that accidents will increase for a few months with the introduction of anything differing in many respects from what personnel are used to handling.

Our objective should be to confound history and see that adequate training, warning, and facilities are provided to get through this introductory period with the new transports while still maintaining our annual reduction to the industry's accident rate.▲

JET NOISE ON THE AIRPORT— WHAT TO DO ABOUT IT

by HOWARD C. HARDY and JAMES E. ANCELL
Howard C. Hardy and Associates, Chicago

It would be presumptuous folly to think that all the problems of the aircraft industry could be completely predicted, especially in such a complex phenomenon as noise. However, we can attempt to extrapolate from the experience we have in military operations and present airport activity.

When we do so, we conclude that there is reason for concern. Not only will we be worried about the exhaust noise of the jet, severe as it is during takeoff, but a larger number of the operating personnel will be exposed to the whine from the front end of the engines. This whine will be similar to that of the turboprop engines now in operation.

CAUSE OF NOISE

This noise is due to the rotation of the turbine blades and is similar to a propeller or fan noise except that the rotation is at high speed and there is a large number of blades. This same condition exists in either jet or turboprop planes with the exception that future turboprop planes will be considerably larger than those we have now.

We can make some reasonable estimates of what this noise will be like, but first, let us examine some figures on what might be considered acceptable human environment. *(Editor's note: The figures to which Dr. Hardy refers are glass slides which he used in his presentation. Although the mechanics of publishing these volumes prohibit reproduction of graphs, interested readers may request tear sheets of the December, 1957* National Safety News, *which contain the figures mentioned here.)*

Figure 1 presents some such data. The acoustical engineer measures the sound in decibels, referred to a standard reference level. These figures are presented in the vertical axis of this graph. On the other axis is a method of presenting the different frequencies of the sounds. This is necessary because the human hearing mechanism responds quite differently to various frequency bands.

Our frequency scale is divided into sections each an octave wide, running from the first band of 37.5=75 cps. up to the last band which has frequencies of 4800=9600 cps. The low frequencies sound like hums and thuds, the middle frequencies like rattles and clangs, and the high frequencies like hisses and clicks.

ACOUSTIC FATIGUE

The middle curve specifies how much noise the average person can be inflicted with for six to eight hours a day exposure, day after day, for many years before suffering a hearing loss. Constant exposure, of course, does not exist on an airfield where the noise is intermittent and the worker has a chance to get an occasional rest from the acoustic fatigue. Under such conditions, the intensity of the noise environment can be increased many times without damage.

We recommend, however, that the exposure never exceed the figure given in the upper curve because such exposure would be painful and might cause hearing damage, if there were many exposures over a period of years.

If hearing loss prevention is the main criterion, the amount of allowed exposure for a worker will depend almost entirely on how often and for how long he is in the noise.

HINDERS COMMUNICATION

However, there are other reasons why noise should not be intense. Speech communication or conversation will be practically impossible and the normal use of the ear as a means of receiving warnings or danger signals may also be seriously inhibited. At conversation levels there is little chance of hearing loss even after years of exposure. The noise should not exceed that given in the lower curve if one wishes to communicate by voice at a distance of about three feet.

These curves then provide a frame of reference to describe the potential environ-

ment which will exist in commercial aviation.

There are three environments which should be of concern to operating personnel:

1. The idling and taxiing activities around the airport terminal or near hangars.

2. Ground run-up and take-off of jet engine aircraft which would be expected to be at some distance from the terminals and hangars.

3. Testing of jet engines alone at overhaul bases.

IDLING AND TAXIING

The idling and taxiing environments will influence the most personnel. These environments will be somewhat similar for both turboprop and turbojet airplanes. The severity of the problem can be imagined if we consider the conditions which would exist at Chicago's Midway Airport, for instance, if two-thirds of all planes had a whine which was 10 db. higher than that of the Viscount, a plane which is now operated by only two air lines at this airport. This is the operating condition predicted by the air lines by 1963.

The noise during idling and taxiing, the compressor whine, is emitted from the intake and is beamed to the front. The octave band spectrum of this noise is given in Figure 2 for a Viscount plane at a distance of 50 feet. The idling noise of the future jet engine is estimated to be that given in the upper curve. These data are only approximate and depend considerably on the rpm. of the engine.

It can be seen that these curves extend considerably into the undesirable regions of auditory perception and therefore become quite annoying to operating personnel. As a result they may, as has already been the case, become of concern to management and to labor unions.

CONSIDER PUBLIC REACTION

This noise will also be quite unacceptable to the public. Unfavorable public reaction to ground operations is not expected to be great from the neighboring residences because these high frequency sounds are rapidly attenuated with distance. We are thinking instead of the public boarding adjoining planes, in waiting docks, waiting platforms, or other parts of the airport facilities.

The magnitude of the noise at the major airports due to a multitude of taxiing and idling activities will undoubtedly bring about an adverse reaction of the public. Most anything which is done to give a more satisfactory airport acoustic environment for the public will undoubtedly help get a better environment for the working personnel.

For personnel not protected by building structures only four solutions are possible:

1. Hearing protection, which, of course, is unlikely to be used by the passenger or visitor.
2. Operating at low rpm.
3. Towing the airplane into the ramp.
4. Hasty installation of small portable mufflers on each engine on the field just after landing and before taxiing to the loading area.

None of these suggestions is convenient and we can see operating personnel shuddering at the difficulties. What will be evolved no one can predict. The importance here is for us to realize that there is a problem and that it demands study. The fact that there is going to be noise around the loading docks should be in the forefront of the mind of those planning future operations.

GROUND RUN-UP

In the case of ground run-up the noise of the intake is drowned out in the intense noise created in the atmosphere by the ejection of the high speed exhaust gases. This is the well-known roar we hear from the jet engines on take-offs. This noise environment during run-up is more important than take-off because it will last longer with usually more personnel at a closer distance.

The intense noise created will be important not only to operating personnel, but in most commercial airports it will cause complaints from residents in the nearby area. It will therefore be necessary in most cases to use ground run-up mufflers to which the airplane is attached during these tests. When such run-up mufflers are used to reduce the community noise, they will also reduce the noise for operating personnel.

Figure 3 shows the noise pattern around a jet engine in the very important band for hearing, 2400=4800 cps. The intake noise is most prominent during idling. The noise of the exhaust of a jet engine appears at higher rpm. and is at maximum at an angle of approximately 45° from the axis of the tail pipe. It is unlikely that operating personnel will have to operate in this cone. The conditions immediately adjoining the fuselage will be less severe.

USING MUFFLERS

When mufflers are used, the noise will be ejected somewhat upwards. The effect of the reduction will not be as great for the airport personnel as it will be for the surrounding community, since almost the same amount of energy will be ejected in all directions around the aircraft. Even with mufflers and protection afforded by the directional pattern, all personnel working around the aircraft must use hearing protection.

Ear muffs give about 30 db. protection in the important high frequencies. Ear plugs can also be used. They are only a little more uncomfortable, but they provide as much as 40 db. protection at the higher frequencies. The combination of helmet, ear muffs, and ear plugs can give as much as 50 db. attenuation in the higher frequencies.

The problem of the commercial air lines will be considerably less than that for the military aircraft. None of the commercial aircraft will be using afterburners. The afterburner engine makes about 10 db. more noise than the engine at full rpm. without afterburner.

Personnel also are more likely to be near the intake side of the engine than the exhaust during ground run-up. The severe intense whine in front of the aircraft is another reason for wearing hearing protection. We know of no problem involving the acoustic environment of commercial aircraft during run-up for which the available hearing protection devices are not adequate.

ENGINE TESTING

The last acoustical environment involves the testing of engines themselves. For commercial aircraft this will probably be done only at overhaul bases. However, there are large numbers of personnel at such bases. The testing of the engine will require running it at high rpm. for long periods of time. This will in many cases cause a neighborhood noise problem. In most such cases, if the noise is reduced adequately to prevent neighborhood complaints, it will be sufficiently low in intensity for the operations at the overhaul bases.

In a few cases, however, the design of the test cells will have to be such as to prevent excessive noise in the immediate vicinity of the cells. This can be determined only by a survey of the site. The problem at the overhaul base is rather similar but not as severe as that in most jet engine production facilities.

All such companies find it necessary to build test cells with sound attenuations which run from 25 to 60 db. Our firm has had an opportunity to study the noise problems of the overhaul bases of American Air Lines at Tulsa, United Air Lines at San Francisco, and Continental Air Lines at Denver, and has found that at these sites about 40 db. reduction or less was adequate.

TEST CELLS USED

Jet engine test cells in use at Ford Aircraft Company in Chicago have reductions of about 60 db. and are designed for considerably larger engines than are now being produced. The noise of the jet exhaust is quieted by passing through a labyrinth of 180° turns, the walls of which are lined with acoustical absorbing treatments especially designed to stand up under the high temperatures, velocity, and intense vibrations which exist in this region. Similar labyrinths quiet the air intake and the air introduced for cooling. The sounds from these cells cannot be heard one-quarter mile from the cells.

This structure is the most economical and rugged which has been designed for the large sound attenuations specified. It proves that it is possible to get almost any amount of sound attenuation required with good design. The size requirement for overhaul bases will be much less than that at Ford because there will be no afterburners used and the amount of noise permitted will usually be considerably higher. There will also be at the overhaul bases ground run-up tests which will require similar mufflers as discussed above.

The jet age will bring new problems in regard to the safety and well being of personnel. Not the least of these worries will be concerned with noise. Solutions for these problems are not readily evident because they depend on the whole over-all operation. ▲

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THE VALUE OF GOOD RECORDS AND HOW TO USE THEM

by CLYDE C. RUDDICK

assistant manager, Safety and Plant protection,
Pittsburgh Plate Glass Co., Pittsburgh, Pa.

When accidents are many, anyone can reduce them. When they are few and the record is approaching the irreducible minimum, it is much more difficult. In the dim distant past, when safety was in its infancy, accident frequencies were literally astronomical compared to our accident experience today.

The safety engineer of that era was certainly not less intelligent than those of later years. He did have his hands full with the multitude of unsafe machines and conditions typical of that industrial period. He made great strides in reducing the accident frequency by a gigantic guarding program.

As the time went on and the accident rates dropped in the companies which pioneered in safety, a leveling off took place in their accident curves. That posed a problem and the safety engineer was in a real dilemma. There had been little need for anything but a guarding and a poster program up to that time.

ANALYTICAL ACCIDENT PREVENTION

As a measure of the keen and resourceful men in safety work at that time, many of them ventured into unexplored fields of analytical accident prevention. This relatively new approach did not blossom forth overnight. It began slowly in many places, particularly where safety enthusiasts faced temporary frustration because their accident rates were more or less static.

Please do not misunderstand. The rates were good for that era and much better than in the majority of industrial plants. Necessity thus created the need for using native intelligence and those few daring thinkers spread the good word.

Records were kept from the beginning of the safety movement. But they were mostly kept to justify safety activities, particularly the high cost of guarding and to compare those records with other plants. The ranks of those who ventured into analytical accident prevention grew. One safety leader assembled the combined thinking of those daring souls, with a considerable amount of his own individual and original thought. H. W. Heinrich of the Travelers Insurance Company will be remembered for his book entitled, *Industrial Accident Prevention.*

ADVENT OF THE CODES

The idea of analyzing accidents, for more than just unguarded machines, grew by leaps and bounds. Many more safety engineers joined the "analytical" surge with almost as many ideas and variations as there were safety engineers. The National Safety Council asserted great leadership in trying to guide American industry in standard methods of recording accident rates and causes. But the task really became one of gigantic proportions. Thus came the call for comprehensive standards.

So the best safety minds known were assembled under the guidance of the American Standards Association and the sponsorship of the National Safety Council. As a result, we can now refer to ASA Code Z16.1, "Method of Compiling Industrial Injury Rates"; ASA Code Z16.2 Part I, "Compiling Industrial Accident Causes—Selection of Accident Factors"; and ASA Code Z16.2 Part II, "Compiling Industrial Accident Causes—Detailed Classification of Accident Factors."

Thus we came into the realm of cause codes and today they are bywords of the safety engineer. Unfortunately, the codes are still not used as they were intended. This has been mainly because many industrial firms were content to remain as they had been before the entire code package was formulated.

Many of them had really advanced considerably from the unsafe conditions period but because of inertia or lack of desire, did not care to overhaul their pseudo forms of record keeping for the "ultra modern"

as recommended by the codes. Many companies, new in accident record keeping, begin with mistaken or misunderstood ideas and are then reluctant to change.

THE CODES

First let me dwell briefly upon ASA Code Z16.1-1954. The computation of accident severity was changed from a "thousand hours basis" to "one million."

$$\text{Frequency} = \frac{\text{Disabling Injuries} \times 1{,}000{,}000}{\text{Hours Worked}}$$

$$\text{Severity} = \frac{\text{Days Lost Due Disabling Injuries} \times 1{,}000{,}000}{\text{Hours Worked}}$$

However, the new Z16.1 should be a veritable dog-eared reference. Never before have we had such a concise, clear cut outline of injury recording rules. We now know precisely when a disabling injury is not counted and vice versa. New values have been given the time charges for permanent partial disabilities. Perplexing questions can be answered such as:

Is an injury in the parking lot chargeable?

When is an employee considered at work?

How about an injury during an athletic event?

What about disabilities arising out of a physical disability?

These and many other questions can be readily answered by the code. Keep in mind that the code deals only with recording injuries and has nothing to do with liability or moral obligation. The states have various measures of liability and the one is not to be confused with the other.

The entire Z16.1 code should be familiar to everyone in safety activities. If you do not have a copy, send 50 cents to:

American Standards Association
70 East Forty-Fifth Street
New York 17, New York.

The selection of accident factors—Code Z16.2 Part I, deals with the accident and its casual factors. These are: Agency—agency part—unsafe mechanical or physical condition—the accident type—the unsafe act and the unsafe personal factor. Here are brief definitions of the accident factors:

2.1 The Agency

The agency is the object or substance most closely associated with the injury, and which could have been properly guarded or corrected.

2.2 The Agency Part

The agency part is the particular part of the selected agency most closely associated with the injury, and which could have been properly guarded or corrected.

2.3 The Unsafe Mechanical or Physical Condition

The unsafe mechanical or physical condition is the condition of the selected agency which could have been guarded or corrected.

2.4 The Accident Type

The accident type is the manner of contact of the injured person with an object or substance; or the exposure, or the movement of the injured person which resulted in the injury.

2.5 The Unsafe Act

The unsafe act is that violation of a commonly accepted safe procedure which resulted in the selected accident type.

2.6 The Unsafe Personal Factor

The unsafe personal factor is the mental or bodily characteristic which permitted or occasioned the selected unsafe act.

The scope of the classification of the accident factors as related in Z16.2 Part I, by groupings, are important. Thus, I urge you to study them by hauling out that filed copy or obtaining one at once. The same applies to Z-16.2—Part II.

ACCIDENT FORMS

General Office Form of Pittsburgh Plate Glass Company

Some 50 odd industrial locations with quite diversified activities require a little different approach in an accident report. Thus we find:

A. Detailed statistical information, very necessary to the general office far removed from the plant location. This form, used since 1937 and having a few obsolete items, is still valid.

B. The injury and what happened, very necessary to classify properly. Many plants attach more details by stapling a slip to this part of the form or writing a covering letter.

C. Machine, appliance or thing causing injury. This section is essential to establish causes.

General Office Form of Pittsburgh Plate Glass Company

If properly filled out by the foreman, this section can tell a story of supervisory attitudes and knowledge of responsibility. The safety committee report reveals the effectiveness of the committee and its function in the plant.

An Electrical Manufacturer's Method of Tabulation

A mass of information in one record. This type of information must be coded.

Supervisor's Accident Report and Code Card

The small form is used by supervision for all injuries except disabling ones. The code card is used by the medical department of that plant, for coding every accident. The same code is also the basis for coding the McBee card. All foremen are given this code card for reference since the medical department reports indicate injuries by code number and letter.

Another McBee Tabulation Card

This and the previous method of tabulation and coding offers a ready reference for accident statistics. IBM—Remington Rand and others will install an efficient system of information which is promptly available, by classification, whenever desired. This card is used at our Lake Charles plant of the Columbia-Southern Chemical Corporation.

An Electrical Manufacturer's Supervisory Report Form

Every one of the six causal factors are covered. This form is used only for disabling injuries.

Lake Charles Plant—Columbia-Southern Chemical Corporation—Supervisory Accident Report Form

This form also covers the six causal factors. The supervisor is charged with finding the unsafe acts and unsafe conditions. He must also name them and state his idea of the remedy.

Lake Charles Plant—Columbia-Southern Chemical Corporation—Supervisory Accident Report Form

A continuation of the cause factors. Here we have attitude, skill and lack of information covered.

APPLYING THE ANALYSIS

The Lake Charles plant studied its records and drew up some charts. Keep in mind this plant had already reduced its disabling injuries to approximately one in 14 months. I would say that the situation has almost reached the irreducible minimum—but the plant safety director does not agree. Consequently, their charts showed statistics of all minor accidents and doctor cases in addition to possibly any disabling injuries. Incidentally, all accidents required a supervisory investigation report. Their previous analyses indicated a closer review of the service department activities. So to prove the suspicion, these following charts were assembled.

The Service Dept. Accidents by Time and Location—This chart indicated the number of accidents in each department and showed the time within the half hour that each occurred.

The Service Dept. Accidents by Location—This chart totaled the number of accidents occurring in each department during 1955 and 1956.

Five graphs were drawn up indicating: the total accidents occurring in each shop each half hour of the day; the total accidents in each cell each hour of the day; the total accidents and times in the caustic dept.; in the power house and in the liquefaction.

These charts did not show the causal factors—Agency, Agency part, etc. But could you imagine anyone as detailed in his approach to perfection forgetting the cause code. Of course not, and you can bet that such analyses are either already made or are in the offing.

Because of the foregoing study, the safety director assigned one engineer to concentrate on an intensive visitation and observation in one location for an extended period. Each location will be studied in the order of accident frequency, until all have been covered. The study will not only be a statistical one but appropriate action will follow each incident found. I have no doubt that this plant will reduce its low disabling rate and its present, rather high all-accident rate still further. My prediction is that the present favorable accident experience will continue for a long time to come. What else could result from such a painstaking approach.

Here is another analysis by another company. Of course, it may be assumed that "hook-on crane disabling accidents" pre-

sented a problem for study and solution. Here a 10 year study, carried on in the most detailed form, presented ample ammunition to ask management for the most drastic reforms. Fortified by this kind of information, the safety engineer can expect management to come through with any reasonable and practical request.

HOOK-ON CRANE DISABLING ACCIDENTS
1946-1955 INCLUSIVE

Nature of Injury	
Fractures or crushes	45 per cent
Lacerations and contusions	26
Amputations	14
Strains	9
Bruises	6
Location of Injury	
Foot and Toes	38 per cent
Leg and ankle	22
Fingers	15
Body	15
Head	6
Arm and wrist	4
Type of Injury	
Struck by an object	55 per cent
Caught between objects	25
Falls	11
Slips	6
Strike against	3
Unsafe Personal Factor	
Unaware of safe practice or unskilled	41 per cent
Inattention or absentmindedness	41
Disregard instructions or wrong attitude	8
Physical weakness or nervous	6
No unsafe personal factor	4
Unsafe Acts	
Exposed under suspended loads or to shifting loads	34 per cent
Taking unsafe position or placing hands in unsafe place	27
Unsafe piling or arrangement, failure to block material	14
Using equipment unsafely or overloading	11
Working at unsafe speeds or giving wrong signal	7
Using unsafe equipment	4
Jumping from vehicle	3
Unsafe Conditions	
No unsafe conditions	36 per cent
Misalignment or improper hook-up	22
Unsafely piled materials—congestion—uneven and slippery floors	19
Unsafe method	11
Defective equipment	8
Not wearing safety shoes	4
Years of Experience	
0 to 5 years	72 per cent
6 to 10 years	17
11 to 15 years	4
16 to 20 years	3
25 to 30 years	4
Under Five Years Experience	
0 to 6 months	33 per cent
7 months to 1 year	15
1 to 2 years	14
2 to 3 years	14
3 to 4 years	12
4 to 5 years	9
5 to 6 years	3

FOR THOSE WITH FIVE YEARS OR LESS EXPERIENCE

Unsafe Personal Factors	
Unskilled	47 per cent
Inattention	33
Improper attitude	9
No unsafe physical factor	5
Nervous	3
Bodily defects	3
Unsafe Acts	
Taking unsafe position	50 per cent
Unsafe arrangement of material	21
Unsafe use of equipment	10
Positioning hands unsafely	5
Wrong signal	5
Unsafe speed	3
Improper lift	3
Jumping	3
Location of Injury	
Feet	40 per cent
Legs	24
Fingers	10
Head and face	9
Body	7
Arms	5
General	5
Nature of Foot and Leg Injuries	
Fractures	52 per cent
Bruises (Hematomas and contusions)	22
Strains	8
Cuts	5
Amputations	3

Is it any wonder that this large plant recorded a frequency for 1956 which surpassed any previous record of that plant? Can you be surprised that this same plant turns in a frequency, each year, far below the national average?

In a similar manner, our own plate glass plants enjoy frequencies occasionally under 1.0, and more frequently between 1.0 and 2.0. Our chemical plants come through, year after year under the national rate and even below the low average rate of the Manufacturing Chemists' Association, and all because of searching for the factors of causes as outlined by the codes.

We can all do more in the field of analytical accident prevention. Surely the rewards are great. If national leaders in safety, such as Dupont—Dow Chemical—Westinghouse and General Motors, to mention a few of the large companies, can have frequencies as they do each year—then we can certainly afford to do the same. All of those corporations use and follow the codes, but they do more. They follow up their analyses with intelligent action. And that is exactly what the codes will do for you.

Keeping records for the sake of gathering statistics is not productive. Designing a course of action based on those statistics will ring the bell for any safety engineer who does and has the patience to stick to such a course of action.▲

HOW DO YOU INVESTIGATE AN ACCIDENT?

by EARL H. STOCKDALE

assistant director, Accident Prevention division, Gulf Oil Corp., Pittsburgh, Pa.

The investigation of accidents is good practical business and is an essential part of any accident prevention program. Any business can improve its records by determining the causes of past mistakes and applying the needed correction. Accidents resulting in injury, damage, loss, or any combination represent circumstances that have actually occurred and are not probabilities. Similar accidents will occur if causes are permitted to exist.

The investigation of accidents is not for the purpose of placing blame, but a fact finding operation to gather information needed to determine reasonable and practical action for the solution to the problem. In this connection, it is not only the individual or individuals involved in the particular accident that we are concerned about but all other employees that may be exposed to situations.

When investigating an accident, frequently the tendency is to skim the surface and think in terms of injury prevention. But this approach does not penetrate deep enough to get to the root of the problem. Possibly I can explain the difference between injury investigation and accident investigation by using this typical example.

Let us assume that my job is to drive a fork lift truck and pick up a pallet loaded with cases of product and deliver the load to a waiting trailer truck. On the way to the trailer truck, some cases fall off. Now if I think in terms of injury prevention, any damage and extra work of reloading the fork lift truck may go unnoticed. If one of the cases just missed hitting an employee, we may say we had a near accident and forget it.

If one of the cases happened to hit an employee and only bruised him, we may say it was only a minor injury and again forget it. If the case happened to hit an employee and broke his leg, we become concerned because the results were spectacular, a serious injury, necessitating injury investigation and when thinking in terms of injury prevention, the question becomes "what was the cause of the case hitting and breaking the leg."

CAUSES OF MISHAP

But if we use the accident prevention approach, the question becomes "what did anyone do or fail to do that led to the case's falling off in the first place," and/or, "What defective condition by its very existence contributed to the case's falling off."

Certainly cases fall off many times for each time someone is struck; but each time one falls, some economic loss results. Whether or not it strikes anyone is a matter of chance; and if it does strike someone, the extent of injury is again largely a matter of chance. So why wait until the serious injury occurs to investigate an accident, or why limit our investigations to those few accidents that result in serious injury?

Once we have determined the causes of the cases falling off, we take the specific action needed with the specific people who have the problem, so that cases can be moved on a continual basis without any falling off. If we do, we move more cases and at the same time move them without injury or damage.

As everyone knows, the supervisor is the one who should make the investigation, as he is the one responsible for getting his men to put the cases on the truck in the way he wants them loaded and when he wants them loaded. Investigating unplanned, unwanted occurrences and taking the action needed to control the causes is an integral part of a supervisor's job.

TRAIN HOW TO INVESTIGATE

In this connection, the staff accident preventionist can strengthen the company's accident prevention program by providing any needed supervisory explanation or training in how to make an investigation to identify causes that are reasonable and practical to control.

One nice feature of being in a staff position is the privilege the staff accident

preventionist has of investigating anytime, anywhere that the immediate supervisor or any level of supervision needs help, or when help is indicated from a review of the report of accident investigation. But the staff accident preventionist should be concerned when a supervisor continually solicits help as some supervisors may feel that preventing accidents is solely the job of the staff accident preventionist. This is a little like saying that it is the fault of the accounting department when a company loses money.

One of the fundamentals of successful accident investigation is a knowledge of the chain of events which produce all accidents. Undoubtedly, we are all familiar with Mr. Heinrich's accident sequence. Briefly stated it is this:

> "In every accidental occurrence, there is always a chain of events which occurs in a logical and fixed order. Each link in the chain is dependent upon the preceding link."

This chain of events or sequence of factors always exists whenever an accident occurs whether or not an injury results. We may not be clever enough to identify each factor in the sequence but each exists nevertheless. Termination of the accident sequence may be in the form of injury, damage, loss, or any combination of undesired results which we usually hear of first.

Final factor in the sequence is the undesired result: injury, damage, loss.

There are many types of injuries such as burns, cuts, fractures, fatalities and many different types of injuries may result from the same accident. But knowing the type of injury, damage, or loss is of little value as it does not tell us what to do to prevent a recurrence. When an accident occurs, the degree of severity is largely a matter of ...ance.

For example, when two cars collide, we may recall cases where one or more occupants were injured severely while other occupants had no apparent injury and the extent of damage to the vehicles also varied. We would, of course, allow the severity to guide us to a degree in how we concentrate our efforts, but we do this by moving on to the preceding factor which is the accident itself.

Second factor in the sequence is the accident

An accident is not an injury nor a cause: it is the unplanned, unwanted occurrence. It is what happened that was not planned or wanted in our method of performing the job. A few examples would be:

1. Left front tire blew out, car struck pole, and overturned
2. Fell from scaffold to ground
3. A one inch line broke and sprayed acid
4. Hammer slipped out of employees hand and struck co-worker
5. Valve leaked chlorine gas

These typical accident examples are movements of people, objects, or substances that are unnecessary, or irrelevant toward completion of the job.

The accident, when the man fell from the scaffold to the ground, is evidence of failure to use the needed work method or the existence of a defective condition or both. The undesired result, whether this man fractured his arm, or leg, or only bruised himself, and the accident type "fall to a different level" give no indication as to what anyone did or did not do that was wrong or what condition was defective.

The third factor in the sequence is the cause —the unsafe act and/or unsafe condition.

UNCOVER UNSAFE ACT?

In trying to determine if an unsafe act was performed, we might consider: what did anyone do or fail to do that caused the unplanned, unwanted occurrence? What did anyone do differently, this time? In other words, what specific movements, or acts, are needed to eliminate or add to this work procedure in order to prevent the same accident from recurring? The direct answer to this question indicates the unsafe act.

A few examples of unsafe acts would be:

—Failed to check oil in crankcase
—Used a pipe wrench for a hammer
—Used a broken ladder
—Did not use the guard on the saw
—Did not stop at an intersection stop sign

In trying to determine if an unsafe condition existed, we might consider: the mechanical or physical condition of the piece of apparatus, tool, equipment, work platform, floor or handrail, to see if a mechanical or physical defect existed which contributed to the accident. There does not have to be an unsafe condition involved in every accident. Experience has proved that the majority of accidents are caused by unsafe acts.

A few examples of unsafe conditions would be:

—Rotted out walkway
—Overloaded electrical line
—Lack of a relief value on a pr... ...e vessel
—An unguarded fan
—Unanchored decking on scaffold

FIND UNSAFE CONDITION

Each example of unsafe acts and unsafe conditions says specifically what was wrong. We all know this is most important because it tells exactly what we must fix. We should avoid the use of ambiguous terms such as carelessness, improper, awkward because these terms mean something different to different people and correction is frequently in generalities. Yet, experience has proved over and over that too frequently the unsafe act or the unsafe condition was not specifically identified, even though it is the heart of accident prevention work.

In fact, when generalities are used, it could indicate that the accident was not investigated to the point where the specific cause was known. And with the use of generality terms, our job becomes more difficult to show tangible results.

If it is stated that no unsafe act was performed or no unsafe condition existed then the accident could not have occurred. There is always a cause and there may be both an unsafe act and an unsafe condition. If we identify exactly what is wrong, correction is closely related.

In any particular accident investigation, emphasis should not be placed on separating an unsafe act from an unsafe condition, but a determination of the cause that is most reasonable and practical to control. Actually if we want to be technical about it, a good number of our unsafe conditions were created originally because someone failed to modify, repair, or maintain.

ACCIDENT CASE

Let us check the first three factors in the accident sequence by considering this accident example:

An employee is sent to work on a high scaffold. He falls to the ground and breaks his back. The first two steps in the accident sequence are apparent:

1. Undesired result—broken back
2. Accident (the unplanned, unwanted occurrence that broke the back)—fell from scaffold to ground

The broken back was a result of falling to the ground. But the cause is unidentified. Unless we determine the work method he should have used or the defective condition which caused him to fall, we have no assurance that the next man to ascend the scaffold will not fall.

But a supervisor is interested in avoiding another fall and a few of the things he might do in determining the cause would be:

- Discuss the accident with the injured employee, when the injured is in condition
- Question any witnesses
- Determine what the employee was doing just before and at the time of the accident
- Visit the scene of the accident and determine whether or not: the handrail was in place, handrail was standard height, man was standing on handrail, man was standing outside handrail, boards in decking were weak or rotten, decking unanchored or scaffold legs not firmly supported.

The supervisor must find out what anyone did or did not do that caused the employee to fall from the scaffold to the ground, so that he will know what to do to prevent another fall. Unless he has determined accurately the specific cause, it will be a matter of chance whether or not he will apply the needed corrective action.

If he fails to examine a defective scaffold, and incorrectly assumes that the man fell because he stood on the handrailing, then the real cause of the accident would remain to endanger other employees. If the supervisor fails to determine the cause, it is probable that another accident will eventually occur.

On the other hand, failure to find out exactly what the employee was doing may keep the supervisor from finding the cause of the accident. If he assumes the "handrailing too low" when actually the man fell because he was standing on top of the railing, the true facts are not brought to light. Installing a new handrail will not stop this

cause. Furthermore, other employees will not learn from this experience.

DETERMINE REASONS

Once we have determined the cause, we know what we must fix but we don't know how to do it unless we know why the employee performed as he did or why the defective condition was permitted, which brings us to:

The fourth factor in the sequence—Reason

Why did the employee perform as he did, or why was the defective or unsafe condition allowed to exist? Answers to these questions provide information needed not only to take corrective measures to prevent another possible injury, but also to improve operating methods. These reasons sometimes called contributory causes represent the underlying inefficiencies that actually laid the ground work for the unsafe act and/or unsafe condition.

For example, a lack of adequate instructions or a failure to comply with instructions is usually an indication for the need of improved supervision. If the worker complains of fatigue, there is every reason to believe that a slow down in production has occurred. Fatigue can result from noise, poor lighting, or unnecessary movements due to location of equipment or controls. A wrong attitude on the part of the worker may be due to discomfort or a lack of supervisory interest.

TALK WITH WITNESSES

What better way can a supervisor strengthen his supervisory qualifications than to talk to those involved in the accident or any witnesses to determine the specific reason which indicates where and how the supervisor can improve his work records. Until we get to the point as to where the immediate supervisor determines the reason, we have no assurance that we will progress toward accident records.

By using these basic accident sequence factors as guides when investigating any accident, we can channel our investigation to causes and reasons that are most reasonable and practical to control. This technique prevents misuse of terminology such as quoting the accident, or reason as the cause.

For example, I recall a recent accident where the cause was quoted as "left front tire blew out and car struck a bridge abutment." That is the accident itself, the unplanned, unwanted occurrence, but what caused the tire to blow out and strike the bridge abutment? In other words, when investigating an accident, we start off with the final factor "undesired result" and trace the chain of events, each factor in the sequence, back to the point that suggests a reasonable and practical solution. Let us demonstrate witht this accident example:

A new inexperienced employee was given a gasket and sent to flange a six bolt flange in a pipe line. He put in the gasket but in tightening the bolts, he did not pull the flanges together evenly. As soon as oil was pumped through the line, the flanges leaked spilling several barrels of oil over the ground before it was discovered.

1. What was the undesired result? Loss of oil, rework
2. What unplanned, unwanted occurrence put the oil on the ground? What happened? (Accident) Oil running out of flanges
3. Cause: What did anyone do or fail to do that caused the oil to run out of the flanges? (Unsafe act) Tightened bolts unevenly
4. What condition by its very existence contributed to the oil running out of the flanges? (Unsafe condition) None
5. Reason: Why did the employee tighten the bolts unevenly? Had not been told "What was the right way to tighten the bolts." (Lack of knowledge)

In many cases after the reason has been determined, there may be unanswered questions in need of further investigation: possibly a point of entry by the staff accident preventionist. For example, in the accident just discussed:

1. Why hadn't the employee been told how to tighten flanges?
2. What other employees are tightening flanges unevenly?
3. What is the procedure for tightening flanges?
4. What is the supervisor's indoctrination procedure for new employees?

It is impractical to disassociate the work of investigation from the task of corrective action, so after necessary correction has been taken, check observations should be made until we are convinced that the action taken was sufficient to prevent a recurrence of the cause.▲

WHY SET UP INSPECTION PROGRAMS?

by **FRANK W. KELSEY**

coordinator of safety, Jones & Laughlin Steel Corp., Pittsburgh, Pa.

Safety inspections can alert those preventing accidents to be on guard and to do something about potential hazards. Safety inspections are a necessary and vital part of any well-rounded accident prevention program. Inspections concern the identification of unsafe conditions and unsafe acts before they can contribute to an accident. They are the principle means for locating accident causes.

The finding and correction of unsafe conditions and practices are one of the best means by which management can show employees its interest and sincerity in accident prevention. Safety inspections help sell the accident prevention program to employees. They also encourage employees to inspect and correct conditions in their own areas. They afford the safety department an opportunity to contact the individual workman and provide the workman with an opportunity to point out unsafe conditions and practices which might otherwise go unnoticed.

WHY NECESSARY TO INSPECT?

Some years ago, our steel works divisions initiated an unsafe condition and practice report. After a vigorous effort to sell it to supervisors and workmen, many of these reports were received—so many in fact that the works manager asked whether or not we wouldn't have all unsafe conditions in the works soon corrected. He failed to realize that inspections are constantly needed because unsafe conditions and practices are continually being created. Most unsafe conditions and practices do not remain corrected.

Many unsafe conditions are the result of objects wearing out through prolonged use—and sometimes abuse. The side rails of ladders and their rungs develop cracks and become weakened. Ropes become frayed and worn. Power transmission belts deteriorate. Stair treads get worn or broken.

This means that unsafe conditions are continually being created by people and machines. It also means that unless steps are taken to detect and eliminate such conditions, accidents will inevitably result.

Unsafe conditions have been likened to water leaking into a boat. If the water isn't continually bailed out, the boat will be swamped. Left uncorrected, unsafe conditions will grow in number. The result—a high injury frequency rate.

EMPLOYEES CREATE HAZARDS

Many unsafe conditions are the result of employee actions. No matter how well-trained workmen may be, they can cause unsafe conditions. Material may be piled where someone could stumble or trip over it or it may be stored in a hazardous manner.

Guards may be removed but not replaced. Hand tools may be left in a defective condition. Here again, is a continuing source of unsafe conditions—pointing out why safety inspections are an absolute necessity.

Not only must the plant be inspected for unsafe conditions, but workmen must be observed to see if they are working safely. We know that unsafe practices occur even among well-trained men—men who know better. Unsafe acts may be the result of:

Lack of knowledge or skill.

Improper motivation—that is, for various reasons men prefer the unsafe way.

Defective capacity—that is, unsafe acts may be due to physical conditions such as poor eyesight, overweight, lack of coordination, worry, etc.

Safety is everybody's business; consequently, in the accident prevention program, responsibility for safety inspections is broadly shared.

Members of the safety department must be continually on the alert for unsafe conditions and practices. All employees should be encouraged to report unsafe practices and conditions.

Works labor-management safety committees, working within contract requirements, may make inspections to improve safety and

to recommend to management new safe practices for adoption.

In the larger plants, joint departmental labor-management alternating inspection committees, assigned by the department head for a limited period only, could inspect for unsafe conditions and practices and report their findings to the department head. The principle advantage of such an inspection procedure is that it affords every employee in the department an opportunity to become familiar with and to participate in the accident prevention program.

Special safety inspections may involve the services of trained personnel.

Certainly, all supervisors and foremen should have a well-defined responsibility for the inspection and safe maintenance of equipment within their area.

WHAT IS INSPECTED AND FOR WHAT?

First there should be a clear understanding as to who has the responsibility for safety inspections. Then, the problem of what to "look at" and "look for" should be settled.

Experience has determined that the following 24 categories, which may or may not be of equal importance in any specific area, will provide a general answer as to what to "look at" when inspecting for unsafe practices and conditions.

1. *Atmospheric Conditions:* hazardous conditions of dust, gases, fumes and sprays.
2. *Chemical Substances:* all liquids and solids that are toxic in nature.
3. *Containers:* all objects for storage of materials, such as barrels, boxes, bottles and cans.
4. *Conveyor Systems:* any system that transports materials to or from operations or processes.
5. *Electrical Conductors and Apparatus:* wires, cables, switches, controls, transformers, lamps, batteries and fuses.
6. *Engines and Prime Movers:* sources of mechanical power, excluding electric motors, steam engines and gas engines.
7. *Elevators, Escalators and Manlifts:* Requires no further explanation.
8. *Firefighting Equipment:* all firefighting equipment plus related structures as sprinklers and fire plugs.
9. *Guards and Safety Devices:* all removable and fixed guards, and safety devices or attachments, excluding personal protective clothing and equipment.
10. *Handtools, All Kinds:* equipment that is held or carried when in use.
11. *Hoisting Equipment:* cranes, derricks, power shovels, dredges, air hoists, hydraulic jacks.
12. *Inflammables and Explosives:* Requires no further explanation.
13. *Machinery and Parts Thereof:* power equipment that processes or modifies materials, e.g., agitators, grinders, forging machines, pulverizing machines, drilling machines.
14. *Materials, Raw or Processed:* materials and supplies essential to production of finished product, excluding materials elsewhere classified.
15. *Mechanical Power Transmission Systems:* shafts, bearings, gears, pulleys, drums, cables, belts, sprockets, ropes and chains when used to transmit power.
16. *Overhead Structures and Equipment:* any structural parts or equipment that may fall from above.
17. *Personal Protective Clothing and Equipment:* goggles, gloves, aprons, leggings.
18. *Pressure Vessels, Boilers, and Pipes:* objects subject to internal pressure from compression of liquids or gases.
19. *Pumps, Compressors, Blowers and Fans:* objects that move or compress liquids, air or gases.
20. *Shaftways, Pits, Sumps, and Floor Openings:* all types of openings into which persons may fall or trip.
21. *Walking and Standing Surfaces:* floors, aisles, stairs, platforms, ramps, roads, scaffolds, ladders.
22. *Warning and Signal Devices:* direct communication systems as radio, telephone, buzzers, bells, lights.
23. *Vehicles and Carrying Equipment:* trucks, cars, trains, motorized carts as well as non-motorized equipment for transportation of materials.
24. *Miscellaneous:* other potentially hazardous objects or conditions that do not fall into the above categories.

In our own corporation we adopted the use of a safety inspection inventory form to determine the items which need inspection in any particular area of supervision. This particular form reviews all potential sources of accidents from an inspection point of view.

The procedure involved in the use of this form consists of two basic steps: 1. Determine what to "look at" and 2. Determine what to "look for."

This safety inspection inventory calls for a list of items that fall into the inspection category, and describes where these items may be found. It identifies the critical parts of the item which should be inspected for unsafe conditions, and the unsafe conditions which should be "looked for."

A thorough job calls for a safety inventory of each of the 24 categories should they apply. It would also provide a complete inventory of all the potential accident agents in a specific supervisory area.

"LOOK-FOR" GUIDE

Items to be considered under the "Look For" guide can be grouped under the following five major headings:

Safety Devices, Signal Devices and Guards
- Missing or inadequate guards.
- Lack of or faulty bracing support.
- Missing or faulty warning devices.
- Missing or faulty safety devices.

Structural Defects and Material Characteristics
- Sharp-edged, jagged, splintery conditions.
- Worn, frayed, cracked, broken conditions.
- Uneven, rough.
- Slippery conditions.

Functional Defects and Characteristics
- Unsafe susceptability to breakage, collapse.
- Unsafe susceptability to tipping over, falling.
- Leakage of gases, fumes, or fluids.

Ventilation, Illumination, Noise
- Noxious fumes, gases.
- Inflammable or explosive fumes, gases.
- Insufficient illumination.
- Excessive noise.

Hazards of Storage, Positioning and Arrangement
- Congestion of traffic or walking space.
- Protruding objects.
- Poor housekeeping.

This inventory would hardly include every possible hazard. But it will provide a permanent record, listing most of the items to be "looked at" and what to "look for" in each department when making safety inspections.

This inventory will also determine who is to do the inspecting. Some of the responsibility will fall to the foreman, some to safety inspectors, some to maintenance men and other responsibilities to skilled specialists.

WHEN SHOULD INSPECTIONS BE MADE?

When inspections are made will depend on the items to be inspected. Some items or conditions require continual inspection to make employees always alert for their occurrence. Gas and fume hazards are an example.

Some inspections are called for *immediately prior* to certain work operations. For example, entry into a manhole may call for a preceding check for gases. We use a field clearance report which requires the signature of department maintenance and operating supervisors before outside departmental personnel are permitted to work within a department.

Some items require periodic inspection—daily, weekly or monthly. Other inspections may be semi-annual or annual. Special inspections may be in order because of particular occurrences, for example, the investigation of an accident may reveal a special type of hazard.

This safety inspection inventory when completed, will indicate: what must be inspected, what to inspect for, who must do the inspecting, and when the inspection should be made.

IMPORTANCE OF CORRECTIVE ACTION

Inspections themselves are important; but follow through for correction is of utmost importance. Only by correction can unsafe conditions be made safe and workmen made to realize that management is earnest to promote the accident prevention program.

While the correction of unsafe conditions is an important phase of the accident prevention program, we believe that the observance and correction of unsafe practices is more important, because unsafe practices occur with greater frequency than unsafe conditions. Hence, improvement in the number of unsafe practices corrected should have a more significant effect on the frequency injury rate.

This statement is not made to discourage the correction of unsafe conditions, but to emphasize the need for locating and correcting unsafe acts or practices. Some of the common unsafe practices may be grouped under the following headings:

1. *Operating without authority. Failure to Signal or Warn.*
   (Ex. Start, stop or move equipment without authority.)
2. *Failure to Make Secure.*
   (Ex. Failure to lock, block, tie or otherwise secure materials or equipment against unexpected movement.)
3. *Operating or working at unsafe rate.*
   Running.
   Jumping.
   Operating vehicles too rapidly.
4. *Improper use or failure to use.*
   Guards, safety devices and personal protective equipment.
5. *Using unsafe equipment. Using equipment unsafely.*
   Use of unsafe hand tools.
6. *Taking unsafe position or posture.*
   Exposure under suspended loads.
   Improper method of lifting.
7. *Unsafe loading, placing, storing, mixing.*
   Overloading.
   Crowding.
8. *Working on moving or hazardous equipment.*
   Getting on and off moving equipment.
   Working on equipment in operation.
9. *Miscellaneous unsafe acts.*
   Distracting, teasing, horseplay.
   Wearing unsafe personal attire.

With these common unsafe practices in mind, you can plan observations for unsafe acts.

As with unsafe conditions, after an unsafe act or practice has been observed it is essential that something be done about it.

The correction of unsafe acts or practices involves a problem in human relations. The employee must be approached in such a way that there will be no resentment on his part. Certainly he should not be subjected to humiliation. He should be talked to in private and informed of the safe way to do the job and an effort made to get his agreement.

HOUSEKEEPING

Good housekeeping looms large as a very definite factor in the prevention of accidents. A well-planned periodic housekeeping program, set up on a rating basis with awards to the unit with the best score will do much to help the cause of safety.

A continuing systematic method for finding and correcting unsafe conditions and practices is great value in the prevention of accidents, since unsafe conditions and practices are continuously being created.

Safety is everybody's business and responsibility for inspections should be specifically delegated both as to "when" and "by whom."

After indicating what items or practices should be inspected and presenting a safety inspection inventory form we again emphasize the importance of corrective action after unsafe conditions and practices have been determined.

"Why Set Up Inspection Programs?" To emphasize: *ORGANIZE — DEPUTIZE — SCRUTINIZE.*

MACHINE TOOLS AND PRINCIPLES OF GUARDING

by HAROLD MOORE

safety engineer, Remington Rand Inc., Elmira div., Elmira, N. Y.

The measure of a good safety program is the determination of top management to back the movement and actively support all those to whom the duty has been given to supervise, develop and engineer the safety program in their organization.

Most assuredly, the success that has been gained and maintained by those companies whose no-accident records are outstanding, has been attained by the whole-hearted backing of the safety engineer, or director, in his program of injury prevention. For, after all, injury prevention is the goal at which we all aim.

This present situation has been a matter of growth, in just the same way as there has been a definite growing in production methods. Management realizes that good production depends on accident-free operation. So in the beginning let me say that if your management, I mean the chief of your company who has delegated the safety job to you will co-operate, you start with few handicaps, nothing like the handicaps which those of us who have pioneered the accident prevention movement.

It doesn't matter whether you are a newly appointed or even a more matured individual in the no-accident movement. This job you have been given bristles with opportunities to progress in this field of injury prevention. If it should be thought necessary to choose a motto or a watchword we would declare—"They shall not get hurt."

So, let us first break down some of the essentials that govern the province of machine guarding and, second, the scope of the responsibilities and duties connected with the job.

MACHINE GUARDING

Fortunately today we do not have to start from scratch. The progress made in the field of machine guarding has been phenomenal, and it has been stimulated by the acceptance of the principle that it is the inescapable duty of the industrialist to accept that responsibility. Answers to this program of machine guarding are available to those who will make it their business to study and apply the principles.

First—Where do we find them?

We can and should make use of the text books—The Safety Manual, Safe Procedure pamphlets and job Instruction Cards, in addition to all other stimulating literature of the National Safety Council.

It is probable that the companies you represent are subscribers, members or supporters of the National Safety Council and thereby can, at little extra cost, provide you with a knowledge of the tested methods which have proven effective insofar as the material—or physical aspect is concerned.

BE A SAFETY DEVOTEE

However, these manuals, text books and such to which we have referred are of little use if they remain on your bookshelf. This means, of course, that you shall not be a mere safety job-holder, but a devotee, one who is imbued with the spirit of his work and whose studies are not a task but an opportunity and an investment.

One or two points about machine guarding do stand out in our experience. The first is that the primal parts of most machine tools today are already taken care of by the machine tool designer and manufacturer. We mean such things as gears, universal joints, accessibility of stop-start motions and the combination of those operating features which are designed to prevent the casual or inconsidered act of the operator.

There are still some old-time machine tools which may need your attention. However, the more important, "point-of-operation" protection will always provide the greatest scope, and challenge, for investigation, study and ingenuity of the safety man, —the devoted safety man. Let us analyze this a bit. We have learned that injuries don't just happen. They are caused. The accidental injury is merely the effect of the cause. So in considering these points of operation we shall, we must accept the axiom that no one wants to get hurt. If that were not true, then injuries would not be accidents: they would be routine.

MAN CAUSES MOST ACCIDENTS

What then is one of the main causes of accidents and the one which needs the intensive consideration of all of us in the accident prevention field? In our opinion it is the unpremeditated, the instinctive, the automatic act of the human individual as opposed to the Robot.

A machine is designed to do certain operations. The machine does not think; it takes no regard of any conditions, just merely operates as it is designed to do, and if the operator doesn't realize and accept this he is an accident liability. Let us illustrate.

Take a punch press which has been, and properly, looked upon as a number one maimer.

Thousands of dollars have been invested in the design of punch-press guards—de-

signs accepting the frailty of the human operator, and to make the guard what euphemistically we call "*fool proof.*"

Actually what is being done is meeting the situation so as to combat the effect of the instinctive action we spoke about.

As an illustration of an instinctive or unpremediated action think of yourself driving up a knoll, say at 40 m.p.h. and at the top 50 yards ahead you see a farm wagon crossing, or some cattle, or some children playing. Do you go through a long process of thinking what you will do?

No. Instinctively your foot leaves the accelerator, you step on the brake—and you slow down. By the same token, if you are sitting beside an open window and a moth, or a bug, flies in and alights on your face, you brush it off in an instant. Well, a press operator seeing something on the die, a chip or a misplaced part, has the instinct to reach in and sweep it off.

DRILL JOB SAFETY

An impatient drill operator doing a drill job in sequence, will when closing one drill operation retard the drill by using his hand. What does a point-of-operation guard do? It prevents, or must be designed to prevent, such incidents before they become accidents. And the success of the design of the guard and the insistence on its use is the accident preventor.

We cite this type of machine because, in safety parlance these machines are considered bad offenders. We shall not go into detail regarding the many varieties of machine guarding, that is the physical guarding of machines. As we said, a large percentage of machines in this day are in incentive production—and this brings to light the would-be "corner cutter"; the guard dodger and the "take-a-chance" boys.

Where does our safety man stand here? Oh no, it is not simple; it is a challenge. Let us emphasize. The safety man, if he is ever going to make a success in accident prevention, must work with the tool designer; the ranks of supervision from foreman down to set-up man with methods engineering, time study man and union stewards. He does not give orders. He is not a dictator, but he is a salesman for injury prevention and a friend to the employee and others.

In his sphere he has much need for publicity of his objectives and support to back them up. For aids, he arranges for and makes up safety committees. If need be he uses plant publications—if there is one, posters illustrating the danger of certain procedures and he also disseminates news regarding safety activities, outstanding safety performances and gives credit to safety suggestions submitted from the floor.

USE FIRST AID FACILITIES

He can and should make use of the first aid and medical departments and their facilities; keep in touch with the plant nurse *and be immediately advised if* and when a condition arises which requires prompt attention and maybe drastic action.

We need hardly tell you that to-day in the safety field, there is opportunity for the safety man to keep abreast of new developments in automation with its prospect of monotony-promoting drowsiness. Also the new aspects of compensible liability available. Radio activity is one that should be the subject of investigation, consultation with specialists in this field who can—and will—gladly help.

Another field which is becoming a cause of worrysome consideration is noise—with the possibilities of producing hearing defects or losses. This divides itself into two divisions: The factual study of noise producing machines or other conditions by the use of detector devices; and *the evaluation* of noise-reduction, baffles, insulation and personal protective equipment.

The safety man should be included, and, if permitted by the scope of his authority, a consultation with the specialist, the engineering division, the medical department and industrial training group, in fostering a successful safety program.▲

PLANT CONSTRUCTION AND MAINTENANCE

by THOMAS B. COLEMAN

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The key to injury free performance in any endeavor is, has been and always will be the safe worker. This is particularly true in construction and maintenance work because of the nature and environmental conditions of this work. There are federal, state and local laws which specify definite requirements for safe working conditions. Books, brochures and printed articles give all the information needed to determine what is safe or unsafe in equipment facilities, conditions and tools.

An outstandingly good job of building safety into most tools and equipment has been done by the engineers. However there will always be opportunities to develop engineering improvements for the tools and equipment used by the construction and maintenance men.

The work assignments of the construction and maintenance men are not repetitious. Each job the men do presents a different set of circumstances, conditions and problems. Therefore the tradesmen, journeymen and master mechanics must be well grounded in the techniques of safe work methods. A broader knowledge of the work, use of the equipment and protective devices is essential.

Even with the knowledge of how to protect against the unexpected and of things that make the work area safe, we must depend on the man working safely because the supervisor cannot give the same time to *the individual* or group as can be devoted to the fixed location workers.

Because the construction and maintenance men are widely scattered the supervisor does not have as frequent contact with them as the supervisor of a group of production workers confined to a particular space.

Therefore the men on this type work must be thoroughly familiar with the problems and potential hazards. We must of necessity place more dependence on these men.

TRAIN SAFE EMPLOYEES

To obtain safe workers we must select men with care, and then train them for safe work. When instructions are given to a man we dare not assume he knows what to do, or how to use all the necessary safeguards.

We must take time to review all points of danger, all the pitfalls and inform him of the exact requirements and expectations for safe work. We must also equip the man with sufficient and suitable equipment to meet the safety requirements.

If we hire an electrician and tell him to wear a hard hat to withstand high voltage contact, and we give him a hard hat that has no value except impact resistance, we have not given the man adequate or suitable safety equipment. The safety equipment must give the protection we want the man to have.

After adequate instructions have been given, suitable safety equipment provided, the environmental conditions are good, every hazard considered and the employees follow our demands—then some member of the supervisory staff is called to aid a man in an area where eye protection is required.

This supervisor goes to the tradesman but does not bother to wear his safety glasses. He is setting a bad example for the employee. Within a day or two that employee will probably be working without the specified eye protection.

You must insist that all members of management help in setting a good example. The staff must always use the safety devices specified for use in any work area they visit. There must be rigid compliance to all safety rules and regulations. You dare not disregard or fail to use the proper equipment in the approved manner.

Circumstances that lead to a fatal accident only can be eliminated by exacting rigid compliance to all rules and regulations. We must outline and review them when indoctrinating a new and inexperienced worker. Never leave any part of the rules unexplained. To be sure no information is missed, make up a guide list or induction procedure and follow it.

The newly hired experienced tradesman should be given just as thorough an indoctrination as the inexperienced man because

he may have formed bad habits in his last place of employment.

Here's what happened to one man with a bad habit. In his indoctrination the supervisor covered the local rule against hitching rides on industrial trucks. However, the new man disregarded the rule and jumped onto the forks of a passing truck. His left foot slipped and was caught under the frame of the truck. When the injured man was interviewed he said, "I always hitched rides on the trucks in the last place I worked and got away with it. I did not expect to go wrong this time either."

This indicates a need to go a step further in our training procedure. We must review some of the rules for safe work each time there is a change in work assignment. The training given by the supervisor must be continuous.

The master mechanic, journeyman or lead-off man are important in the day-to-day training of the apprentice and helper. They must set a good example and be thoroughly familiar with the rules and procedures. Any lead-off man who decides upon a change in method or procedure that reduces or eliminates safety from the task is unworthy of continuing in that role.

Management has the responsibility to provide safe equipment for the men to work with and the workers have a responsibility to themselves and management to use all that is provided. We might consider each employee as having been hired conditionally. Every occupation has certain conditions to be met, such as the welder and his eye protection, the millwright and his boatswains chair with a safety line and the man who builds and works from a scaffold that requires a toe board and guard rail.

TRANSFER UNSAFE WORKERS

Each man who fails to use the specific safety equipment for the exposure or job has failed to meet the conditions of employment. The man who is unwilling to comply with the conditions for safe work should be transferred to less hazardous work or his service should be terminated. To continue him in an occupation where he does not meet the conditions will surely result in disaster.

The supervisor must set a good example at all times by using all the safety devices he expects his men to use when exposed to the hazard of the job. If an employee is having difficulty on a particular task and calls the supervisor for help, the supervisor must use whatever equipment the man must use. If the job is dusty and calls for a dust mask he should use a dust mask. If he goes on a scaffold where a life line is required then he must use a life line.

The older employee will have a great influence on the new men and helpers. If the older men do not set a good example we will never achieve complete acceptance and use of the safety equipment. There are a few ways to secure acceptance and use of the safety equipment, job methods and operating techniques that guarantee the greatest safety.

First, rules must be stipulated and followed. They must be clear cut and as simple as possible. When outlining the rules to the employee the supervisor must make certain there is complete understanding. Leave nothing to guess work. It may be necessary to repeat and repeat until you are understood.

The supervisor must make no exceptions to the rules. They must apply uniformly. The moment he lets one man work contrary to the rule he is in for trouble. Other men in the gang will be found working without the item that was excepted for the one man.

REVIEW SAFETY RULES

When job assignments are given out, the supervisor should review the safety requirements of that job. He must not assume the men will remember or that the man knows all the danger points of the new assignment. One supervisor covered the area fully. After giving the millwright all the information for the job, he then reviewed the safety requirements. He pointed out the need to lash the ladder on the building truss and the need to wear safety glasses.

Finally the supervisor said "and button up your shirt collar because those metal chips from the drilling will be hot. If you get one of those hot chips down inside your shirt it may cause you to fall off the ladder and we don't want that to happen, ever."

This supervisor did an excellent job of instructing his employee; nothing was left to chance. The employee followed through on the instructions because they were complete and explicit. He knows that this supervisor will not tolerate short cut methods or failure to follow orders.

There may be times when non-compliance with the rules and safety requirements cannot be enforced except by some disciplinary action. This step should be taken whenever it is warranted. It is important that the action be uniform. It must be fair yet adequate.

Good judgment must be used in leveling the penalty or else it may be turned into a joke as in one instance. The man was to be given two days off for an infraction. The days were to be a Thursday and Friday but the supervisor decided he wanted the man on Saturday because they needed his particular skill.

When the employee was informed of the penalty and then was told they expected him on Saturday he laughed at the supervisor and said "You must be crazy to think you can give me two days off at the end of the week and then say you expect me in on Saturday. This is just what I have wanted. This gives me a four-day weekend. I'll be able to put my new boat in the water and try it out. You won't see me until Monday Mr. Supervisor."

LEARN THROUGH PENALTIES

This action was not a penalty because it gave the man something he wanted and in turn the entire gang looked upon this action as a huge joke. At another time three men would not continuously wear the eye protection that was required. After a reasonable interval in which every effort was made to have these men comply they were placed in other occupations where eye protection was not required.

Arrangements were made for the change and the men were told what was to happen. Three men after their initial protest about the loss in earnings said, "You never convinced me that you meant what you said about wearing those safety glasses. Give me another chance on this job and I promise I'll wear the safety glasses all the time." They were were given another chance and they have fulfilled their promises.

We have given a lot of thought to the supervisor and what he must do to run a safe job. But let's look at the duties you and I must fulfill to help make the job as safe as possible.

First, every hour spent on writing reports of injuries is an hour that could have been used in personal visits to search for unsafe conditions, human failings, and damaged or defective tools and equipment that often result in injuries.

VISIT JOB LOCATIONS

You should be seen in the field each day by as many employees as possible for you to visit. You must never pass by an unsafe condition, act, or piece of equipment. You should make arrangements for some corrective action before you go on to the next area. Show righteous indignation when such a show is justified. Do not accept anything but the best efforts in every aspect in the fulfillment of your safety program.

The only way to come down near the zero mark in injury frequency is by the elimination of every conceivable hazard and by wholehearted and complete acceptance and use of the safety equipment, rules and regulations that may be established for the protection of the employees. There is no easy way to accomplish the desired results. It takes hard work on your part, your supervisor's part and on the part of your management.

The key to injury free performance is the safe worker. In construction and maintenance work there is hardly any repetition to the work because each job and location presents different hazards. The men's knowledge must be much broader to meet the constantly changing conditions. The men must be well instructed and dependable because the supervisor cannot be with them constantly. Their training must be thorough and they must be adequately equipped to work safely.

There is a constant need for you and the supervisor to set a good example. Compliance with all the safety regulations is imperative. Training the men is and must be exacted from all employees. There can be no exceptions.

When disciplinary action is required it must be uniform, fair, and adequate. Remember that every occupation has certain conditions that must be met. Therefore every employee is hired conditionally and when he does not meet the conditions of employment he is no longer employable on that job.

You, Mr. Safety Man, must spend every available minute searching for the unsafe practice, the unsafe condition, and the unsafe equipment so they can be corrected before anyone is injured.

PRINCIPLES OF INDUSTRIAL HOUSEKEEPING

by PETER CONTARDO

safety director, John A. Roebling's Sons Corp., Trenton, N. J.

Housekeeping must be ranked at the top of the list of things we should do to prevent occupational accidents. It is the one activity which more than any other is used as the spearhead of the safety effort.

Housekeeping is usually described by the following well-known statements. Some people say it means "keeping the plant clean and orderly"; others describe it as "a place where everything is kept in place."

In plants which have had good housekeeping for many years most of the employees use the well known expression "a place for everything and everything in its place."

In a recent survey taken in a manufacturing plant 30 employees were asked to define housekeeping. It included the superintendent, industrial engineers, safety personnel, industrial nurse, maintenance men, janitors, equipment operators, an accountant, machine operators (laborers, and others. All of them included either the word clean or the word orderly in their replies. Twenty-four of them used both words. This seems to indicate (at least on the basis of this survey) that housekeeping consists of "order and cleanliness."

STOP SQUALOR

I once heard it referred to as the elimination of industrial squalor. We may find it advantageous at times to use this definition in our work because despite the great progress made in industrial accident prevention, and particularly in plant housekeeping, squalor in industry exists as surely and probably to as great a degree as it does in blighted tenement districts and so-called backward rural communities.

In addition to controlling or eliminating work hazards, order and cleanliness in our plants provides an unusually strong sales appeal for our way of doing things as opposed to a state-owned and controlled economy. It is difficult to persuade a visitor, whether a local citizen or from a foreign land, that in our system we have genuine concern for our working people if we keep our plants in a sloppy condition.

Industrial squalor does not enhance the prestige of the free enterprise system at home or abroad. The habit of squalor becomes contagious and (if it exists in our plants) spreads beyond the confines of the plant gates. Witness the alarming harm done to the countryside by the so-called "letterbugs."

SAFETY IS SERVICE

Safety-men should be in the forefront of any efforts to clean up (and keep clean) America. It is an opportunity to render a real service not only to our employees and industry, but also to our communities.

Our obligation for industrial housekeeping does not begin and end at the plant. Through our Chambers of Commerce, our local safety societies, our local governmental officials, we must do our share to help make the entire community, and especially the industrial community, "housekeeping minded."

Let us analyze the real meaning of industrial housekeeping. What is it? What does it include? It may be defined as "all those activities which are necessary to keep the interior and exterior of the plant in a reasonably clean and orderly condition."

The plant includes all buildings and structures, equipment, machinery, yards, roads and parking areas. The interior includes the inside of all buildings from cellar to attic, and the contents. The exterior includes not only the outside of all buildings, but also, tanks, trestles, stacks, roofs, fire-escapes, window ledges, plant yards, roads, parking areas, and storage areas.

A "CLEAN" PLANT

To be "clean" a plant must be reasonably free of controllable dirt, grime, rubbish, garbage, and other material—and in its broadest sense includes the protection of employee health through adequate sanitary facilities, the prevention of occupational diseases, and the protection of the community from air and stream pollution. The latter are special problems which will not be discussed here by the speaker.

"Orderly" means to install, store, use or move material, equipment and machinery in as straight a line as possible, making economical use of available floor space, so that operations are conducted with maximum efficiency and safety and minimum effort and confusion.

Safety men may be functioning under any one of the following conditions with or without sincere, active management direction and support.

a. A new plant in either the planning stage (i.e. before construction begins) or immediately after completion of the plant structures.
b. A reasonably new plant with or without an established, successful safety program.
c. A so-called old plant (over 30 years old) with or without an established successful program.
d. A comparatively new or old plant which had a program but for a variety of reasons it fell into disrepute.
e. A plant which really never had an effective program.

What ever the circumstances, the principles and methods which we must follow to develop and administer the industrial housekeeping phase of the accident prevention activity remain unchanged. How should we proceed?

INSTILL DESIRE FOR CLEAN PLANT

● Create and instill in top management the desire for a clean plant. The most effective means at your disposal is to make one or more members of top management "housekeeping champions." Every company, small, medium, or large, fortunately has a number of top officials who are instinctively sympathetic to reasonable efforts to clean up their plants and will support your plans.

These are the men who will not only react favorably, but will "go to bat" to influence other members of management on the wisdom and advantages of good housekeeping. You must reach the group by thoroughly selling and enlisting the help of the few in the group who can aid you most.

● The next step is to persuade management to adopt and publicize a housekeeping policy. In short this policy should simply state that the executives of your company want a reasonably clean, orderly plant.

● The policy should be translated into specific orders from executives to operating heads, to foremen, to employees.

● It is our experience that initially the operating people consider housekeeping just another chore or job to do because the owners and/or managers want it. In the beginning there may be little enthusiasm for this additional job and it is the wise safety man who will literally get on his soap box and slowly but diligently sell all, particularly supervisory personnel on the value of a clean shop.

● The next phase in the evolution of the housekeeping effort is the development of a program, the spelling out of *who* and *how* the job must be done.

● The last phase is the enviable position reached (after many years of patient work on the part of many individuals) where housekeeping becomes a tradition. You have heard from time to time, the expression—that in a certain company or corporation "housekeeping is a tradition which started a good many years ago and is being maintained as strong as ever today."

MANAGEMENT'S RESPONSIBILITY

The steps which management must take to organize and maintain a good housekeeping program, can be summarized as follows. Management must—

1. Tell everybody in the organization—keep telling them.
2. Tell them why they want housekeeping—enumerate advantages.
3. Tell them who is responsible for accomplishing it.
4. Tell them how it should be done.
5. Provide necessary equipment and personnel to do the job.
6. Get everyone in the act.
7. Reward them when they are doing a good job: penalize them when they do a poor job.

Before telling you how we followed the seven steps in our own corporation it might be well to repeat a fact with which many of us are familiar, namely that about 75 per cent of all manufacturing plants in this country are 25 or more years old. This

complicates the housekeeping problem and makes it more of a challenge. Many of the older plants enjoy better housekeeping than some of the newer ones which have more space and better facilities. We must remember to do the best we can with the facilities available, rather than using lack of modern buildings as an excuse not to do anything.

1. How did we at Roebling tell everybody, and how did we keep telling them? First our formal safety policy was prepared, published, and distributed. (It contained strong emphasis on housekeeping.) The vice president in charge of production made certain that all supervisory personnel received copies. It stated, in effect, "that management wanted a clean plant."

He frequently at manufacturing manager's meetings, and in his inspections, reminded them of the company's desire. All service and staff department heads were notified of the new "party line"—namely, "we're going to have a clean plant."

HOUSEKEEPING ADVANTAGES

2. At staff meetings of various departments, and in our safety training programs for supervision we emphasized advantages as follows:

a. Reduction in work injuries.
b. Increase in efficiency—brought about by easier flow of materials, and higher productivity.
c. Improvement in morale of employees—they like to work in an orderly atmosphere.
d. Sales—favorable effect on customers. In one particular instance, an important customer visited our plant (after our program was in progress) and then increased his purchases from 15 per cent to 30 per cent of his needs because he was so favorably impressed by the orderliness he saw.
e. Community relations—one of the best avenues to winning and holding the esteem of the community is by having the plant pleasing to the eye.
f. Labor relations—reduction in employee complaints and grievances.
g. Fire losses minimized.

3. Who is responsible? We placed responsibility on—

a. Operating personnel—supervisors, foremen, janitors, laborers—each have a responsibility. Staff personnel also have an obligation to do what they can to promote housekeeping.
b. Maintenance personnel—barricades, cleanup during, and after each job.
c. Safety department—training, safety meetings, posters, inspections, contests, and publications.

4. How the job should be done. We made haste slowly. In my experience, even the most enthusiastic management can be overwhelmed if you try to get too much done too quickly. Keep in mind that good housekeeping habits are not acquired over night. It takes years.

We ordered all of obsolete material, surplus, scrap from exterior, and interior of buildings, removed. Inspections were made, and inventory taken in each department, and to give you an idea of what can be hoarded, 13 cars of scrap were removed from the plant in the first week of the campaign. A vacuum cleaning of the walls of our carpenter shop produced two barrels of wood flour.

Each foreman was given orders to clean up his own office and keep it clean, and made responsible for housekeeping in his own department. Each foreman was given orders to instruct and train individual employees in good housekeeping habits, emphasizing the importance of each man keeping his own work area clean.

HOUSEKEEPING EQUIPMENT

5. Over a period of years we equipped various departments with:

a. Vacuum cleaners, power floor scrapers, power floor sweepers; however, in the hard to get places we still use considerable hand sweeping.
b. Aisle markers. One plant uses compressed air aisle paint markers. One plant uses gravity fed paint aisle markers, and another plant uses plastic discs, which are nailed and cemented to the floor.
c. Use of mineral absorbent on floors, and elimination of the use of sawdust, where oil and grease is spilled or splashed.

d. Outdoor storage bins for scrap, chips from machines, etc., were installed.
e. Central bundling area for scrap was set up.
f. Distinctively painted rubbish and scrap cans were furnished.
g. Incinerators were constructed where needed.
h. We reviewed our toilet, washrooms, showers and facilities, and developed a long range program of modernization of same.
i. Oily waste receptacles were provided.
j. Lighting facilities were reviewed, and still being reviewed, with improvements being made where necessary.
k. Exhaust ventilation was provided at processes requiring same.
l. Bulletin boards were installed and traffic warning signs were repainted on the exterior and interior of the plant.

STRESSED COOPERATION

6. All of our promotion, all of our publicity, and all of our training stresses the notion that housekeeping is something that is accomplished by having everyone do his share.

7. Reward system. We do not have formal housekeeping contests, and do not favor awarding "booby prizes" to departments with poor housekeeping. We find a word of praise from a top executive, a customer, or a visitor is sweet music to our operating people. However, we are now considering initiating a contest in our present program.

A schedule of sweeping and scrubbing floors, of collecting and removing scrap and rubbish, of cleaning walls and machinery, of washing windows, and cleaning lights, of washing, sanitizing, and deodorizing toilet-rooms, washrooms, and locker rooms must be worked out on a trial and error basis. The cleaning job must be tailored to fit the needs and requirements of variable conditions in different departments, and in dissimilar plants and industries.

We must set a housekeeping standard for ourselves—how? We must select the best plants in our industry and make it our objective to establish as good a reputation for housekeeping as they enjoy. Eventually we should excel to the point that other companies will use our plants as models for their housekeeping program.

Here are some of the attitudes which retard progress in housekeeping.

1. We must guard against objections of operating people that lack of space makes housekeeping impossible.
2. We must not permit ourselves to blame poor housekeeping conditions entirely on employees or employee's bad habits.
3. We must refute the quaint, but out moded, notion that a dirty plant is a barometer of good business because only busy plants are dirty. Surprisingly, there are still a number of people who believe this.
4. Last, but not least, we must constantly debunk the notion the housekeeping costs too much money.

After developing a housekeeping program we must not relax our efforts. Just as other elements in the safety effort require constant, repetitive attention, so also does housekeeping. In short we must not only get the plant clean and orderly, keep it clean and orderly, but most important of all we must not let the housekeeping program take a backward step. That would be fatal—because while the climb to success in housekeeping is a long hard one, the road back to industrial squalor is a quick easy one.▲

INITIATING AND MAINTAINING INTEREST IN SAFETY

by E. CLARK WOODWARD
director of safety, A. O. Smith Corp., Milwaukee, Wis.

Initiating and maintaining interest in safety is a broad subject and can be discussed for hours. Therefore, let's consider this problem in its simplest terms. Initiating and maintaining interest in safety is essentially a selling job.

Selling safety is no different from selling any tangible product so far as selling principles are concerned. Too often we think that selling "intangibles" is more difficult than selling washing machines or refrigerators or stoves or lawn mowers. Actually, the principles are the same. All we have to do is change the name of the product from "lawn mowers" to "safety."

If you really want to sell safety and keep it sold, I advise you to get ahold of the sales manual of any large appliance manufacturer or read any good book on how to sell merchandise. Just change the words around a little bit in your mind and see for yourself how well the principles apply to selling safety or, in our case, to initiating and maintaining interest in safety.

KNOW YOUR PRODUCT

Before you can sell any article you must know that article thoroughly. Suppose you were selling washing machines. You would be expected to know your brand of washing machines thoroughly. You would be coached in all the workings of the machine. You would have to learn all of its many advantages to the user. To be a good salesman, you would have to be proficient in your knowledge of what benefits your device would bring to the prospect.

On the other hand, you would have to learn all the objections which might be raised by a prospect in the course of making a sale. In other words, you cannot wait until you get in the customer's home before you think of the answers to the prospect's doubts in regard to your product. You must know the answers beforehand and be ready to answer them.

All this is true about selling safety. You must know and be completely sold on the advantages safety brings to the employee. You must know in advance and be ready to answer the usual objections which are raised by most people before they accept safety as a part of their way of living. If you are selling the idea of wearing safety glasses, you must be ready in advance to answer the argument that the prospect thinks safety glasses are too heavy, etc.

WHY PEOPLE BUY

People buy safety for the same basic reasons that people buy washing machines. In order to complete a sale, certain requirements must be met.

All of us have common desires. The psychologist can outline them to you and they will include such motivations as a desire to live, desire for profit, desire for prestige, desire to compete, and quite a few other natural inclinations. The sales manuals will tell you that we all have these basic desires.

However, we have them to varying degrees. One man has a greater desire for profit than another. Another man is greatly in need of feeling superior to his fellow men; and so it goes. A sale is made when the salesman is able to play upon human desires and convince the prospect that the thing he desires is actually a "need." Once that is accomplished, the prospect feels his desire is justified and he will buy what you have to sell.

My wife wanted an electric dishwasher for many years. We raised three children and managed to get along all those years without an electric dishwasher. However, after all of our children were married and had left our home I suddenly learned that my wife "needed" an electric dishwasher. She absolutely had to have it!

I attempted to argue the point. I said, "All the kids have left home and you only have dishes for the two of us. Why should you have a dishwasher?"

"Because," my loving wife replied, "I lost my dishwashers when the girls got married."

I didn't have a chance to overcome that argument. Some salesman had persuaded her that her desire for an electric dishwasher was now a real need. You know what happened. We have a very beautiful dishwasher in our home.

KNOW YOUR PROSPECT

Not all people buy products or buy safety for the same reasons. As I said before, we may all have the same basic desires to varying degrees. But, certain desires will be stronger and therefore, the most logical for the salesman to work on, depending upon our position in life. Thus, the appeals that are effective with top management will not mean much to a lathe hand or a sweeper in the factory. By the same token, we cannot use the same appeals to top management or middle management, or the foreman as we use for the people in the lower echelons.

In our company we make definite efforts to appeal to the desires and needs of every level and we use definite devices for the purpose.

In order to sell top management, we devote considerable effort to getting the facts and presenting them properly to show that accident prevention is good economy, that it increases efficiency, and that it is a measure of good management generally. To do so, we have even published special booklets in which we have charted, somewhat dramatically, the savings made in our company through accident prevention and have pointed out the need to continue our efforts in bringing down our frequency rate year after year. As a result of that kind of selling and the resulting "buying" by our management, they have taken certain steps which help us to sell safety to the levels of the organization below them. This, of course, is a necessity in selling safety. The top management must be sold and must make it evident to one and all that they are sold.

As a positive indication of such attitude, our president issued the following statement of policy:

> "When a man enters the employ of A. O. Smith, he has a right to expect that he will be provided with a proper place in which to work, proper machines and tools with which to do his job, and that he will be able to devote his energies to his work without danger to his life and health.
>
> "Only under such circumstances can the association between employee and employer be mutually profitable and harmonious. It is our desire and intention to provide a safe work place, safe equipment, proper materials, and to establish and insist upon safe methods and practices at all times.
>
> It is a basic responsibility of all those carrying executive authority to make the safety of human beings a part of their daily, hourly concern. This responsibility must be accepted by each one who conducts the affairs of the A. O. Smith corporation, no matter in what capacity he may function."

AWARDS SAFETY TROPHY

In addition, our President awards a beautiful bronze trophy each year to that division which makes the greatest contribution toward accident prevention in our corporation. That device inspires competition and has proved effective.

By the same token, we devise special appeals to the staff organization such as engineering, time study and purchasing. In our training programs for executives we attempt to point out, in keeping with our President's philosophy, how each specialist is concerned with accident prevention and how the prevention of accidents will benefit his function.

Our superintendents, general foremen and foremen are also approached with a knowledge of their desires and needs. We carry on certain campaigns and programs which bring the line supervisors into the act in various ways. Sometimes we have the supervisor show movies. In some campaigns they all wear lapel buttons and ribbons, or they may utilize yellow flags to mark hazards, and we often supply them outlines for brief safety talks. We try to keep them all active by providing selling material for them to use.

MAKE IT POSITIVE

Safety is inherently a negative subject. It is a silly business in some respects. The harder you work to prevent accidents, the less happens. We safety people must always be striving to work ourselves out of a job. Perhaps the day will come when some-

one in my company decides they do not need me anymore because "we don't have any accidents around here."

Seriously however, good selling should be positive rather than negative. Human beings do not respond as well to negative appeals such as fear of punishment or threats to their well-being as they do to more positive approaches. If you show a man a gruesome picture resulting from an accident, he is instinctively inclined to think "it won't happen to me." On the other hand, if you show him happy and favorable results of working safely, he is more inclined to think "that will happen to me."

We have tried out this theory in many ways including a series of monthly safety posters which are carried throughout a calendar year. The whole thought of the campaign lay in the idea that there are many enjoyable activities in life. We want our people to enjoy those things. However, the employee cannot enjoy them if he gets hurt. Following this theme, we have issued colorful cartoon posters of many seasonal activities such as swimming, fishing, skating, picnics, traveling, card playing, bowling and golfing with the repeated advice that "You can't do these things if you get hurt." We found the campaign very effective and we think the answer lies in the fact that it was positive.

My argument is not complicated. Put in its simplest terms, I am convinced that every salesman of safety should study the basic requirements for selling any product. Let's forget the idea that safety is intangible and devote our efforts in making the "product" we have to sell a tangible, real and positive thing in the mind of our prospects. Let's be sure we know our product, its advantages and the arguments against it.

Let's try to understand the desires and needs of human beings in a realistic sense and to understand how those desires vary between groups in different levels of our organization. With that knowledge in mind, let's go to work to accentuate the positive and to build an all-around selling campaign that will bring results because it's built on a knowledge of what it takes to make a man buy safety as his way of life.▲

JOB SAFETY ANALYSIS AND PRE-PLACEMENT PHYSICAL EXAMINATIONS

by WILLIAM E. GRUBER

manager, engineering dept., Standard Accident Insurance Co., Detroit, Mich.

Of all of the fundamentals of accident prevention that have been taught and applied this subject, and in particular job safety analysis, has perhaps received the least usage in industry—even in the large corporations. Pre-placement physical examination programs are fairly common in industry but there are still many small manufacturing organizations that have not realized their value.

Job safety analysis is often confused with plain job analysis or job specifications—actually it has different purposes and different aspects. The similarity exists in that both are aimed at achieving efficient production.

Job safety analysis has four major objectives:

1. To establish a written break-down of a job that can be used for training workers to do their job safely.
2. To analyze a job for the purpose of determining the hazards with the view of possible elimination of these hazards.
3. To determine the tools and equipment that are necessary for safe operation.
4. To establish a basis that can be used in connection with proper selection and placement of employees. It is this objective that we are primarily concerned with here.

JOB SAFETY ANALYSIS

The following is a suggested method to be used in making the job safety analysis:

1. First, select the jobs for study with priority given to those which present the greatest hazard either from the standpoint of catastrophe possibilities, severeness or those which have the most exposure in terms of number of persons, length of the job, etc.
2. Divide the job into its components so that the analysis can become simplified. If the component is too large the analysis may become too complicated and thereby confused.
3. Analyze each component by first obtaining details of the operation either by observation or from a regular systems analysis and by discussion with the person who plans or supervises the job. You should then record all of the details of the operation and it may be advisable to use line drawings in some cases. Finally it is necessary to analyze each of the problems of movement as they relate (1) to the person who works on the job and the various materials and and equipment (2) the adequacy of clearance between moving and fixed objects (3) any mechanical means that can be considered for use in place of manual operations when it is possible and practical to do so.

KNOW JOB REQUIREMENTS

If the analysis is being made primarily to place personnel then it is necessary to obtain additional information about the physical requirements of the job such as the amount and kind of lifting, whether prolonged sitting or standing is required, the use of general and specific functions, the vision requirements, etc.

As a result of the conclusions reached in your analysis you may wish to make certain recommendations for the correction or control of the various hazards noted such as the alteration of the existing operation, the substitution of less toxic chemicals or less hazardous equipment or the provision of personal protective equipment.

Pre-placement physical examinations are used for the purpose of determining the physical abilities of prospective employees so that they can be related to the demands of the job in such a manner that the employee will be able to do the job safely—so that he will not endanger himself or others.

There are numerous benefits to be derived from the use of a good placement program. A few of the more important benefits are:

1. A reduction in the number of accidents.
2. Improved labor relations.
3. Improved job placement.
4. Economic benefits for both the employer and the employee.

There is a popular misconception as to the purpose of a physical examination program. Some people believe that it is used for determining the physical defects of an employee so that he can be rejected from employment. Actually this is not the case. Modern management has adopted a positive approach and is actually seeking a means for employing people who, years ago, were considered unemployable.

PROPER PLACEMENT POSSIBLE

To do this it is necessary to have excellent coordination between the personnel man and the industrial physician so that together they will come up with a concept of the man's psychological and physiological abilities to compare with the skills and requirements of the job. In this way the man will be in a good position to do his job well.

The physical examination program may be very simple or very complex depending on the needs and the facilities that are available. Every concern should find it possible to conduct a program regardless of whether or not they have a personnel department or a medical department. The average industrial physician, with a little training and a working knowledge of the operations being conducted in the specific plant can perform a valuable service.

Of course, to do even a better job a proper analysis of each job should be made to determine the physical requirements that are applicable such as the amount of lifting, use of fingers and other body functions as outlined earlier in this presentation.▲

PRACTICAL SAFETY EDUCATION AND TRAINING

by ROBERT G. REEVE

administrative supervisor, safety services dept.,
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Before we discuss these factors, it would be well to explain what we mean by the terms "education" and "training." For convenience, we *shall define education as the* broad process of effecting behavior by appealing to individuals and groups through general approaches with the intent of selling them on our safety philosophy.

Training, however, appears to be the process of giving our people definite experiences that will cause them to develop, to stamp in, habits of working safely. For example, our children are "educated" to a liking for a certain breakfast cereal by watching their cowboy hero favor it; but their final attitude is developed when they actually try it themselves.

Now it's obvious that either negative or positive attitudes may develop toward any proposal or program. Hence, it is necessary that we tailor our program to produce positive attitudes, just as the salesman presents his wares in the manner best calculated to get the customer's name on the order blank.

HUMAN FAILINGS=ACCIDENTS

This, one would think, ought to be easy to do. The benefits of working safely are obvious to us; but apparently much less so to the average employee. In fact, with a little observation it can be seen that, while we have improved machines, processes, and guarding, installed conveyors, and eliminated belts and nip points, we are still having too many accidents. In a big majority of the cases, these accidents are found to be caused by the unsafe acts of individuals.

Accordingly, our problem boils down in the main to the motivation of individual safe behavior. Hers is a real challenge! It doesn't appear within the realm of human nature to want to be safe; in fact, if you observe many automobile drivers, you will be impressed with their apparent desire to commit suicide. The worker on the job displays some of the same tendencies.

But the picture isn't quite that dark. It is possible to re-educate people, to convince them factually, to enlist them in a cause that impresses them as being worth their time and effort. Our job is to determine how. This, then, becomes a campaign plan.

There are many tools available. Let's look them over.

MANAGEMENT ATTITUDE

First, it's basic to any good safety program to have management "sold" on it. That's a big area, and we must here assume that this has been accomplished. The fact that you're on the payroll is some indication.

It helps greatly to have a safety policy—written, and openly supported by top management.

Management can and should be brought into the educational program: via personal appearances at meetings, safety talks, letters to homes and articles in company publications. By the way, that's good education in two ways, of management as well as employees.

Then don't forget that management must be kept informed of company progress via reports such as this Executive Report; of developments in the field by publications and invitations to conferences. You can't expect supervisors and employees to be vitally interested in safety if management is not.

SUPERVISORY PROGRAM

Now let's look at the supervisor. He is the key man in safety, production, quality control, and employee morale. He is not necessarily a specialist in all these fields, but he can be made sufficiently well-versed to do a good job.

First, he too must be "sold" on safety, just as top management must. To measure his interest—observe him in action. His employees will. Does he cut corners on safe procedures, pass up hazards for convenience, wear safety equipment, talk safety with zeal? People sense these things, and it's up to us to get the supervisor to the positive stage.

To do so we use foreman's safety sessions. Here we will cover topics from philosophy to specific programs. These sessions should give him a chance to participate, discuss, question, relate experiences. Frequently, the supervisors severest critic is another supervisor or himself.

Second, publications such as our *Safety Highlights* may be a valuable mode of communication.

Case reports issued as *Accident Digests* or *APB's* which describe cases that have happened. This gives the foreman a chance to appraise his own area for similar hazards.

Accident investigations with analysis of causes and steps to prevent recurrence give a good ground for his actions.

Job safety breakdowns to locate job hazards and to set up safe operating procedures.

Safety inspections, in the foreman's presence, not only evaluate hazards of his department, but also give him the basis for his own inspections.

Analysis of suggestions and grievances may help him find clues for unsafe spots or hazards.

Statistical analyses, such as accident summaries, trend indicators, and cost breakdowns give the foreman ammunition for an attack on hazard areas and can improve production and lower costs.

The safety department can supply the supervisor with:

1. Materials for employee safety talks (cases or National Safety Council material).
2. Accident breakdowns for trends and clues.
3. Services such as protective equipment and liaison with medical and compensation departments.
4. Standard and safe operating procedures.

And finally, the safety man can be an open "ear" for the foreman to cry into, to consult on problems or new ideas. If you give him enough chance, he'll make himself a part-owner in your safety program.

EMPLOYEE TRAINING

Now the suggestions made to this point have been building up toward one main objective—to make the employee what we choose to call "safety-conscious," that is, to effect his attitudes and behavior on the job.

Let me point out that the degree to which you have been successful in selling management and supervision on safety will have a marked effect on the employee. It's sort of contagious—in either the positive or negative direction.

But we have many points of attack in this area of employee motivation or education.

First, the general approach—sort of a broadside attack. Here we use posters, publications such as the company house organ, handouts, movies, contests, radio and TV programs. Unfortunately, there are no accurate ways to evaluate the effects of these programs on employee attitudes. We only hope they correlate with lower rates and costs.

The second approach may more accurately be termed actual "safety training," and time spent in these areas pays off in changes in employee attitudes that can be observed and measured with some degree of accuracy.

1. *New employee orientation.*

   General—held at the employment office, this period is spent outlining policies and general safe practices.

   Supervisory—actual instruction in the safe operation of a specific job, pointing out hazards and methods of work. This includes showing, observing, and follow-up.

   Note: In plants fortunate enough to have a setup utilizing "Vestibule" training, safe practices are made an integral part of job instruction and training.

2. *Supervisory contacts.*

   Again the key man in production is the key safety instructor. Inspection of work areas, and instruction and insistence on proper housekeeping produce positive employee attitudes. Observation of work habits with instruction in safe practices insures employee compliance.

   Five minute safety talks (at least three daily in our plant) keep the employee informed and motivated to better efforts.

Crew "tailgate sessions" should be led by the foreman (or lead crewman if trained and properly prepared).

The foreman may find job safety analysis a good technique in locating hazards and bringing them to the attention of employe. Safety manuals, standards, and other published procedures from a good basis for foreman—employee discussions.

Let me emphasize that if I had the choice of only one means of employee contact—this would be it! By virtue of his position, the supervisor is the most effective means of motivating safe work attitudes.

COMMITTEEMAN TECHNIQUE

This technique follows the idea of enlisting employees directly in the program. Just a title has little value; a function should be included. Our committeemen are rotated at four-month intervals, and appointees are given four hours of preliminary training in basic accident prevention before their term begins. Monthly meetings during their term as committeemen give further opportunity for discussion of cases, inspections, etc.

Apprentice Training

Apprentices follow a prescribed course, and safety should be made an important element. Our apprentices hold monthly safety meetings over their four year course, and they have compiled a fine record of accident-free work over the years. Also, they become good supervisory material with an excellent grounding in safety.

Home Approach

The approach through home influence is a separate category. We may not think of it as education, but it is a fact that an informed family may well contribute toward making the breadwinner safety-conscious. While much of this educative material will concern off-the-job safety, it will relate to the development of attitude, which is our basic concern.

One final word of caution. With few exceptions, training procedures must be tailored to fit the individual organization. Don't try to superimpose another program on your people. Substitute your plant experiences, cases, organizational peculiarities, make it your own.

NATIONAL SAFETY COUNCIL
425 N. MICHIGAN AVE., CHICAGO, Ill.

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1957
CURRENT SAFETY TOPICS Volume 4

CEMENT & QUARRY INDUSTRIES

Transactions of the
45th National Safety Congress
(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL
425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

CEMENT AND QUARRY INDUSTRIES

This volume is a record of the sessions held at the 1957 National Safety Congress by the Cement and Quarry Section. The conduct of these Congress sessions each year is only one of the many co-operative activities which the Cement and Quarry Section carries on in behalf of its members, and for the benefit of accident prevention work in cement and quarry industries generally. The section gives guidance in the preparation of a great variety of technical and education material useful in the day-to-day safety programs of cement and quarry companies.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

FATALITIES IN THE CEMENT, QUARRY AND MINERAL AGGREGATES INDUSTRIES

by ARVID TIENSON
safety director, Material Service Corp., Lyons, Ill.

Since reviewing these cases I certainly have a greater awareness of "lessons to be learned from fatalities." Let us now look together at a number of typical case histories to bring more sharply into focus, the "lessons" most of us know and on occasion forget.

YOU CAN "DROWN" IN SOLIDS

A relief man and a roll tender were found suffocated in a gypsum bin. On a routine check the foreman noted the employees' absence from their jobs. The hopper bottom of the bin was finally cut away disclosing the suffocated men. A safety lifeline provided for the employees' use while in the bin was not used. A long blow rod for barring the gypsum also lay untouched.

We have, in this case, an interesting sidelight. One of the two employees had been to the doctor two days before complaining of recurrent headaches and dizzy spells during the past year. The plant safety rules called for wearing a life belt when entering a storage bin or silo.

Another point—the need for entering the bin at the time was questionable since a car of gypsum was being unloaded into the tank directly feeding the mill flow.

A new sheave, life line and belt, portable working platform and additional safety walkways were installed to prevent a similar occurrence. Also under consideration is a new steel bin which would eliminate the necessity of barring material. Management is insisting that supervisors properly instruct their employees of the hazards in their jobs. Also that they maintain strict compliance on the part of employees in the use of the safety belts.

A truck driver employed three months with a company was changing a screen cloth. The bulb in the lead light caused a short involving the screen and electrocuting the employee. 110 volts can kill particularly with moisture or water present. Under the proper conditions as little as 30 or 35 volts can cause death.

I understand that a transformer outlet is on the market that reduces the 110 volts to six or 12 volts for use in lead lights to prevent such an accident.

In another case there was a transformer bank that steps down 4,160 volts to 480 volts with an inadequate wooden fence guard about four feet high. There were two water valves within the enclosure. It had been standard procedure to cover the valves with straw and manure each fall to prevent them from freezing.

The employee who was killed was told several times not to enter the enclosure under any circumstances. However, he did. This individual had personal problems. Despite warnings he did not understand the extent of or heed the electrical hazard present.

A much safer enclosure for the same transformer bank is a cyclone fence with barbed wire and a locked gate. The key is in the possession of the electrical department. No one is allowed to enter the enclosure unless it has been de-energized. The water valves have been removed.

CHECK YOUR ELECTRICAL GROUNDS

A laborer employed eight years, but at his present job for five months was electrocuted. The victim grasped the handrail and stepped on motor base hold down bolt charged with 2,400 volts by "floating ground." Five minutes after reporting for work, the victim was found lying on the floor beside wooden platform next to tube mill motor. His pulse was weak and because it was assumed he had fallen and might be injured internally, he was not moved.

Within 10 minutes his pulse had stopped. Then it was determined from burns on his left foot and right wrist that the victim had been electrocuted. Meanwhile, an attempt to start raw mill caused oil switch to explode. Chief electrician's investigation disclosed a "floating ground" in starter which cause the motor to ground to frame.

Tube mill motor base was grounded the following morning with 2/0 wire and all other installations were checked for grounds. All electrically operated equipment should be so checked regularly by qualified personnel and methods.

COVER FLOOR OPENINGS

A machinist employed 33 years was killed when he fell 20 feet through a floor opening. The victim and fellow employees were installing equipment in a new raw storage building being erected by an outside contractor. The opening in the floor for the motor base to be installed next to the top of the new elevator had been covered with planks.

Six feet away a section of the floor grating had been removed to make hoist opening. It too, had been covered with planks but two of the three planks had been removed by contractors and placed beside a 30 inch by six foot opening. As the victim and a helper started to carry the first plank from the motor base opening, the victim either tumbled or tripped and pitched head first through the floor opening.

All floor openings should be either covered or barricaded whether in a permanent plant or during construction. When it is necessary to have plant men work in the same area with outside construction men it is always necessary to take extra precautions. Outside contractors should be required to comply with plant safety rules.

MOVING MACHINERY ACCIDENT

We have here what I consider a typical type of moving machinery accident. See what you believe was the principal cause of this fatality.

The deceased, age 22, had been employed as a floor and car sweeper nine months prior to the accident and one month later transferred to a helper in the super hydrate department.

During the course of employment this man worked three different shifts under three different foremen. The deceased at the time of the accident was taking an hourly lime sample. Using a gloved hand he dipped the can below a revolving cooler shaft to collect a sample. The glove caught on one of the bolt heads of the shaft. The employee was unable to free himself and was pulled head first through a small lid opening and into cooler chamber.

Because his neck was broken, it was assumed that his head hit the cooler casing. The limp body was then pulled feet first down into surge tank bucket elevator boat a distance of six feet. One of the buckets caught his foot and dragged him to the top of the 50 foot elevator. The drag caused the machinery to overload and it stopped.

After searching for the victim and the source of trouble his body was finally located. Welders were summoned to cut into shaft and remove the body. Two hours before the accident this employee had a "quarrel" with his wife who had been living with another man.

HAZARDS ELIMINATED

Why did this particular accident occur? Was it because of his personal problems, the protruding bolt, wearing gloves, new on the job, not properly trained, because the opening was too large, the work procedure unsafe or sampling was at an improper location or while machinery is moving?

These hazards were eliminated as follows:

1. Future samples will be taken through a four inch by six inch opening at the base of the chamber away from all moving parts.

2. The cooler shaft has been covered to prevent clothing from catching on protruding bolts, even though a regulation exists prohibiting any one to put an arm into chamber.

3. Job instruction including integrated safety measures have been drawn up more definitely. This is a continuous program to be developed for all jobs.

A shovel operator, aged 30, employed seven months and at present job nine weeks, was struck by falling material. He sustained crushing injuries resulting in death.

FALL OF MATERIALS

The victim was loading stone into trucks with electric shovel near a quarry face where blast had been shot two days previously. Middle 20 feet of 60 feet face was approximately perpendicular. Loose rock from this section tumbled in a 40 foot arc striking and crushing the corner of the operator's cab.

The victim was pinned in the cab and could be released only after twisted metal was cut away. He died three hours later. Report states that the quarry supervisor was distrustful of dangerous face and had instructed the victim to move his shovel away just 15 minutes before rocks fell. He should have worked in another part of quarry until unsafe conditions were corrected. The deceased was well instructed in safety. Although this man was safety conscious, his desire to be an efficient operator resulted in safety becoming secondary.

Was it lack of job experience or not following instructions? Did the supervisor fail in his responsibility by not insisting that the shovel move immediately? Was the face inspected after blasting?

FOUR HORSEMEN CAUSE ACCIDENTS

Now I would like to make a few observations on not only the half a dozen fatalities mentioned above but also on my impressions after reviewing a number of deaths in our industries.

More than 80 per cent of all fatalities in industries represented by our section are caused by the Four Horsemen as publicized by the P.C.A. They are High Places, Electricity, Moving Machinery and Haulage. In other words we know where to expend our efforts to do the most good.

Apparently the greatest single "killer" in [illegible] industry is asphyxiation by solids that are in a fairly divided form, due to falls or slides of materials. Sand, cement, gypsum, sand, slag; any one may be the "culprit."

The construction and maintenance of our buildings, equipment and quarries is such that high place hazards are the rule rather than the exception.

Heavy mobile equipment are all over the place. We have probably the highest ratio of varied heavy mobile equipment per employee of any industrial section in the council.

HIGH VOLTAGES HAZARDOUS

It is also obvious that the accident involving electricity is common. Why? We use high voltages through out our operations under the most adverse conditions both in use and abuse by our men and the weather conditions. Our maintenance standards and abuse of electrical equipment as an industry would horrify some other sections.

Many of the fatalities that occurred involved inexperienced men on the particular job. In the majority of the cases reviewed, some company safety rule was being violated by the victim. The review of these cases indicated that first line supervision in many instances were not doing their job.

SAFETY SUGGESTIONS

We know in what areas of our operations most of our fatalities occur. We know that inexperience is a large factor. We know that safety rules are not complied with and/or not enforced. We know that first line supervision on occasion are not doing what they are paid for. We know that we have a personnel problem. We know that our training program is inadequate. So what do we have to do?

Here are a few suggestions that should be a basic part of any safety program in our industry if we are to save additional lives.

1. The establishment and enforcement of basic safety rules is necessary and must receive full support from top management. This should be a condition of employment.

2. New employees should be instructed as to the hazards of his job and follow the safe procedures outlined by his foreman. Every foreman must instruct new employees on the hazards of the jobs before they are permitted to start work. Wherever possible specific safe job procedures should be worked out.

3. The use of personal protective equipment is essential. For example the use of the safety belt alone would prevent almost all suffocation deaths and many falls. They protect the car dropper and the electrician. Another example—the hard hat to protect against falling material and equipment. There have been a number of drowning cases where employees must work over water.

However, the use of personal protective equipment must be enforced. Only a 100 per cent program is effective.

First, only electricians or trained personnel are to do electrical work.

Secondly, have an adequate grounding program for all electrical equipment including portable electric tools.

Third, have periodic inspection and testing of all electrical equipment parts of adequate ground and other defects.

Finally, use lockout procedures and work on de-energized equipment whenever possible.

Adequate guarding of all "nip points" is obviously essential. On maintenance the use of lockout also must be an integral part of the job procedure. Guards must be replaced before machinery is started up again.

HAULAGE

Here the use of proper work procedures well understood by engineers, drivers, switchmen, and everyone else involved is most important. Unauthorized riders or riding on the outside of vehicles should be prohibited.

Suitable warnings by horn, bells or other signals should be given whenever movement occurs particularly while backing.

Almost invariably there is more than one factor in the chain of events involved in a given accident. In most instances the particular accident would not have occurred if one link, one protective measure had broken the chain of unsafe practices.

We notice that in a number of cases there was a factor of emotional distress due to personal problems at home or to illness. We also note that there is not too much correlation between accidents and degree of injury. Why? I believe it is because the sample (the number of fatalities) is not, fortunately, large enough.

How often do we say or ask ourselves this question after an accident that did not result in death; "but for the grace of God that employee would have been killed." Not until we ask ourselves that question after every accident no matter how minor, will we give fatalities their true statistical meaning.

Not until we take the same corrective action on each accident that could have killed as we do with an actual fatality, will we benefit in any large measure from "Lessons to be Learned From Fatalities."▲

SAFETY DISCIPLINE

by CARL HEINICKE

safety engineer, Electromotive Corp., La Grange, Ill.

Is a [illegible]-day penalty lay-off for not wearing a hard hat good safety discipline? Is a three day suspension for wearing unsafe shoes helpful in obtaining safety discipline? Is it better to close your eyes to what is happening than to face the fact that discipline cannot be made to "stick?" These questions are asked every day, not only by safety personnel, but also by other members of management and by labor itself.

Most of the confusion results from the use of the word *discipline*. To some people discipline is punishment, to others it is training. If a standard definition for discipline can be used, most of the problems we face can be solved without too much difficulty.

Webster defines discipline in this manner: "Teaching or instruction; that which is taught to pupils; training which corrects, molds, strengthens, or perfects; punishment or chastisement; control gained by enforcing obedience or order as in a school or army, hence, conduct as troops noted for their discipline; rule or system of rules affecting conduct or action—to develop by instruction and exercise, to train for self control or obedience to given standards; to chastise or punish; to train or drill."

Two of these definitions are especially appropriate, mainly, "training which corrects, molds, strengthens, or perfects," and "rule or system of rules affecting conduct or action."

Using these definitions then, we can say safety discipline is a system of rules affecting conduct or action which involves training to correct, mold, strengthen, and perfect. In the production concept of this definition, safety discipline is the organized safety

program in any plant. Good safety discipline therefore, depends on a good, well-organized safety program.

General Motors recognizes this problem and as a corporation set up seven basic principles for safe plant operation. These seven principles are:

—Provide active top management support
—Maintain adequate safety personnel
—Develop safety instructions for every job
—Instruct each new employee
—Operate through supervision
—Make every employee safety-minded
—Extend efforts beyond the plant.

Let us examine each of these principles in the light of our definition for safety discipline and see how they apply.

NEED ORGANIZED PROGRAM

A good safety record is clear evidence of good management. Accordingly, General Managers and other top division and plant executives will make safety their responsibility by maintaining a comprehensive safety program at all times, meeting with key supervisory personnel at least once a month to review safety, taking any action necessary to improve safety conditions. In thus giving its concrete support, management will imbue the entire organization with a continuing zeal for safety.

Safety discipline necessarily must start with the top echelon of the organization. These are the men who must decide whether the rules of conduct from a safety standpoint are the rules which they will support and enforce.

For instance, if the rule states that hard hats are to be worn in certain areas, then unless the men at this level of the organization wear hard hats in those areas, the rule will be frequently broken, and there will be poor safety discipline. The same is true of the wearing of safety shoes, wearing of eye protection, rules and regulations covering the operation of machinery. Good safety discipline must start at the top.

Each plant should have sufficient, well-trained personnel to insure continuous careful attention to safety. A qualified man should be assigned to direct the safety program, handle safety education, and assist the supervisory force in maintaining safe working conditions. The staff of safety engineers and inspectors should be sufficiently large to cover all operations.

Good safety discipline does not originate in the safety department. However sound, reasonable, logical rules of conduct from a safety view-point must be suggested and recommended by this group. If the rules are illogical, hard to administer, and difficult to maintain, good safety discipline will be difficult to maintain. On the other hand, the safety department is not the police force but the watch dog of safety discipline.

It should not be the responsibility of the safety department to see to it that proper eye protection is worn or that proper clothing is worn, but on the other hand, when those conditions are noticed by safety personnel, the supervisor in the area should be notified. If the conditions are repeatedly noticed in the same area, then the safety personnel must refer the problem to higher supervision.

Calling the attention of the supervisory organization in an instructive manner to the discrepencies in the manner in which safety discipline is carried out is one of the principle responsibilities of the safety department.

Safety rules and instructions as to safe practices should be set down in written form covering each job in the plant. This material should be used as a basis for safety instruction of new employees and of employees transferred to new jobs.

INSTRUCT NEW EMPLOYEE

The purpose of writing rules and instructions for each job is so that all of the employees will receive the same instructions; at least the supervisor will have some written material rather than depending on his memory. Supervisors have a lot of things to remember and an important safety instruction might be over-looked if the rules were not written.

Since it would be impossible to write a complete set of instructions covering every phase of every job, these written instructions serve the supervisor as a guide and a rule of thumb for those operations which are not specifically spelled out.

Each new employee should be thoroughly instructed in general safety policies, rules, and procedures before being referred to his supervisor for job training. In turn, the supervisor should review with him thoroughly the safety measures of the particular job before he starts to work. Subsequently, the employee should be followed-up closely to make sure that he understands and is carrying out the safety instructions applicable to his job.

This follow-up should not be entrusted to anyone, but should be carried out by the supervisor who at the same time watches the new employee for a period up to 15 minutes before talking to him. This enables the supervisor to determine bad or poor habits which the employee may have developed and also gives the supervisor an opportunity to become better acquainted with not only the process, but also the tooling used on the job.

OPERATE THROUGH SUPERVISION

At our plant no new hire or re-hire is started on the job until someone from the safety department talks with the new employee about the general safety policies of the plant, and advises him of the safety equipment and other protection available to him. We have found that it is helpful to invite members of the supervisory organization into our induction meetings so that they have some idea of what we tell the new employees.

The put-on card which the supervisor uses in introducing new employees to their new job has a check list for the supervisor on which he checks off the safety information for the specific job that this employee is going to do. Good safety discipline starts with the new employee at the time he is indoctrinated. Unless he is thoroughly indoctrinated, he may get started on the wrong foot and consequently make the supervisor's job more difficult.

We have found it advisable to treat employees who are being transferred to new jobs as though they were new employees. Our safety record during the past year clearly showed that we have a problem with employees who have had 10 or more years seniority. The problem consists of keeping these people safety-minded. This is particularly true any time there is an up-grading or when there is a lay-off, and people get bumped from job to job.

The supervisor is the key man in the safety program because he is in constant contact with employees. Each superintendent should hold meetings with his foremen at least once a month to review safety conditions, general policies and specific situations. Foremen should take the initiative in making a success of the safety program in their own departments.

As a part of this effort they should talk about safety to two employees daily for at least five minutes each. Good plant safety discipline does not originate with the supervisor, but depends upon the supervisor's success in his day to day contacts with employees. The five minute daily talks are the key to this success. If the talks are used to reprimand an employee, they will fall short of what they are intended.

The safety talk should be constructive and informative with the employee not only listening but participating in the conversation. If the supervisory organization uses the safety rules as a matter of convenience, then safety discipline will be weak. Supervisors must realize that when safety instructions are given, they must be carried out for the safety of the employees, not only when it is convenient, but also when it is inconvenient and when production is behind schedule.

MAKE EMPLOYEES SAFETY-MINDED

The cooperation of the individual employee is vital to the success of a safety program. Continued attention is required to make certain that all concerned, management and employees alike, do their part in protecting the safety of the individual at all times. Every available medium: safety booklets signs, posters, and plant papers may be used to good advantage in furthering the objective of such a program.

Safety discipline starts at the top of the organization and depends upon the supervisory organization for its success. And we find that the employee is the foundation of safety discipline.

We do not have good safety discipline if our employees do not work and act safely of their own accord. Safety talks, safety booklets, poster, signs, and safety puzzles and safety contests, are all aimed at getting the employee to think of safety for his own good at all times.

Special attention should be given to off-the-job safety as employees have more accidents away from work than they do on

job. Our objectives should include efforts to promote the safety of employees and their families by: maintaining a comprehensive safety program for employees driving company owned vehicles; providing material on highway safety to aid employees driving their own cars; encourage employees to develop safe practices in their homes, on the farm, or in recreational activities; participating in community safety activities.

EXTEND EFFORTS OFF-JOB

The fruits of plant safety discipline should be shown in the off-the-job activities of the employee. If we have really sold him on the rules of conduct not only for machinery operation, but all phases of personal safety, then the employee will practice these rules not only in his own home, but also in driving his car or while using recreational facilities.

This does not answer the question of how many days' suspension an employee should receive for an infraction of safety rules. I have purposely refrained from attempting to answer that question because in my opinion that is not a safety problem. The punishment for the infraction of rules is actually the responsibility of the supervisor in conjunction with the Labor Relations Department.

Where there are many infractions of rules, it is probably due to the fact that the top echelon of the organization are not whole-heartedly in agreement with them or that the supervisor in immediate charge has used the rules as a matter of convenience rather than as a matter of protection for the employee.

Good safety discipline cannot be measured by the number of people suspended for violation of safety rules but rather can be measured by the spirit, the push, and the sincerity with which top management operates the safety program. Safety discipline is the direct result of sound, reasonable, logical rules of conduct as recommended by the safety department, and enforced by all levels of management.

Safety discipline depends on the attitude and the manner in which the supervisor carries out his day to day assignments and contacts with the employee. Safety discipline is the day to day activities of the employee carrying on his routine duties not only on the job, but also off the job.

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CHEMICAL INDUSTRIES

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NATIONAL SAFETY COUNCIL

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

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Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE CHEMICAL SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Chemical Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Chemical Section carries on in behalf of its members, and for the benefit of accident prevention work in the chemical industry generally. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of chemical companies.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

SAFETY IN HIGH PRESSURE CHEMICAL REACTIONS

by M. R. KINTER

assistant director, high pressure laboratory, The Dow Chemical co., Midland, Mich.

Before we can intelligently discuss the subject of high pressure, we must first define it. Any definition we propose will be arbitrary since it depends on your frame of reference. To a pipefitter, a 400 p.s.i. steam line may well be "high pressure." To the mechanic in an ammonia plant, the term may mean 5,000-10,000 p.s.i. The gunsmith will think of "high pressure" in terms of the breech pressures in a 30-06 rifle with a heavy powder load, which go to 50,000-55,000 p.s.i. For many purposes we might say that anything above 500 p.s.i. should be considered as high pressure.

However, when discussing this topic from the viewpoint of safety, we must remember that any amount of pressure may be hazardous. A few years ago an auto mechanic in our city suffered serious permanent injury when a new auto tire, which apparently was defective, ruptured while he was inflating it. A pressure of less than 30 p.s.i. was involved. The hazard attendant on working with liquids or gases under pressure is not strictly a function of the pressure alone, but is more properly considered in terms of the amount of stored energy involved.

A consequence of my last statement leads to another point we must always keep in mind. There may be hundreds, or even thousands of times more energy in a gas at a given pressure than in a liquid under the same conditions. We do not commonly think of hydraulic pressures of a few thousand p.s.i. as being particularly dangerous. However, a gas under the same conditions presents an entirely different situation.

I shall try to discuss the philosophy, principles, and pitfalls of working safely with high pressures. In doing this, I hope that we may come up with some ideas which may be of value to anyone working with high pressure, be it in a large elaborate, industrial high pressure laboratory, or in the limited facilities found in many schools or small companies.

Let us first briefly mention the principal hazards we find in high pressure work:

Projectiles—In event of an uncontrolled reaction or explosion, parts of ruptured vessels, gauges, or fittings may be propelled at high velocity from the equipment. Such missiles can easily kill a man.

"Secondary" Explosion—The sudden release of flammable gases into the cubicle or work area followed by ignition may result in a violent explosion. The shock wave from such detonation can result in serious damage to the cubicle and injury to personnel.

Toxic Materials—Failure of high pressure equipment may release substantial quantities of toxic gases—e.g., when working with carbon monoxide.

Fire—The failure of high pressure equipment or a burst frangible safety when working with flammable materials frequently results in fire. Although usually of short duration, these "blow-torch" type fires are often very intense.

The safety measures taken in high pressure work do not basically differ from good laboratory safety practices. However, the potential severity of the consequences of a given incident—e.g., rupture of a vessel at 30,000 p.s.i. compared to a crack in a glass flask—demand considerable extension and amplification of safety measures.

BASIC PRINCIPLES

Our first basic premise must be that all reactions under pressure are hazardous. Not that the types of experiments we may carry out are fundamentally any more unpredictable than most laboratory reactions, but we must consider the amount of energy stored. This emphasizes the importance of conducting unknown or exploratory experiments on a small scale.

In addition, a basic characteristic of high pressure vessels must be kept in mind. It is very easy to have a large safety factor in strength built into a small—say 500 ml. or less—pressure vessel. This however, becomes more and more difficult as size in-

creases, due to size and weight considerations.

Conduct all pressure experiments behind barricades, and base practices and procedures on the assumption that the experiments will get out of control. The barricade or cubicle may vary depending on the scale of operation. It is essential that the men never, except under extremely unusual circumstances, enter the cubicle while the system is under pressure.

Strict adherence to safety rules is essential and presents the usual problem of "familiarity breeds contempt." We have found no magical solution to this problem. I know of no other approach than repeated and repeated instruction and education of all people who have any contact with this type of work. Also, one must never assume that, because an experiment has been carried out many times without incident, it may then be regarded as harmless.

This calls to mind an accident resulting from just such a situation. The experiment, conducted at 500-1,000 p.s.i., had been run countless times in an open laboratory without barricades. One morning a technician unthinkingly changed the order of the application of heat and the addition of catalyst. The resulting explosion did extensive damage to the laboratory and, but for extremely good fortune, could have resulted in very serious injuries.

CUBICLE LAYOUT, BARRICADES

The purpose of a high pressure cubicle or cell is to protect operating personnel from injury as a result of a mishap with the experiment. This is best accomplished by directing flying fragments and the force of an explosion away from the workers rather than trying to confine them. There are many possible arrangements which may be used to accomplish this, but they all have one thing in common—at least one wall acts as a "blow-out wall."

Care should be taken in the installation of doors to be certain that they cannot blow out. When considering the labyrinth type entrance, the possibility of shock wave rebound should be kept in mind. Many instances of serious injury by a reflected shock wave are known.

The materials used for the construction of cubicles may vary, but steel plate or concrete are most common. A number of "sandwich" types may be used, e.g., a double steel plate wall filled with sand. This latter type presents some annoying problems if any new openings through the wall are to be made. We use steel walls for small-scale work and heavily reinforced concrete for large-scale experiments. Welded construction is much preferred with steel plate, because of the possibility of bolts being sheared by an explosion.

I know of a case in recent years in which extensive damage was done by flying half-inch bolts which were sheared by an explosion of a vessel in a bolted steel cubicle. They were propelled with sufficient force to penetrate a concrete block wall and would have easily killed a man. Metal cubicles may be lined with wood which will absorb much of the force of a high-velocity fragment and reduce the possibility of penetration of the metal plate.

ONE UNIT CUBICLE

One type of cubicle we use for small scale work is arranged so that the platform on which the equipment is mounted and the front wall of the cell are one integral unit. When the equipment is in place the cubicle cannot be entered, since the area behind it is restricted. This system is useful where frequent equipment changes are necessary. Transparent plastic sheet is used as a "blow-out wall" in these cubicles. It has the advantage of low cost and it admits additional light, thus making the area safer.

A concrete cubicle is used for larger-scale work. The walls and roof are 15-inch, heavily reinforced concrete. The observation windows are of two-inch laminated glass which is capable of withstanding a .38 caliber magnum shell at point-blank range. All lines and valve handles enter the cubicle through steel strips or sleeves mounted in the concrete.

The area behind our high pressure cubicles consists of a river and a large waste pond. We have no wall behind the area. Placing a large wall behind a high pressure area presents the problem of reflection of a shock wave, particularly from a secondary explosion of flammable material in the cubicle. Of course, it is not always possible to locate near a large, vacant area. The next best thing is a hill or slope of some sort. This will absorb any fragments and tend to dissipate the force of an explosion.

Good ventilation is important in a high pressure area. We recommend 10 to 20 complete air changes an hour. This is sufficient to remove any flammable or toxic materials which may be released through leaks, which are an everlasting problem in high pressure work. Rapid air flow through the cubicle may also prevent the detonation of a quantity of flammable material released by rupture of the equipment.

Such ventilation should be arranged to prevent the accumulation of heavier-than-air vapors on the floor of the cubicle. An added safety feature may be the use of automatic detecting and alarm devices for such materials as hydrogen cyanide, carbon monoxide, or hydrocarbons.

The use of systems to flood the cubicles with carbon dioxide are useful. Such installations vary from a simple manual arrangement to empty the contents of a large carbon dioxide cylinder into the cubicle quickly to an automatic system triggered by temperature sensitive elements. An installation of the latter type recently prevented extensive damage to pilot-scale equipment in our laboratory when several pounds of a pyrophoric material were suddenly released into the cubicle. The ensuing fire was so quickly and effectively snuffed out that the paint inside the cubicle was not even scorched. The hazards involved in working with purely hydraulic systems are much less than with gaseous systems. It is not uncommon to work at extremely high hydraulic pressures without any protection. I know of an instance in which this practice resulted in an unusual type of injury. The failure of a fitting in a high pressure system resulted in the release of an extremely high velocity jet of hydraulic fluid. The spray hit a worker in the face, penetrating the unbroken skin. The resulting injury was quite painful and was several months in healing. Therefore, some sort of shielding, even if quite light, should be used even with strictly liquid systems.

A high pressure system should never be operated without some sort of pressure relief mechanism. This usually is in the form of one or more frangible safety discs, depending on the number and location of pressure vessels. However, it is not sufficient to place frangibles in the system—there have been innumerable cases of vessel rupture in systems in which there were frangibles. Except for cases of an extremely violent detonation in a vessel, such failures can usually be laid to one of two causes.

In the case of a sudden pressure rise, the frangible safety cannot do its job if the vessel fails before the pressure surge reaches it. It is therefore essential to place the frangible as close as possible to the vessel, and to use as large a diameter frangible and connection to it as possible. We frequently conduct experiments with solids or liquids which can freeze, either of which can solidly plug a line.

EQUIPMENT

Thus, it is essential under such circumstances to arrange the equipment to minimize the possibility of such materials entering the safety assembly. Careful inspection of the safety assembly after each experiment is also necessary to be certain that it is clear.

A frangible safety assembly should be pointed in the direction of the "blow-out" panel and must be securely anchored. If it is deemed necessary to vent a frangible to the outside, this must be done through a large line with no bends. One should not attempt to use a frangible disc at an operating pressure which is close to its rated burst pressure because of deviations of actual rupture pressure from rated pressure. Corrosion and fatigue of frangibles must also be kept in mind to prevent unexpected failure.

CONSTRUCTION MATERIALS

A few general comments concerning materials of construction may be in order at this point. First, I should like to consider the question of hardness or ductility of the metals used in the construction of such equipment. This is important when we call to mind the relatively smooth, tangential "tear" type ductile failure as opposed to the unpredictable, random shattering effect of the brittle failure. Ductile failures rarely yield any fragments, whereas a brittle failure may result in almost anything.

For this reason, hardening is a poor way to achieve strength in high pressure equipment. The most frequent occurrence of a

highly hardened component in high pressure equipment is the cap of the common, flat-gasket type high pressure reactor or "bomb." This is required for practical, structural reasons, but we attempt to avoid it by using other types of closures in all but small, medium-pressure vessels.

With this one exception, a minimum of 10 per cent elongation should be specified for materials used in the construction of high pressure equipment. When purchasing metal stock for this use it is wise to specify metal that is free of flaws or inclusions, and is warranted by x-ray or other suitable tests.

Before a vessel is placed in service it must be pressure tested, preferably to one and one-half times its maximum working pressure. A log sheet should thereafter be kept for each vessel so that a history of its service is available. Frequent inspection of each vessel and regular periodic pressure tests are required to avoid failure resulting from corrosion, small stress cracks, embrittlement, etc.

CONED CONNECTION

The common coned high pressure connection has frequently been a source of difficulty, most of which is easily avoidable with a little care and attention. The sealing surface is on the tapered end of the tubing, and the force is applied from the threaded gland via the collar on the tubing. First, the seating surfaces and threads should always be smooth, clean, and in good order. If not, they should be remachined or replaced as may be the case.

A common error in assembly of one of these connections is in not placing the collar the proper distance back on the tubing. If it is too far back a good seal can be made but all of the force is taken by only a portion of the threads of the gland, resulting in failure under pressure.

High pressure gauges present some problems, but a little thought when locating them will easily remedy this. Always use the solid front or "blow-out" back type of high pressure gauge and remove the glass face cover. A piece of plastic film may be placed over the front of the gauge to keep out dirt. Gauges should never be placed in such a position as to be directly in line with operating personnel, but are best located behind a barricade and observed with mirrors. They should not be used to more than 70 per cent of rating, and will last a lot longer and maintain accuracy better if used at only 50 per cent of rated pressure.

Gas storage or supply cylinders are rather "thin-skinned" and should not be located in an operating cubicle. In event of trouble, their presence can only add to the problem. The use of check valves in lines between vessels, reactors, supply cylinders, etc. adds greatly to the safety of the operation. These one-way valves prevent the possible backing up of a reactant or catalyst, which can have disastrous consequences.

However, a word of caution concerning the use of check valves! They are usually a spring-loaded ball valve and are easily fouled and rendered inoperative by small amounts of foreign material or dirt. Frequent inspection and testing of these devices is imperative, otherwise one may be led into a false sense of security.

In essence, the human side of safety reduces itself to one point—education. The problem becomes one of teaching men to understand their equipment and to think carefully before they act. For instance, one must somehow get across the idea that high pressure equipment, just because it looks rugged, does not require a strong arm and a long-handled wrench for assembly. Care, cleanliness, and a sawed-off open-end wrench will usually do a much more effective job on research scale equipment.

OPERATING PRACTICES

Points such as this must be emphasized, demonstrated, and then continually reemphasized. We had a technician with whom we had to go so far as absolutely to forbid him to operate a high pressure valve with any more force than he could exert by holding the valve handle between his little finger and thumb. This may have been an extreme measure, but the man finally understood.

We use job description sheets, our accident prevention Key Point Cards and other means of discussion to review important points and hazards with the men. One must cultivate the idea that the safety practices are ground rules which are just not to be broken. In a large plant such as ours the men who come into the area from the shops and services department present a difficult problem. These people may be in the area only occasionally and for short periods of time.

They may have little knowledge of the equipment or work, and must be carefully instructed regarding safety practices which may be peculiar to high pressure work. This type of situation will vary with the particular installation and circumstances, but we should always keep in mind the uninformed "stranger" who has occasion to be in the area.

Clear thinking and attention to detail are essential in this type of work. Always be on guard for signs of trouble. For instance, when releasing the pressure from a system it is possible to detect an obstruction in the entry to a pressure vessel by observing such things as the rate of fall of pressure in the lines. Abnormal behavior in this respect is a sign of danger.

Observation of such signs may avert the disastrous consequences of opening a supposedly vented vessel while it is still under full pressure. Men must learn to detect plugged lines, leaks, etc. by these subtle signs and to deal with them safely.

The same philosophy applies to disassembly and maintenance work on such equipment. Each line and vessel must be treated as though it is a loaded gun until you are absolutely certain about it.

High pressure work may be done safely if we use clear, critical thinking and careful planning. We cannot afford to be hasty, to disregard safety practices "just this one time" or to let our guard down in any other way. This applies to all types of high pressure work, be it large or small, simple or elaborate.

Even if the installation is small and funds are limited, it is still possible to keep this basic philosophy and conduct the work in a safe manner. In that respect, safety is like happiness—it is the man that counts and money just cannot buy it.

CONTROLLING HEALTH HAZARDS IN A CHEMICAL PLANT

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Hazards that are likely to be present in a chemical plant are:

1. Ordinary mechanical hazards
—accidental injuries (falls, dislocations, sprains, fractures, contusions, lacerations, thermal and chemical burns, foreign bodies in eye or skin)
—in association with mechanical equipment, noise, vibration, fires, explosion, flying particles or missiles, slippery floors, rigging, stairs, ladders, elevators, vehicles

2. Modern physical hazards
—ultraviolet and infra red radiation; ultrasonus, high frequency waves; X-ray, radium, other alpha, beta or gamma radiation

3. Chemical hazards
—old and well known (but not fully controlled) chemicals
—new products of research and development (often unexplored)
—exposure in course of research on new products
—pilot plant development of new products or processes
—new manufacturing processes involving new ways of handling well-known chemicals or new chemicals.
(1) locus of hazards—aspect of portal of entry—local effects, such as contact with skin, dermatitis—sensitization, gross injury to skin, skin cancer, or inhalation of gases, vapors,

mists, fumes, dusts. Also asphyxiation, irritation of lungs—acute (edema, pneumonitis), irritation of lungs—chronic, pneumoconiosis, fibrosis, emphysema, and granuloma (Be). In addition cancer of lung, deposition—radition within lung and hilar lymph nodes; specific carcinogenic agents are hazards. Ingestion of chemicals, following upper-respiratory trapping of dusts, following contamination of hands and handling things that go into mouth and following contamination of food stored in work rooms—eaten in dirty lunch rooms are potential dangers.

(2) nature of hazard—aspect of absorption—systemic effects such as: acute intoxication, percutaneous, respiratory, alimentary absorption (often two or all three combined); chronic intoxication—remote enzymatic or metabolic effects and organic damage; or remote radiation effects following absorption and distribution of radioactive materials in body—example—bone and marrow, following absorption, distribution and metabolism of specific carcinogins—example—bladder tumor.

RECOGNITION AND IDENTIFICATION OF HAZARDS

1. Toxicologic investigation (in laboratory) (stepwise with progress of research and development in industry)
   (a) screening—preliminary choice or elimination of materials under consideration—
   —immediate toxicity—indicative of type of control measures based on portal of entry (type and point of application of preventive procedure) (degree of precision required in protection, i. e. extent of apparent danger) (medical criteria—type of anticipated injury or disease)
   (b) Comprehensive—(adapted to the problems to be met)
   —manufacturing hazards
   —hazards of transportation and use as raw materials by others
   —hazards of consumer of final product
   —cumulative effects if any
   —metabolic fate in body—remote effects—long-term—chronic—injurious effects
   —diagnostic and prognostic procedures based on results of investigation
2. Toxicologic investigation—(in plant) clinical investigation of personnel
   —basis of all specifications for safe environment
   —sometimes the only basis for recognition of hazard, e. g. beryllium, occupational cancer

CONTROL OF HAZARDS

1. Medical measures of control—environmental—(operations, plant conditions and (how men work)
   —clinical examination—all types.
   —policing the plant—(clinical findings and tests on personnel)
   —identification and quantitation of responses to observed exposure—within physiological (tolerable) limits—beyond physiological limits
   —warning of need for further protection
   —disposition of personnel with respect to exposure restriction of time (duration) of exposure—removal from exposure —temporary or permanent
   —personal protective equipment (choice and supervision, physiological criteria) adequacy of equipment employed—adequacy of its maintenance—adequacy of its use
   —education, group meetings, written instructions, hygienic manual, combined with operating manual
   —reports to engineering personnel (in both operations and industrial hygiene) and to management
2. Engineering measures of control
   —designing and applying measures of control—physical devices for protection against chemicals—plant design—operations design—ventilating design
   —policing the plant (environmental monitoring) inspection—critique of maintenance operations—analysis of materials —air analyses.
   —personal protective equipment (choice and supervision—engineering criteria)
   —reports to medical personnel, and management (directly or through physician)

3. Administrative measures of control
   —appropriate organization of hygienic facility in relation to operations
   —appropriate budgetary provision for hygienic effort

Adequate control depends upon the complete understanding of the hazard through physiologic and toxicologic research.

In addition, satisfactory team work includes:

1. Physician (including nurse and technicians) measures applied to personnel measures to be applied to environment (hygienic specifications)
2. Engineer (including chemist, physicist and technicians) measures to be applied to environment (hygienic technologic applications)
3. Management
   proper organization
   proper financial implementation▲

LIVING IN THE AIR WE BREATHE

by H. H. FAWCETT

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Living in the air we breathe has been a problem since God created man from dust and then breathed into him the breath of life! But even today, the vital role of breathing in our daily life has not been completely appreciated. This paper reviews briefly (1) air contaminants, and (2) commercially available respiratory protective devices, with emphasis on their limitations, and on the training and maintenance necessary for safe and effective use.

Each of us is a creature of habits, but none of our habits is more vital to life than is breathing. So automatic and effortless is this habit that we give almost no thought to our respiration, although most of us cannot live without air for more than five minutes. From the second of our birth when we descend from in utero (where the oxygen partial pressure corresponds to 33,000 feet altitude) into a world with a mixture of gases called air, we must breathe several quarts of air each minute so our body cells can exist, grow, and perform their functions.

For an average lifetime of 70 years, we may breathe in excess of a half billion times. By contrast, we consume "three square meals" and "six glasses of water" daily. Our air requirements which we obtain virtually without effort are of greater significance by any standards than water, food, clothing, and shelter, which demand much "day-by-day" thought and deliberate action to obtain.

We live at the bottom of an ocean of air called the atmosphere, a name given to a mixture of several gases which consist mainly of four-fifths nitrogen and one-fifth oxygen. Virtually limitless in volume and mass as we view it from the ground, it thins out into space. Half of its density is under 18,000 feet. In a multitude of ways the air assists all living things to exist.

FUNCTIONS OF AIR

Besides providing oxygen for breathing-oxygen which lungs transfer to the blood—air conveys both sound and light, absorbs heat, enables fires to burn, propels boats, turns windmills, makes possible air brakes, vacuum cleaners, and other useful machines. Air in motion forms winds which modify climate, equalize heat and cold, and distribute rainfall. Rivers high in the air, such as the jet stream, greatly influence weather and are an increasingly important factor as airplanes travel at higher altitudes. The ancient Greeks ranked air with earth, fire and water as one of the four fundamental elements.

Since each of us has been breathing several times each minute from our birth, respiratory protection and devices to aid or supplement breathing might seem unnecessary. If pure air were truly ubiquitous, and no harmful gases, vapors or dusts existed,

breathing problems would be confined to underwater or to travel in high altitudes. Unfortunately, pure air is a relatively rare commodity, and is much harder to obtain pure than many chemical elements and compounds.

Some variations of the air are caused by natural forces (such as moisture from rain or dust from winds on dry earth), while some are due to man (such as combustion products, unburned or incompletely burned fuels, solvents, vapors, dusts, fumes, inert and toxic gases). When these variations are small, we say that the air is "pure," but when the variations, either alone or in combination, exceed our ability to adapt to them, or our ability to tolerate them, we say the air is "bad."

AIR POLLUTION

No simple yardstick has yet been devised to tell us when air ceases to be "pure," although numerous air pollution studies are underway, and threshold limit values (maximum allowable concentrations for industrial exposures) are available as a guide. We have just begun to realize that air pollution control may be even more important than stream pollution control. When extreme conditions exist, as in London, Meuse, Donora or Los Angeles, we know that human life is more difficult than other times when smog is not present.

On a minor scale, every year a serious problem exists from dust or pollen (such as rose fever, hay fever, or ragweed fever) for allergic persons, and we have found that respirators are frequently considered a a welcome supplement to medication for the relief of such conditions.

Most breathing air supply problems can be controlled with adequate ventilation. If air could be properly treated to remove particulate matter, noxious vapors, and toxic gases, heated or cooled, and then distributed as required, breathing can be reduced to a minor problem insofar as purity of air is concerned. Unfortunately, adequate ventilation and air treatment is sometimes impossible or impractical where emergency action must be taken to preserve life and property.

Therefore, we must provide man with respiratory protection if we expect him to survive. A glance at the case histories of incidents collected at random from many sources and appended to this paper shows that respiratory problems have occurred in many diverse activities. Specialized knowledge and action in advance is essential if such injuries are to be prevented.

It is sometimes glamorous or unusual incidents which produce serious results; failure of a pressure system in an airplane at high altitudes will cause blackouts in seconds; above 43,000 feet, even breathing pure oxygen is not adequate— a pressure suit or a pressurized cabin is essential. On the other hand, no less serious are the problems when commonplace materials, such as a few sausages overheating and burning on a frying pan on a kitchen range produced sufficient smoke and toxic gases to overcome the occupants; firemen required respiratory protective apparatus to effect a rescue of the unconscious victims.

Gases and smokes resulting from fires have been studied for years, and excellent reports are available, but it is impossible to predict what gases may be encountered or in what concentrations in a given fire. A large number of different flammable chemical compositions or chemical combinations that change with heat, such as plastics, fabrics, insulation, refrigerants, solvents, paints, insecticides and building materials, play important roles in our daily lives.

VARIETY OF GASES IN FIRES

In addition to carbon monoxide, carbon dioxide, and water (present in nearly all fires), one may expect ammonia from burning wool, cyanogen from burning silk, acrolein from burning fats, sulfur-containing gases from burning rubber and leather, and chlorine-containing gases from burning or smouldering chlorinated plastics. From piled newspapers smouldering in limited oxygen, 41 per cent of the total gases given off was found to be carbon monoxide, and 43 per cent was carbon dioxide.

A pile of newspapers in a large open hallway would give an entirely different concentration of carbon monoxide and carbon dioxide within the breathing zone than the same pile burning in a small enclosed basement. Determinations ranging from two per cent to four per cent carbon monoxide have been made using recognized CO detectors in the smoke of building fires in the same room in which firemen were engaged in extinguishment, by a medical doctor wearing self-contained breathing apparatus. A vigorous movement is now underway to encourage fire and other rescue services to use adequate respiratory protection more effectively.

AIR CONTAMINANTS

The conventional classification of air contaminants follows:

A. Aerosols (dispersoids) (particulate contaminants)—dusts, fumes and mists.

A better classification of aerosols is based on physiological effects:

A. Nuisance and Inert: produce no known injuries: calcium carbonate, magnesium carbonate, gypsum

B. Inert pulmonary reactions: produce non-specific pulmonary reactions: silicates, carbon, aluminum

C. Minimal pulmonary fibrosis-producing barium compounds, tin, iron oxides

D. Extensive pulmonary fibrous-producing silica, asbestos

E. Chemical Irritants: produce inflammation or ulceration alkaline reactions: acids, fluorides, chromates

F. Toxic systemic poisons: produce pathological reactions: lead, manganese, antimony, arsenic (not more toxic than Pb), arsenates, organic-phosphates, cadmium, radioactive, beryllium (more toxic than lead)

G. Allergic manifestations: produce allergic reactions: pollens.

H. Fever-producing reaction: action unknown or allergen: metal fumes, certain textile dust, (hemp, cotton, jute, bagasse)

A. *AEROSOLS*

Formerly called dispersoids or particulate contaminants, these are substances present in the air as minute particles (such as dusts), as fumes (such as metal fumes), or as mists (such as chromic-acid mists). In grouping these together, it is recognized that they may be physically filtered, screened, or adsorbed from the air with properly designed filters. Aerosols may range in size from 150 microns to a thousandth of a micron in size (1 micron equals 39.37 millionths of an inch or 1 x 10-4 centimeter). Many dusts are also fire and explosion hazards.

Pneumonokonioses (Greek for lung dust) or pneumoconioses are a group of lung conditions which result from the inhalation of dust. Silicosis is one of the most common types of pneumoconiosis, and is caused by the inhalation of "free" or "uncombined" silica, such as quartz, opal flint and crystobalite. Many other dusts may produce lung involvement such as absestos, talc, the silicates, carbon, iron and barium.

Other dusts cause chemical irritation, such as the acids, alkali substances, fluorides and chromates. Allergic reactions may be caused by common dusts such as pollens, synthetic resins, plastics, felt, fur, gums, spices, tobacco, paper, rubber, wood, starch, flour, and wool. The Bureau of Mines groups all the above dusts as "Pneumoconiosis-Producing and Nuisance Dusts."

TOXIC DUSTS

Another classification of dusts refers to "Toxic Dusts." Some have a lower threshold limit or maximum allowable concentration than does lead, although the Bureau of Mines classification uses lead as a reference. Among aerosols more toxic than lead are: cadmium oxide fume, chromic acid and chromates, mercury, mercury (organic), yellow phosphorus, picric acid, selenium, tellurium, calcium arsenate.

Respirators approved for all the above dusts (both toxic and pneumoconiosis-producing and nuisance dusts) are called "dust" respirators. A few substances, such as beryllium and radioactive substances, are not currently covered by Bureau of Mines schedules.

"Fumes" include aerosols formed by the condensation of vapors from heated metals. Melting, cutting, and welding of zinc, lead, cadmium and other metals produce such fumes.

"Mists" and "Sprays" include liquid droplets formed when liquids are carried into the air or are formed by a reaction with the moisture in the air. An interesting example is 0.3 parts per million sulfur dioxide, with sunlight, forms 20,000 particles per c.c. of sulfuric acid mist.

The availability of filters with pore sizes from 10 millimicrons (approximately the size of the polio virus) to five microns (the size of common contaminants in liquids) has greatly improved and speeded up analyses

of aerosols such as acid mists, metal fumes, smokes, and radioactivity.

In recent years, study and measurements of even smaller particles in air than previously observed, known as condensation nuclei, have contributed greatly to our understanding of the nature and number of particles in air. The particles in the air on which water will condense are called condensation nuclei; under natural conditions only the larger particles are so effective. When the air is sufficiently super-saturated apparently any particle will serve as a condensation center.

Particles from such diverse substances as platinum, silver, stearic acid, glycerin and lubricating oil will all form droplets at a sufficiently high supersaturation of water vapor. Practical methods are now available to measure the number of particles in an aerosol in free air. A wider use of the technique already available for size and numbers of an aerosol would not only throw light on some of the problems of air pollution but would certainly lead to further improvements in our knowledge of aerosols.

Respirators for insecticides are tested and listed by the U. S. Department of Agriculture.

B. *GASES AND VAPORS*

In this major group may be included most of the air contaminants which are not classified as aerosols.

1. *Irritant gases* are those which produce inflammation of tissue, such as the skin, the eyes, and the respiratory tract membranes. They are divided into two general groups:

a. action is limited to irration (such as hydrogen chorıde)
b. action extends to systemic effect (such as oxides of nitrogen)

Some of these gases and vapors have pronounced odors, but the nose cannot be depended upon as a reliable method of estimating concentrations.

2. *Asphyxiants* are substances which deprive the body tissues of oxygen, causing hypoxia (oxygen starvation). Two general methods of action are known: *simple* asphyxiants (such as nitrogen, hydrogen, helium, and methane), which dilute or replace the oxygen partial pressure in air; and chemical asphyxiants (such as carbon monoxide, hydrogen cyanide, hydrogen sulfide, acetonitrile, aromatic nitro and amino compounds like aniline, nitrobenzene and derivatives), which combine with the hemoglobin of the blood to prevent oxygen-carbon dioxide exchange.

The insidious nature of the action of the simple asphyxiants, and the speed with which they can act, is still not widely appreciated; whereas most people have a healthy respect for the chemical asphyxiants. Under proper medical supervision, pure nitrogen may be breathed for several seconds and this technique has been used clinically by Himwich and others. However, nitrogen and the other simple asphyxiants give almost no warning between the time breathing air is replaced with the asphyxiant and unconsciousness overtakes the subject.

PHYSICAL REACTIONS

A loss of mental facilities begins within a few seconds, and unconsciousness may occur shortly after with no warning. The brain is the first organ of the body to be affected seriously by oxygen want, and the subject "blacks out" quickly. Mention is made of this little-appreciated phenomenon not only because asphyxiants can be released in a room or tank with inadequate warning from the action of a fixed carbon dioxide fire extinguishing system, from a large spill of liquid nitrogen, from a leaking gas system, from an inert-gas producer, or from a leaking cylinder, but also because airline-supplied respirators, hoods and suits are frequently attached to a plant air supply with little appreciation of the hazard.

For example, at the Acids and Heavy Chemicals sub-section meeting, Chemical section, National Safety Council, October 25, 1956, no company present reported use of a special air system for respiratory equipment. If a cross-connection should occur anywhere in the air system which would permit an asphyxiant, toxic, or flammable gas to enter the air used for breathing, the results can easily and rapidly be fatal.

Oxygen, used indiscriminately, may also be a hazard, since serious fires have been reported where oxygen, either from a cylinder or an airline, or a leaking hose or pipe, was used for breathing purposes in an airline respirator or hood where welding or other flames were involved. Only a completely separate air supply, supplied by a compressor which cannot evolve carbon monoxide, carbon dioxide, oil mist or other unwanted impurities or from cylinders of tested known purity should be used for airline respirators, hoods or suits. In any event, regardless of supply, the system should include pressure relief valves, filters and absorbents as recommended.

2. *Anaesthetics* are gases and vapors whose action is primarily by inducing the symptoms of anaesthesia when inhaled in sufficient quantities. These include the substances which come to mind when the word "anaesthetics" is mentioned, such as the ethers, chloroform, methyl chloroform (1,1,1-trichloroethane), trichloroethylene, ethylene oxide and nitrous oxide (laughing gas), as well as hydrocarbons, aldehydes, ketones, other halogenated hydrocarbons, the aromatic hydrocarbons, alcohols, esters, and carbon disulfide.

DECOMPOSITION OCCURS

In addition to the physiological action of these materials alone and in combination, decomposition products are produced in a fire or when they are otherwise subjected to heat. Even relatively harmless substances such as the Freons and the Genetrons, (widely used as non-flammable refrigerants of low toxicity, as replacements for ammonia, sulfur and ethane), will evolve toxic decomposition products if they are heated above their decomposition temperatures. This has occurred where Freons and Genetrons were used as cleaning solvents.

Metal parts, after cleaning, were heated above the safe limits in order to dry and flash off the remaining solvent. Several persons were hospitalized with pulmonary congestion. Trichloroethylene degreasers, properly installed, maintained and operated, are safe, yet the failure or misuse of these vapor degreasers has created serious hazards including both fires and toxicity.

Mass hysteria and unconsciousness due to the little-appreciated anaesthetic action of the trichloroethylene has occurred in seconds; in one incident 72 persons were overcome, and in another, 26. Fortunately, all recovered after removal to fresh air and oxygen inhalation. The hazards of carbon tetrachloride mixtures in fire fighting and in other applicatuons are well documented.

4. *Substances producing other effects*—This classification includes several substances whose action differ from previously-mentioned substances. Included in this group are mercury, white phosphorus, tetraethyl-lead, nickel carbonyl, arsine, the boron hydrides, phosphine, hydrogen sulfide, and the widely-publicized military "nerve gases." The initial action of these gases and vapors is primarily on the nervous system, with respiratory arrest following.

CONTAMINANTS COMBINE

If the above classifications appear complicated, it must be remembered that these air contaminants seldom occur alone, and that even less is known about the combined action of two or more substances, especially if they are in different groups, than of the individual substances. Even if particles in the air are non-toxic in themselves, they are known to act as carriers of condensable toxic vapors—formaldehyde can have its toxicity increased five times by the presence of an aerosol.

It is little wonder, then, that respiratory protection can become a highly complicated subject, and that the practical application of respirators, gas masks, and self-contained breathing apparatus (all with their limitations), even by persons thoroughly trained in their use, is not cut-and-dried or foolproof.

Relatively untrained persons in an emergency situation, are in especially vulnerable positions. Many of the case histories attached to this paper clearly point to the need for more widespread appreciation of the nature of the hazard, as well as of the limits of the various respiratory protective equipment used.

RESPIRATORY PROTECTIVE DEVICES

A. *AIR-PURIFYING RESPIRATORS*

The fundamental limitations of any air purifying device are that the air must be within the limits for which the respirator was designed (for example, the oxygen content must be more than 16 per cent); the particular unit will only protect against the specific substance or combinations for which it was designed, (for example, aerosol [dispersoid] [filter type] respirators will give no protection against gases and vapors); and the canister or filter must be

maintained in proper working condition (on a properly maintained facepiece that fits snugly enough to exclude leakage).

Aerosol (filter type) respirators require frequent changes in filters when breathing resistance becomes uncomfortable when used where excessive dust or fumes are involved. Chemical cartridge respirators will safely protect only against the specific vapors and gases in non-emergency situations where no more than 0.1 per cent is encountered.

Extremely toxic materials, such as acrolein, acrylonitrile, aniline, dimethylaniline, arsine, bromine, carbon disulfide, carbon monoxide, dimethylsulfate, hydrogen cyanide, hydrogen fluoride, hydrogen selenide, hydrogen sulfide, iodine, methyl bromide, methyl chloride, nickel and iron carbonyl, nitrobenzene, nitroglycerine, nitromethane, oxides of nitrogen, ozone, phosgene, phosphine, phosphorus, trichloride, stibine, sulfur chloride, the boron hydrides and others are too toxic even in low concentrations for reliance to be placed on simple cartridge type respirators.

NOT FOR ODORLESS GASES

Chemical cartridge respirators should not be used against gases which are odorless or whose odor threshold is high, since the only warning of failure of the respirator or of concentrations which are above the ability of the respirator is odor. Methyl chloride is an example of such a gas whose warning properties are too slight for practical purposes. Substances which are highly irritating to the eyes, such as sulfur dioxide, require eye protection (such as a gastight goggle, an air-supplied hood, or a full-facepiece).

Several lacrimatory (tear-producing) substances, such as benzyl chloride, are in the same classification, and a respirator alone is clearly inadequate. Some substances, such as carbon monoxide, cannot be stopped by a chemical cartridge (except by the Hopcalite in the Type N universal gas mask and in the miner's pocket self-rescuer). Ammonia cartridge respirators will protect against ammonia up to 1,000 p.p.m., while eye irritation from ammonia begins at about 700 p.p.m.

Mercury cartridge respirators are effective against concentrations of mercury vapor normally encountered at ambient temperatures, but service life is proportionately reduced where higher concentrations of mercury from elevated temperatures and pressures are present. (There is no Bureau of Mines approval schedule for mercury respirators). Combination cartridges have the limitation of a shorter service life when used with one particular type of hazard than the equivalent specific single-purpose canister would have for the same hazard.

FACEPIECE TYPES

Normally, respirators use a "half-mask" facepiece, covering the nose and mouth, while gas masks use both full-masks and full facepieces. (Only full facepieces on gas masks are approved by the Bureau of Mines). Recently, the "self-rescue" or "pocket" respirator, normally used with a cartridge containing Hopcalite with a dryer and designed for escape from mines, has been extended into other cartridges.

The mouthpiece of this style respirator is held tightly by the front teeth of the wearer, and the breathing is accomplished through the mouth. A nose clamp blocks off the openings of the nostrils, and prevents irritation of the membranes of the nose. A neckband permits the respirator to be worn ready for instant use. Twelve different filter cartridges will fit the basic holder and mouthpiece.

Industrial canister-type gas masks, with canisters designed for specific substances or combinations, have the same limitations in general as chemical cartridge respirators, except they are effective in concentrations of any specific gas or members of the same group of gases for which they are designed of not more than two per cent in air or a two per cent total for a mixture of gases for which the canister is designed.

The ammonia canister is approved for three per cent ammonia. For shorter periods of time, industrial canister-type gas masks can be used in higher concentrations, but the time of service life will be reduced. Depending on the size of the canister, and the service for which it was designed, the service time varies.

Protection for a combination of various gases, such as acid gases, organic vapors, and ammonia can all be obtained in one canister, but the service life of such a combination is shorter in the combined canister when used with one specific substance, than is the life of an equivalent canister designed for specific substance alone. The only warning that a canister or cartridge is "exhausted" is the detection of odor of vapor or gas passing through the canister or cartridge.

Persons who need corrective lenses in order to work properly when wearing the respiratory protection, especially full facepieces, may find of interest two methods of incorporating lenses inside a facepiece. One method consists of wire frames which fit around the circumference of the sight lenses, and hold a 50-mm round prescription lens.

PRESCRIPTIONS IN FACEPIECES

A second method consists of a center post built inside the mask, onto which can be attached 40mm rimless glasses. Such arrangements seldom allow perfect alignment of the prescription lenses to the viewer's eyes, but, with adjustment, a sufficiently accurate fitting can be achieved for most purposes for reasonably long periods of time.

The type N universal gas mask canister is constructed of several layers including activated carbon (to remove organic vapors), soda lime (to remove acid gases and carbon dioxide), copper sulfate (to protect against ammonia gas), silica gel and other dryers (to remove moisture both before and after the Hopcalite), and Hopcalite itself (a mixture of metallic oxides which catalyzes the conversion of carbon monoxide to carbon dioxide), plus a filter for smokes.

This canister can be used as protection against smoke and gases which do not exceed two per cent by volume total, where adequate amounts of oxygen are present. Sixteen per cent oxygen is cited as the practical minimum, but life is not actually in danger until about 14 per cent or less oxygen is present. A timer is used to count the number of inhalations, and indicates about two hours total use.

DISPOSE OF CANISTERS

A canister should be discarded at least as soon as the timer indicates the pointer has completed one revolution, if not sooner. One authority recommends that universal canisters be weighed immediately on receipt from the manufacturer, and that they be discarded as soon as they have gained 45 grams. This 45 grams limit was imposed since it represents the limit of the dryers to keep the Hopcalite dry, and also to prevent excessive breathing resistance from developing as the dryer becomes moist.

The shelf-life of the universal canister, once the canister has been attached to the facepiece is one year, if stored with the bottom seal in place, even though the mask has not been used. If stored with both top and bottom seals unopened, as received from the manufacturer, the shelf-life is considered by some to be four, and by others, five years.

With an respirator or gas mask, the problem of proper fitting of the facepiece is critical. In addition to the time honored technique of holding the hand over the opening in the bottom of the canister while inhaling gently to see that the facepiece will collapse on the face, another technique recently suggested by the A.E.C. is to use isoamyl acetate.

Since isoamyl acetate (which smells similar to bananas) can be detected in a concentration of as low as one part per million, a small leak will be detected if the acetate is placed on cotton and the cotton passed slowly around the edges of the mask without touching either the wearer's face or the mask. If the wearer can detect the odor, a leak is indicated and the mask should be further adjusted until the odor can no longer be detected.

CIVIL DEFENSE MASKS

As part of its chemical warfare defense program, the Federal Civil Defense Administration is stockpiling a mask designated as CD V-800 organizational mask for use by civil defense personnel. The canister on this chin-style mask is the same as used in the U. S. Army Assault Mask. This mask is reported to give "excellent protection against CW (Chemical Warfare) and BW (Biological Warfare) agents, as well as against the inhalation of radiological particles, or CBR (chemical, biological and radiological)".

Designed to be used in conjunction with a detection kit, CD V-810, which will detect and distinguish between the nerve gases and the mustard gases, the V-800 mask is a specific mask for war gases (including nerve gases) and will not protect against carbon monoxide, ammonia and other gases. The Army Chemical Corps recently an-

nounced a new E-13 mask for troops. It is designed to give the soldier complete protection against the inhalation of war gases, germ warfare agents and airborne radioactive fallout particles, but does not protect against direct radiation.

The new mask does not have the protruding canister used in current masks. This was made possible through development by the Chemical Corps of a new light-weight, pliable gas-aerosol filter material. Pads of this material are enclosed within cavities molded into the rubber facepiece of the mask. Lower breathing resistance, superior vision, better speech transmission, and greater comfort are claimed.

It should be noted that the CD V-800, the existing and the new Army gas masks should be used for purposes for which they were designed only. After both World War I and II, several instances were reported where "surplus" Army masks were used for protection against gases for which they were not designed, with serious consequences. It is important that gas masks are not misused.

B. *AIR-SUPPLIED RESPIRATORS*

Since the simplest solution to all respiratory problems is to supply pure air to the breather, the use of an air supply from some remote source where the air is not contaminated is both simple and logical. For many applications, air-supplied equipment has real advantages, but this equipment is subject to definite limitations. The simplest type is the Bureau of Mines Type B hose mask, which is a facepiece to which is attached a hose without a blower which must extend to a respirable source of air. This mask depends on the breathing action of the wearer to move the air. For this reason, a maximum hose length of 75 feet has been established for the hose mask without blower.

Low pressure blowers, operated either by hand or by power (power blowers do not carry Bureau of Mines approval) are used to supply Bureau of Mines Type A hose masks up to 150 feet. All hoses should originate at the blower.

A respirable source of air must be assured, and a safety man must be present at the blower at all times. Fouling of the hose may cut off the air supply, and the exit route must be the same as the entrance route. These hose masks can be used safely only if the above precautions are observed.

Airline-supplied Bureau of Mines Type C respirators are divided into two classes: (a) the continuous flow type and (b) the demand or intermittant demand flow type; (a) is usually used with a powered compressor or blower, while (b) is usually used with breathing air supplied from cylinders. The use of such equipment in atmospheres immediately hazardous to life is not recommended since failure of the air supply or fouling of the hose would be serious, and further, it is absolutely necessary to have respirable air of unquestioned quality.

We have previously noted the hazard of using a plant air supply for air-supplied breathing equipment. It is recommended that a separate air system be used exclusively for breathing air. Depending on the pressure available and the diameter of the hose, there is a limit to the length of hose which is practical.

Wherever possible, such systems should be piped as close to the outlet as possible, so possibility of fouling of the hose and cutting off the air supply will be minimized. Exit from areas where air-line respirators are used must, of course, be the same as the route in. If a compressor or tank supply is used, sufficient pressure relief control must be available to protect the wearer against pressure in excess of that prescribed for the equipment.

AIR-INFLATED SUITS

Air helmets, air hooks, and air-supplied suits have the same general limitations as for air-line respirators. An interesting development in this field is the use of air-inflated suits for protection of the whole body against hazardous materials.

In one form, the large impervious plastic tunnel or pipe allows a man to work in one room while using air from another—the slight air pressure supplied giving both breathing air and inflation (or body) to the suit. The front of the suit is tailored into a facepiece, and arms with gloves are attached. Mobility is reported good within the obvious limits imposed by the length of the tunnel attached.

In another form, a complete suit with built-in arms and legs is supplied with air for inflation and a hood, also air supplied, is used for head, face and respiratory protection. Depending on the particular fabric, plastic, or composition used in its construction, this suit allows work inside tanks, reaction vessels and other confined space which still contain a hazardous atmosphere.

Properly used, together with safeguards to insure that the wearer's air supply and lifeline are always in proper position and working order, this suit has increased safety and decreased operating costs in maintenance work inside tanks containing materials which are corrosive or are easily absorbed through the skin such as aromatic amino and nitro compounds. The same limitations noted above for air-line respirators should be noted.

Regardless of the type "respirator" used, a definite program of control is necessary to insure the device is used properly, is properly maintained, and that it is doing what is expected of it. After the Canadian Chalk River atomic reactor incident, respirators were used to prevent inhalation of radioactive contaminants. This program was successful only after a respirator official was appointed to control the use and maintenance of respirators, regular urine-samples were analyzed to show definitely the degree of absorption, and an improved respirator was made available.

C. *SELF-CONTAINED BREATHING APPARATUS*

Self-contained breathing apparatus supply complete respiratory protection in any concentration of toxic gases and under any oxygen deficient atmosphere. However, certain gases and vapor will cause systemic poisoning by skin absorption. Although a small group, these exceptions are highly important, including hydrogen cyanide, nitro and amino aromatic compounds, ethylene imine, phenols and a few others. These gases and vapors require complete skin protection of an impervious type in addition to respiratory protection.

EARLY REBREATHING APPARATUS

The early self-contained rebreathing apparatus, which was imported from Europe, had serious deficiencies. Loss of life was reported by users in this country; 19 accidents are reported involving 26 facilities between 1911 and 1940, due partly to equipment failure and partly to improper use. Where life-lines and standby rescue squads were employed, the apparatus was generally satisfactory in the hands of well-trained users.

The first self-contained breathing apparatus to be approved by the U. S. Bureau of Mines was of the two-hour rebreathing type.

The oxygen rebreathing type apparatus is relatively heavy (39# for the two-hour type) and is bulky. Most self-contained (closed circuit) oxygen breathing apparatus in use today require mouth breathing with a nose clip, but a full facepiece has recently been approved. Careful training is required in use and in maintenance of this apparatus. A minimum of 20 hours initial training is recommended by the Bureau of Mines.

RESTRICTS MOVEMENT

Demand-type air and demand-type oxygen breathing apparatus is available in half-hour, quarter-hour and 7½ minute ratings. Only the half-hour demand apparatus is Bureau of Mines approved; the Bureau has no approval schedule at present for any self-contained apparatus of less than a half-hour. Although the schedule of work on which the Bureau's half-hour rating is exhausting, large men under extreme stress have exhausted a half-hour (40 cu. ft.) cylinder in significantly less than a half-hour.

Differing only in whether it is supplied with compressed oxygen or compressed air, the apparatus weighs nearly 30 pounds for the half-hour type, with the large cylinder (40 cubic feet) on the back. It is relatively awkward to put on and it restricts action in confined spaces. With practice, it may be put on and into operation from a mounted backboard in less than 20 seconds.

The back position of the cylinder makes it difficult to crawl under equipment. Climbing in and out of small openings, such as manholes, requires care when wearing this type apparatus. Operation of a motor vehicle is awkward when wearing a cylinder on the back. (15-minute and 7½-minute demand apparatus use smaller cylinders slung on the side of the wearer, which overcomes this objection to some extent.)

The purity of the air or oxygen with which the cylinder has been charged should always be questioned since other gases such

as nitrogen, acetylene and carbon dioxide and gas mixtures other than air have actually been found in "breathing air" cylinders. Errors in compressed air used for breathing may be rapidly fatal, and every newly-filled cylinder should be checked to insure it actually contains "breathing air," regardless of the source of supply.

Unless the user has his own compressor producing air of an unquestioned purity, no cylinder should be put on a demand breathing apparatus or air-supplied respirator, hood or suit until the contents have been checked for purity. The Orsat gas analyzer or the Beckman paramagnetic oxygen analyzer are often used in analyzing oxygen percentage while carbon monoxide may be checked with the National Bureau of Standards colormetric tester available from two manufacturers.

High pressure cylinders may leak, and frequent inspection is necessary to insure that the air or oxygen is actually available for use in an emergency. High pressure valve, gauge, and demand regulator must be maintained in top operating condition by inspection and a regular preventative maintenance schedule as recommended by the manufacturer.

ATMOSPHERE CUTS SERVICE

If demand-type apparatus is worn in environments where pressure above one atmosphere is present (as in caissons or tunnels under higher than atmospheric pressure), the service time is reduced as the pressure increases. This is also true of underwater use of the regular demand-type apparatus; a special adaption is available for underwater swimming. Other peculiar effects have been reported when demand and closed circuit oxygen breathing apparatus was worn under pressure.

The use of oxygen in atmospheres above two atmospheres absolute pressure should be avoided since oxygen produces a toxic effect under such conditions. For periods up to 12 hours at normal atmosphere pressures, however, oxygen may be used without apparent ill effects by healthy persons—persons in questionable physical condition should *not* wear *any* emergency breathing equipment, but should remain away from contaminated air and underwater.

When the supply of air or oxygen has been depleted, the supply in the demand type apparatus cuts off abruptly, and the facepiece must be removed immediately or asphyxia can occur. One British half-hour breathing apparatus has available as optional equipment an automatic warning whistle (Pat. No. 644105) which will start to blow when the cylinder pressure falls to 300 pound/square inch, to aid in warning the wearer to return to fresh air at once.

The seal around the facepiece must be absolutely gas-tight in a toxic atmosphere since in the demand-type apparatus the facepiece is under slight negative pressure momentarily during the beginning of the inspiration phase of the cycle. A recent revision by one manufacturer eliminates this negative pressure part of the cycle. Another novel feature of another demand mask (54 cubic feet of air or oxygen divided between two 26 cubic foot cylinders for balance) is a plug-in attachment carried with the mask for administering resuscitation to an overcome person on-the-spot while still in a toxic atmosphere.

In the above discussions, no mention has been made of the fire and explosion hazard of air which is richer than 21 per cent in oxygen, or of pure oxygen itself. Certainly air should not be replaced with oxygen, either in a breathing apparatus, in a ventilation technique, or for any other purpose, without full consideration of the increased potential hazards from fire, as the oxygen concentration increases above the 21 per cent oxygen content of air. A flammable vapor-oxygen mixture requires only about one thousandth the energy to ignite it as does a corresponding flammable vapor-air mixture.

The resulting fire or explosion is many times more violent. Failure to appreciate these facts (which have been published and well documented for years) has cost many lives. For this reason, it is as important to analyze a suspected atmosphere for oxygen concentration as for flammable vapors and gases, and for toxic gases. By using either the time-honored mine safety lamp as an oxygen indicator, or the more recently available Beckman paramagnetic oxygen analyzer, it is possible to obtain fast and sufficiently accurate oxygen analyses for practical purposes.

Combine such oxygen analysis (which will reflect inert gases or oxygen deficient atmospheres as well as excessively high oxy-

gen concentrations) with a check for flammable vapors and gases (using one of the many instruments commercially available), and a check for whatever toxic gas is suspected (for CO, for example, the National Bureau of Standards glass tubes containing palladium chloride which changes color with CO). To ignore any one of these fundamentals is to run risk of trouble.

SAFE 45 MINUTES

The self-contained oxygen-generating breathing apparatus is approved by the Bureau of Mines, and is rated for 45 minutes. Some of the models produced for the military are not Bureau of Mines approved, however. The weight of 14#, carried on the chest and stomach, gives it a decided advantage both in weight and convenience over the demand-type apparatus, although the chest position creates limitations in use under some conditions.

The highly exothermic reaction which generates oxygen from the potassium superoxide (K_2O_4) evolves significant heat, which might serve as an auto-ignition source to carbon-disulfide or nickel carbonyl vapors under extreme conditions. This temperature of the canister surface may reach 250°F, and is equivalent to the hazard presented by unshielded incandescent lamps, hot plates and steam pipes in such an atmosphere.

When worn in hot areas, or while working hard in the heat, the oxygen generated may occupy a volume which requires "dumping" of surplus oxygen to maintain comfort. The apparatus requires care in starting, especially in sub-freezing temperatures—for this reason it is considered good practice that both the apparatus and the canisters be stored inside or in a heated truck cab or automobile, and that the apparatus be thoroughly started above freezing temperatures, if possible.

Unless the sub-freezing starting is thorough, the wearer may be aware of insufficient oxygen during the first few minutes, by a feeling of "light headedness" and difficulty in coordination. If such a condition is noted, he should return to fresh air, deflate the bags and re-start the apparatus, until the breathing rate and the generating rate balance before re-entry.

In inserting the canister in the canister holder (canister is stored separately), care must be exercised to avoid cuts from the torn top seal when removing it, and the canister brought securely into place after it has been punctured by the sharp point designed into the apparatus for that purpose. The facepiece should not be donned until the canister is completely seated. A fresh canister should always be used in any emergency.

Once opened, a canister will continue to evolve oxygen even when removed from the apparatus and re-capped. To enter a hazardous atmosphere with a used canister is a highly dangerous practice—a fresh canister must be employed to insure safety. In view of the relatively high cost of these canisters, the temptation to re-use canisters is great, but should be avoided, and canisters promptly disposed of to insure the safety of the next user.

DON'T RE-USE CANISTERS

The disposal of the self-contained oxygen-generating canisters must be performed according to the instructions. Oil, grease, gasoline, or other flammable or combustible liquids must be kept from the canister mouth, or an explosion will occur. Only clean water in large quantities should be used to destroy a canister. The canisters should be promptly disposed of, and not be left sitting around where they could contact combustibles.

For reasons noted under discussion of demand-type breathing apparatus, the self-contained oxygen-generating apparatus should not be worn under pressures greater than two atmospheres absolute.

Smaller Self-Contained Breathing and Oxygen Inhalation Devices

U. S. Bureau of Mines approval for self-contained breathing apparatus currently makes no provision for apparatus rated for less than 30 minutes. In emergencies where a smaller, less cumbersome device with a shorter life would give adequate protection, the only available devices until recently were regular demand masks with smaller cylinders for 20, 15, and 7½ minutes service, using the same facepiece, reducers and regulators as on the larger approved devices.

Recognizing that many (perhaps most) breathing emergencies can be brought under control in 10 minutes, and that the first 130cc of expired air contains relatively lit-

tle CO_2, there is now available a lightweight device in which oxygen from small cylinders, supplemented by the first 100cc of the previous exhaled breath, is used for breathing at a rate of seven liters per minute. The device is still too new for extensive field experience, but represents a novel and new approach to the weight, bulk and cost of presently approved equipment.

Another recent development is a small portable anaesthesia and oxygen breathing device which is designed for use by medical personnel primarily, but which has obvious application as a "self-rescuer" for escaping toxic atmospheres. The device consists of a face piece with pressure limiting valve, an aluminum central body, a soda lime canister in volumes of 100cc to 500cc, two aluminum cylinders, each containing three liters of oxygen, and a six liter rubber rebreathing bag.

Using the device for escape, it is claimed a young male adult walking three mph can travel safely for 1100 yards using a 200cc soda lime canister, and 1800 yards using a 500cc canister. Since the complete unit weighs less than two pounds, and the oxygen cylinders are pocket-size, the device may rightly be called pocket-size, and, in the hands of trained personnel, should be useful for self-rescue oxygen inhalation or resuscitation.

Maintenance, Training and Medical Precautions

In discussing respiratory protection, we have shown the importance of breathing "good" air, briefly reviewed the major air contaminants, and discussed briefly apparatus available. We have stressed the limitations of each type, rather than the advantages, since we believe that limitations were not as widely appreciated as advantages. The ideal breathing apparatus has yet to be developed. We have tried to create the impression that a thorough knowledge of the particular apparatus used is essential for its safe use under various conditions.

Maintenance of the apparatus in first-class condition so it is immediately ready for use at any time is likewise important. Metal parts of apparatus will wear, tarnish or corrode; rubber parts will slowly "age." Facepieces will take a "set" and must be discarded. Cylinders, regulators and valves on demand-type apparatus must be checked frequently for leaks; canisters on industrial or universal service masks or chemical cartridge respirators must be replaced.

Washing the facepiece with an antiseptic solution or soap, rinsing in clear water, and drying will assure that sanitation and cleanliness is not neglected. This also prolongs the useful life of the facepieces. Proper storage conditions and frequent checking for deterioration are as important with respiratory protective equipment as with fire extinguishers, parachutes and life-lines.

TRAINING DEFICIENT

Training is the third, and perhaps most important leg of the triangle of respiratory safety. There is serious deficiency in this phase of the respiratory program. Putting on a device for a few minutes once a year is not adequate training. The U. S. Bureau of Mines Health and Safety Activities, through its district and sub-district offices, conducts training courses in first-aid, and also in the use of various emergency breathing apparatus.

The course can be modified to meet special needs on request. Addresses of offices which offer these courses may be obtained by contacting the Health and Safety Division of the Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. This service of the Bureau is available to the mineral and allied industries, as well as to governmental agencies. The Bureau has at each of its Health and Safety field offices throughout the country mine-rescue equipment, and will make it available to trained personnel in any emergency.

During training, breathing apparatus should be worn for relatively long periods, in dark and confined spaces, climbing hills or stairs, duplicating all manual labor expected, and in smoke-filled atmospheres by hand-carried lights while performing work. Smoke generators are available, which will quickly fill a room, a basement, a tunnel or a small building with a smoke that is realistic, but which is relatively harmless and can be ventilated out without any damage.

The "buddy" system and team drill should be practiced, as in a real emergency. The use of life lines should be a part of this training, and should be a standard part of any underground, tank or smoky operation.

Signals as used by mine rescue teams based on OATH (O=OK=1 pull; A=advance=2 pulls; T-take-up=3 pulls; H=help=4 pulls) should be employed and stand-by men, ready to enter the area for rescue, should always be on hand.

Hand-carried short-wave two-way radios may also prove useful for communication between base and field party. When used in atmospheres which may contain flammable vapors or gases, any electrical devices should have a "permissible" rating by the Bureau of Mines for the gases or vapors involved.

PHYSICAL EXAMS LACKING

The need for proper physical examinations for persons wearing emergency equipment has not always been appreciated in the past. A regular program of physical checkups with particular attention to the respiratory and circulatory system as well as general physical condition probably would have prevented some cases where inhalation of a smoke combined with physical exertion with or without respiratory protection, has produced serious illness.

Pulse rates before, during and after exercise, general physical condition, moderate weight, good eyesight and proper teeth alinement (where mouthpiece breathing is involved) are considered vital to pre-training by the Bureau of Mines instructors. A practice of not permitting persons to return unprotected to smoke or fumes after they have been overcome and revived, would help prevent more serious inhalation effects.

Such restraining action may require physical force to implement it in practice, since a patient who is partially recovered from fume or smoke inhalation may display highly irregular behavior. One recommendation is that persons sufficiently exposed to smoke and carbon monoxide to require treatment should not return to active duty in less than four to six hours, while those who have been rendered semiconscious or unconscious should rest 24 to 48 hours.

Properly maintained breathing apparatus, used with full appreciation of its limitations, by healthy persons, properly and adequately trained, will eliminate most "fume" disabilities in the future. However, the ideal breathing apparatus for all applications has not been developed, and may not be developed until there is sufficient demand for it.

CASE HISTORIES

AMMONIA

The incident in question took place in Singapore, Malaya, during the early days of the war 1942, just prior to the fall of the city to the Japanese.

Our ship was tied alongside the docks, having just completed a mission. The city was under air attack continually, so that we maintained a full scale Battle Watch, ready for any emergency. It was after one of these raids that a strong odor of ammonia was observed on our ship; our blower ventilating system was picking it up. Investigation by our shore patrol informed us that a large cold storage plant had been hit and that the local fire department was attempting to rescue several members who were trapped inside the buildings.

Our fire and rescue section was dispatched to the scene at once; we were equipped for such work with demand-type breathing apparatus, with proper protective equipment and safety lines. Upon arrival we were briefed as to the plant layout and the possible location of 10 men inside the building with a British type canister mask for protection. We entered the area working in pairs, and during the next 20 minutes removed 10 firemen, who had been well trained by the best of British methods, but unfortunately ill equipped for such violent conditions.

When found, all men were unconscious and upon removal from the building were rushed to the hospital, oxygen being administered enroute by a fine Australian medical team. Of the 10 men rescued, six died from the effects of ammonia inhalation, four men recovered completely.

During the entire operation none of our team experienced any breathing difficulty; the teaching of damage control, fire and rescue work by Naval standards are very good. Their careful selection of reliable equipment has been the result of careful research and experience.

NITROGEN IN AIR-LINE RESPIRATOR

Employees in an area were required to use air-line respirators as a precaution against inhalation of radioactive particles. The air line was also used to provide instrument air.

FILMS

1. *Mechanisms of Breathing* (EBF) 612.2-1, Pennsylvania State University, Audio-Visual Aids Library, State College, Pa. or Encyc. Brit. Films, Inc. 1150 Wilmette Ave., Wilmette, Ill., (16mm sound, 11 min).
2. *Oxygen*, 16mm sound, 10 min., B&W and color, Coronet Films, Coronet Bldg. Chicago 1, Ill.
3. *The Air We Breathe*, 16mm sound, 26 min., B&W; Mine Safety Appliance Co., 5-45 49th Ave., Long Island City, N. Y. or local sales office.
4. *The City That Disappears* (Los Angeles), 16mm sound, color, 30 min., (Stanford Research Institute, Menlo Park, Calif.
5. *A Report on Smog*, 16mm sound, color, 20 min. (same source as 4).
6. *You Bet Your Life*, 25 min., 16mm sound B&W, available same source as 3.
7. *Use of Oxygen in Aviation*, TF1-4595, 22 min., 16mm sound, color, same source as 8.
8. *Oxygen, In-Flight Requirements*, TF-1-5038A, 25 min., 16mm sound, color, Air Force Training Films, Eastern Film Exchange, 1356 Film Library Flight (APCS) (MATS), Marietta Air Force Station, Marietta, Pa.
9. *Oxygen-In-Flight Equipment*, TF 1-5038B, 30 min., 16mm sound color, same source as 8.
10. *The Physiology of Anoxia*, 30 min., 16mm sound, B&W, same source as 11.
11. *The Breath of Life*, 10 min., 16mm sound color, H. J. Polk, Oxygen Therapy Dept., Linde Air Prod. Div., U.C.&C., 30 E. 42nd St., New York 17, N. Y.
12. *Safe and Efficient Oxygen Therapy*, 20 min., 16mm sound color, avail. same source as 11.
13. *Nitrogen Inhalation Therapy*, 10 min., 16mm silent color, Dr. H. E. Himwich, Galesburg State Research Hospital, Galesburg, Ill.
14. *Solvey Chlorine Emergency Devices*, 16mm silent color, 40 min., Research Dept., Solvey Process Div., Allied Chem. & Dye Corp., Solvey, N. Y. or local Solvey sales branch off.
15. *Use of the Air-Chem Suit*, 16mm sound, 30 min. color, Cost Reduction Section, Chamber Works, Organic Chemicals Dept., E. I. DuPont deNemours & Co., Inc. (Penns Grove, N. J.) avail. both with magnetic sound tract & regular optical sound tract.
16. *Breathing Apparatus*, Fire Dept. Training Film, 16mm sound B&W, 30 min., Public Relations sect. Los Angeles Fire Dept., Los Angeles, Calif., also avail. as Navy Train. Film
17. *Breath of Life*, 16mm sound, color, 10 min., Scott Avia. Corp., Lancaster, N. Y.
18. *No. 2 Training Film*, 16 sound B&W, 20 min., Scott distributors.
19. *Damage Control, Oxygen Breathing Apparatus*, MN-6931A, 16mm sound, B&W, 22 min., Navy Train. Film, U. S. Naval Train. Aids Center, E. Coast, 207 W. 24th St., N. Y. 11, N. Y.
20. *Rescue Companies*, 16mm sound 30 min., by Warwick & Tompkin, Public Relations section, Los Angeles Fire Dept., Los Angeles, Calif.
21. *Nerve Gas Casualties & Their Treatment*, 16mm sound color, 30 min., State CD Offices, or thru the Federal CD Admin., Battle Creek, Mich. on Fed. contributions prog. or thru W. B. Jacques, E. R. Squibb & Co., 745-5th Ave., New York, N. Y.
22. *Gas Obstacle Course*, TF-14440, 16mm sound, B&W, 19 min., 1943 (Air Force) same source as 8.
23. *The Effects of Weather on the Travel of Smoke & Gas Clouds*, TF-1-4666, 16mm sound, B&W, 21 min., 1949, avail. same as 8.

A regular compressor and a standby compressor were provided on the air line. Over a week-end, both compressors were out of service, so bottled nitrogen was manifolded into the line by a temporary jumper connection to maintain instrument air pressure. An employee, aware of the circumstances, was told to wear a filter-type mask. By habit, however, he entered the area and was found dead several minutes later due to nitrogen inhalation in the air-line respirator he had worn instead of the filter-type mask.

Breathing air systems, using an approved compressor or tank system, should be closely supervised and used only for breathing. Employees whose work takes them out of contact (visual or audiable) with others should be closely supervised. Human error caused this fatality.

CARBON TETRACHLORIDE AGAIN

Bunker C oil leaks had sprayed oil over the walls and ceiling of a small boiler room. Fearing the fire hazard which might result from using kerosene on the electrical equipment, the plant engineer had four men use a bucket of carbon tetrachloride with a long-handled brush.

Respirators of the proper type were provided and worn, but due to a missing part and poor fitting on one mask, one of the men became ill and was hospitalized three weeks with typical carbon tetrachloride poisoning symptoms.

A properly adjusted respirator, a less toxic solvent (such as 1,1,1-trichloroethane), and ventilation—any combination of these measures would have prevented this injury. It was also noted that the injured man occasionally consumed alcoholic beverages—a contra-indicated action in solvent areas.

PHOSGENE

A chemist suffered a major injury when phosgene gas containing dissolved HCl escaped from a cylinder too fast for the capacity of the hood. The chemist was wearing a Type N universal canister mask, but he noticed that his eyes were irritated when he took the mask off moments later in the fresh air.

Two men who worked alongside him were wearing air-line respirators and did not smell phosgene nor notice any eye or throat irritation. The chemist was hospitalized for 10 days from a toxic exposure to phosgene fumes, and was absent from work for about one month. The two other men suffered no ill effects whatsoever.

NO RESPIRATORY PROTECTION

A chemist was decomposing a reaction mixture containing phosphorous oxychloride in a hood by pouring it over ice onto a four-liter beaker. While his back was turned, the reaction became violent and the mixture overflowed onto the hood floor. A small amount also spilled onto the laboratory floor, since he did not have a catchpan under the beaker.

He directed his laboratory assistant to leave the room promptly, but stayed behind to throw some ice on the spill on the floor and open windows. He re-entered the laboratory after 10 minutes, when the fumes had subsided considerably, and cleaned the spilled material off the floor. This required 10 minutes, during which period he inhaled some of the fumes, chiefly HCl. He did not use any respiratory protection, although it was available.

He did not notice any ill effects that day, other than eye and throat irritation, but he was hospitalized on the following day for bronchial and pulmonary congestion. He was in the hospital for four days.

* * *

A vertical catalyst bed was being rodded out to remove solids. Dust and fumes from the solids being discharged at the bottom of the reactor were sufficient to cause coughing and discomfort to the operator, although spot ventilation was being used at the top of the column.

The operator continued to work out his shift, but that night he had an attack of nausea and vomitting, accompanied by persistent coughing. Following a recurrence of the original attack, he was admitted to a hospital for four days.

An air line respirator was readily available, although the magnitude of the dust hazard was not fully appreciated at the time.

* * *

During the operation of a small scale reactor housed in a barricade, it was necessary to enter the barricaded area and withdraw condensate every half-hour. This removal consisted of opening a valve at the

bottom of a condenser to check for and remove any unconverted by-products. In performing this operation it was necessary to discharge some vapors to insure complete withdrawal of the condensate.

The injured had been doing this during his shift without using the air-line respirator which was prescribed protection equipment for this operation. In addition to this exposure, he had entered the barricade during the early part of the shift to make minor repairs to a leaky blower.

The injured worked for several days with no apparent ill effects. While at home he developed a fever and shortness of breath which was subsequently diagnosed as acute bronchial asthma. He was home for three days.

In this case, the injured failed to obey written and verbal instructions to wear an air-line respirator, and the injured's shift leader failed to enforce this rule. Since then, all operators in this group have been reinstructed in the necessity for observing regulations regarding barricade entry, and have been informed that repeated violation of safety regulations may constitute grounds for dismissal.

WRONG TYPE MASK

An employee washing out a chlorine tank car passed out due to insufficient oxygen. A fellow employee put on a Type N universal canister gas mask and entered the car for rescue purposes. He, too, passed out and it was necessary to use self-contained breathing apparatus to rescue both. Fortunately, both men recovered.

* * *

Fire was located in a drying-storage room of steel construction, measuring 8 feet x 50 feet x 30 feet closed by an absestos curtain at one end. There was no possibility of ventilating. The room was located on the sixth floor of a factory and contained a large quantity of "wood flour" (pulverized saw dust), used in casting ornaments, contained in 100# bags. Fire was started by an electric motor in the rear-most portion of the room.

The fire had smoldered for some time and this room was heavily loaded with smoke, and obviously a high CO and CO_2 content. Alarm was sounded when the heat finally built up enough to activate a sprinkler head, which transmitted an A. D. T. alarm. Since very little smoke was visible external to the drying room (which was held at approx. 150°F) the first firemen went in without any protection. They were quickly overcome.

Members of the rescue company followed closely behind using Type N universal canister masks. These functioned well on the sixth floor outside the drying room, but inside, one of these five men was overcome. The other four heeded the warning sign of "overbreathing" and retreated to fresh air before being overcome. These same men returned to the room after donning self-contained breathing apparatus. In all, 30 men were overcome in this multiple alarm fire—multiple only because all men from the first companies were overcome. All the firemen recovered.

NO RESPIRATORY PROTECTION

A chemist was preparing to use hydrogen sulfide for a determination and when the valve was opened, a leak developed because a washer did not seat properly.

Before the employee could close the valve, the hydrogen sulfide was ignited by the flame from a bunsen burner located in the same hood. In an attempt to close valve, the employee re-entered the room, without wearing protective equipment, was overcome, and struck his head on the edge of a bench as he fell to the floor. He was rescued by another employee who was wearing a demand self-contained breathing apparatus. He was hospitalized for three months and as a result of this incident lost his sense of smell.

ANOTHER SOLVENT INCIDENT

Two electricians, journeyman and apprentice, were working in a concrete pit—four by six foot top opening and standing on the bottom, the ground level was in the proximity of their eyes, nose and mouth. Repair of the small motor involved using a solvent an inhibited grade of 1,1,1-trichloroethane. Approximately 10 minutes after entering the pit, the one electrician appeared to be swaying, somewhat in a stupor and somewhat incoherent. A combination of lifting and pushing forced the man out of the pit. The other electrician used the ladder in leaving the pit.

A few minutes exposure to fresh air and the "overcome" electrician stood up and walked to the dispensary. Examination revealed him to be coherent and no signs of narcosis. He rested for about half an hour and returned to his job—by this time the job in the pit was completed.

A few pertinent facts are in order: solvent was not spilled on the floor of the pit, the "overcome" electrician had returned to work that morning after being off for several days due to a bronchial inflammation, and the other electrician never demonstrated or mentioned any ill effects.

INERT GAS IN TANK CAR

A tank cleaner entered a tank car (which had previously contained caustic soda) and started to wash it down with a hose with the bottom outlet open. After failing to reappear in a normal time, investigation revealed the man lying in the bottom of the car. Upon removal and attempts at resuscitation, it was determined that he had died as a result of weak alkali solution having been taken into the respiratory tract.

This is strong evidence that the inert gas used to unload the car was a byproduct of chemical operations, low in oxygen and could have contained carbon dioxide, carbon monoxide, nitrogen and other constituents. Upon checking the air oxygen and 2000 ppm of reducing gases which would commonly be reported as carbon monoxide.

Inasmuch as the official coroner's report stated that the man fell to the bottom of the car apparently due to heat exhaustion, there was no significant publicity concerning this incident. Corrective measures have been taken to avoid any recurrence.

TANK JOB CLAIMS LIFE

A maintenance mechanic lost his life, and his assistant narrowly escaped in tank incident.

Repair work had been scheduled inside the tank to begin after lunch, and two men assigned to the job. The mechanic decided to look over the job about 11:30 a.m. and went into the tank after sending his helper for certain supplies. The inert gas (which contained essentially nitrogen with small percentages of CO and CO_2) supply to the tank had not been shut off, since the mechanic had not informed anyone of his entry. The mechanic was quickly overcome.

His helper returned a few minutes later, shouted for help, then went into the tank to aid the first man who was unconscious. Before help arrived, the helper was also overcome, but both men were promptly removed to fresh air. The helper was successfully revived, but the mechanic could not be brought back to life.

Failure to follow established tank-entry procedures was the reason given for this fatality.

INERT GAS

Two men entered a kettle to repair an agitator, which is normally a two day job. On the first day nothing unusual happened. On the second day the men went into the kettle, worked for an hour, and came up for a coffee break. When they re-entered kettle, they began to feel weak. They were actually too weak to climb out of the manhole after 15 minutes, but finally crawled out. They came to as they stepped out into the air.

After investigation, it was discovered that one of the men had opened an inert gas line instead of an air line. Close to the top of the kettle was a section for a hose line to be piped to outside the building. The hose was only half-way down into the kettle. The inert gas was heavier than air, when they bent over to pick up tools, they would get inert gas until they eventually were made ill.

* * *

An engineer went down to inspect a kettle. He began to feel sick and came out. Upon investigation later they found the kettle had been "blown-out" with inert gas and did not follow through by removing the gas with proper air ventilation. (The engineer recovered immediately upon leaving the kettle)

* * *

A man went into a non-enameled kettle. The complete kettle was blanked off with exception of entrance. The kettle had been "blown-out" with inert gas. He was overcome. It was necessary to resuscitate the man quite a while before he recovered.

ILLUMINATING GAS IN TRENCH

Two men were working in a series of three by seven by seven foot trenches dug along a 75-foot length of a street. While tapping a high pressure illuminating gas main to install a jumper line into a low

pressure main, a drill slipped and opened a valve in the tapping machine. Gas was released into the trench.

One man immediately left the trench, but the other was overcome. A laborer standing on the bank observed this, and immediately descended into the trench. He tied a rope around the waist of the unconscious man before he, too, was overcome. Meanwhile the foreman of the job put on an air-line respirator and went into the trench to close the valve. By the time the two unconscious men were brought to the surface by the foreman, one was sufficiently ill that inhalators could not revive the laborer even after a half-hour of resuscitation. The other unconscious man was revived.

The final score: three men treated at hospital for gas inhalation while one man was dead on arrival.

MASK IMPROPERLY ADJUSTED

A near fatality occurred when an operator went to tighten a chlorine line in the Waste Treatment Plant and the line disintegrated, thus exposing him to a full blast of chlorine. He had his face mask on, but due to maladjustment, he was hospitalized for twenty-four hours.

NARROW ESCAPE

A plant protection officer entered manhole to inspect water valves, collapsed after about three minutes, was unconscious for three and one-half hours, revived by artificial respiration. If there had not been another officer watching and a truck with a rope on it nearby, this would likely have been a fatality. A six inch artificial gas main 30 feet away had broken and the gas had seeped into the hold. No respirator was worn.

METHYL CHLORIDE

A leak developed in the methyl chloride compressor which was being used to transfer methyl chloride from the drier through a tank to storage. The leak was first discovered by a foreman who had heard the compressor pounding and who entered the area to investigate.

Two men inhaled excessive quantities of methyl chloride. An operator entered the area with a filter type respirator, but left when he detected methyl chloride through his respirator. Shortly afterward he was observed staggering and shouting outside. He was wearing a dust respirator. Both men were given oxygen and sent to the dispensary. Each of the men had a pale white complexion with a bright red overtone.

An examination of the compressor after the incident showed a crack along the base of the compressor housing. This was caused by liquid methyl chloride in the compressor.

The tank had been full for three days and had been frosted over, indicating the presence of liquid.

The incident was caused by attempting to transfer through the full tank.

OXYGEN WASN'T THERE!

During degreasing operations involving the use of Freon-113 (Trifluorotrichloroethane), it appears that one operator fell into the tank while attempting to disengage the basket. The other operator, without calling for help, immediately entered the tank to go to his assistance. Both men lost their lives due to suffocation in the oxygen-deficient atmosphere.

In fire safety, we have long hammered at the point of calling assistance before tackling any fire alone. The same point should be reiterated again and again in training personnel where the hazards of suffocation or entrapment exist. In many large chemical plants, personnel are often widely spaced and telephones are not always readily available at all locations. In practically all plants, however, a fire alarm box is located quite conveniently to all operating stations. Pulling the fire alarm box summons trained assistance and supervision in a matter of seconds. Where feasible, employees should be trained to use the fire alarm box instinctively to summon assistance before attempting on their own.

In any case where hazard evaluation discloses the possibility of suffocation or entrapment, personnel should be thoroughly trained to overcome the instinctive reaction to go immediately to the victim's assistance and to summon help first by the fastest available means.

HYDROGEN SULFIDE!

One man suffocated and two escaped death when exposed to H_2S.

This accident was caused when a precipitation tank overflowed and spilled acid-bearing liquor on the floor. The liquor drained into a sump near the leach station and was then pumped into a reserve holding tank. Later, pipes from a reserve sulfide holding tank were disconnected, allowing the contents to drain on the floor.

The sulfide, during clean-up was washed into the sump and then pumped into the same reserved holding tank. An immediate reaction generated large quantities of H_2S, filling the area surrounding the tank. Unaware of this, three employees entered the area.

The first employee collapsed just as he passed the tank. The remaining two men walked a few feet further; one collapsed and the other reached a window and called for help. Other members arrived and gave artificial respiration while the ambulance was summoned. On arrival at the hospital, the first employee was pronounced dead.

Processing plants and laboratories in the program contain the elements to produce not only gases like H_2S but disastrous fires and explosions as well. These can occur from an uncontrolled chemical process reaction or, as in this case, from improper mixture of two chemicals. Infrequently, storage of incompatible chemicals can be separated physically for safety, which was done here afterward. More reliably, however, the employees should be instructed fully in the adverse effects of chemical combinations possible in the operation.

ALIPHATIC HYDROCARBONS

A pipe-fitter, aged 26, was gassed by aliphatic hydrocarbon fumes in a pit 20 feet by 10 feet by 6 feet deep in an oil refinery while he and another man were inserting a blank in a pipeline which had been shut off. Both men were wearing breathing apparatus supplies with air from a hand-pump, a Y piece being used to supply the two sets of apparatus from a single pump.

While working in the pit, the pipe fitter, who was apprehensive and difficult to reassure, was seen to remove his mask. The safety attendant, who, with the foreman, was watching from ground level, replaced the mask and assured him that it was working properly. When the joint was opened, some liquid escaped owing to residual pressure, and the pipefitter endeavored to come away, but was persuaded to return.

Later, when he again attempted to leave the pit, his airline caught on the bottom of the handrail and impeded his exit. This caused him to panic and he took off his mask. The foreman and the safety attendant running to his assistance, pulled him to safety as he collapsed. His workmate continued to work in the pit without any trouble.

After being given artificial respiration and an injection of coramine, the pipe-fitter was removed to hospital where he recovered. The apparatus which he had been wearing was subsequently found to be in good order, but it was unwise to compel him to work under circumstances of which he was obviously afraid.

AMMONIA

One afternoon, while the engine-room foreman of an ice-cream factory was standing near an oil separating unit, there was a report and ammonia liquid and gas issued from the sump. It was later found that the rubber seal between the sighting glass housing and the sump had "blown." The engine room was immediately evacuated, the foreman taking with him a canister respirator from a rack.

The fire brigade was called and warning given to all employees in the factory. As the concentration of gas was too high for the canister respirator, the foreman was unable to re-enter the engine room to reach the ammonia isolating valve. The gas spread rapidly through the factory area and many of the 100 employees, most of them women, were affected.

There was some degree of panic and some women were rescued from the canteen by firemen. Sixteen women employees and two firemen were admitted to hospital but only three persons were detained overnight. Seven of the women were sufficiently affected to require notification. Occupants of houses within a radius of 50 yards of the factory were also affected. The firm had already been advised to provide self-contained breathing apparatus and they were again advised to keep apparatus of this kind outside the engine room as well as the canister respirators.

TWO FATAL ACCIDENTS WITH BENZENE VAPOR

In one accident a laborer, aged 23, was fatally gassed and an ambulance room attendant and a fireman were also gassed while

attempting to rescue him. The foreman had given instructions for four of a series of 16 benzol tanks to be cleaned after they had been steamed out, tested and declared free from gas. While the laborer with his workmate was preparing to start work on a tank which had been steamed out, he enquired about another tank which had not been steamed and was told they were not instructed to clean that tank.

When the workmate returned after fetching a respirator and a lifeline he saw that a ladder and hose pipe had been lowered into the unsteamed tank and that the laborer had unaccountably entered without a lifeline or respirator. After shouting for help he attempted to enter the tank, at the bottom of which there was about 12 inches of liquid, but was forced to come out because of the fumes.

During the rescue operations a fireman, who in his hurry entered the tank without a mask, was gassed, as was the ambulance room attendant who had donned a fresh-air mask and a lifeline but dislodged his face mask while in the tanks and lost consciousness. The laborer was given artificial respiration and oxygen but failed to recover.

The other fatal case was a benzol house attendant aged 47, who was found lying prone and unconscious on the floor, which was saturated with benzol. He was immediately dragged into the open air and artificial respiration was started at once, this being continued with the aid of a rocking stretcher, oxygen also being given. Despite this treatment, he was found to be dead on arrival in hospital.

When the distillation temperature had been reached it was the attendant's duty to reduce the steam sufficiently to allow distillation to proceed in the normal manner. If this was not done, the crude motor spirit would boil rapidly and would eventually overflow on to the floor. After the accident, the plant was found to be in order, and it was assumed that the accident was due to the use of too much steam.

CARBON DISULPHIDE

Following the discovery of a leak at a rotary valve on an electric arc furnace used for the preparation of carbon bisulphide, the manager decided that breathing apparatus was necessary while repairs were being effected and he issued a permit-to-work certificate accordingly. Without being instructed to do so, a laborer climbed up a ladder to the top of the furnace.

He was not wearing breathing apparatus and, being overcome by escaping gas, he fell to the ground about 10 feet below. After recovering consciousness he was able to walk to the ambulance room.

FOUR CASES OF CHLORINE POISONING

In four cases in which only slight exposure to chorine gas occurred, the effects were stated to have been aggravated by the existence of a previous chest condition. One of these cases was a plant operator who inhaled a whiff of chlorine when adding hydrochloric acid to a reaction vessel under negative pressure, after having put in a slurry of sodium chlorite. The doctor who treated him in hospital considered that the inhalation of a small amount of chlorine had "triggered off" an acute attack in a man subject to asthma.

A process operator, aged 32, whose exposure to chlorine from a leak in a plant for the chlorination of dimethylacetal was slight, suffered from cough, breathlessness and pain in the chest. The chest physician, who found a lesion in the left upper zone and kept him under observation at rest at home to assess the activity of the tuberculosis lesion, thought the infection was a factor greater than chlorine exposure in this case. A night watchman, aged 58, said to have had a previous chest condition, suffered from a sensation of choking, cough and respiratory tightness following a slight leak of chlorine from a control valve.

The fourth case in this group was a fitter, aged 57, who, with other men was cleaning an air-cooler plant from which some water containing four p.p.m. of chlorine was leaking. The other men were unaffected by the small amount of chlorine, but the fitter, who was stated to be a heavy smoker, which caused him to cough continuously, became unconscious and suffered from lachrymation and cough.

IMPROPER VENTILATION

A laboratory technician was cleaning a vessel with a mixture of hydrochloric and nitric acids. The work was being done at a sink in front of an open window. However, there was not sufficient ventilation to prevent the worker from inhaling fumes to make him sick to his stomach. The proper type Canister Respirator was available on the lower floor but the person was not familiar with its use.

NO RESPIRATORY PROTECTION

Several specific instances are known where personnel should have worn protective equipment and did not although it was available and the specific personnel were familiar with use. For the most part these instances involved professional grade personnel of the "difficult personality" category engaged in Research and Development. Injuries were in all of these cases from volatile vesicants, and though injuries were serious enough to have resulted in lost time, there was, in fact, no lost time.

In one instance the employee was convinced to use recommended safety procedures by a combination of greatly increased supervisory pressure and alarmist industrial hygiene propaganda. In another instance such stresses produced no apparent effect.

RESPIRATORY PROBLEMS

We have had people injured while they were wearing respiratory equipment and also we have them injured by not wearing them even though they were available. Some of the latter are the "Smoke Eater" type who think they can get along without the stand-by equipment.

A basic problem with any respiratory protective equipment is knowing the limitations of a particular device. Actually, the popularity of the self-contained breathing apparatus can be attributed to the fact that its limitations are far less than any of those that depend on chemicals for air purification. In addition, the operator does not have to be concerned in knowing whether there is sufficient oxygen in the air.

In one particular process we were confronted with a number of stages in which reactants were more or less open to the atmosphere. In spite of a number of spot ventilators there was a prevalence of noxious odors, most free chlorine.

Chlorine is considered here for its nuisance and noxious characteristics rather than for its toxicity. Even small amounts have a definite odor and they usually cause an operator to get out of the contaminated area. This latter incidently provided cause for an additional problem and usually ended in a lost time injury. Many times the individual would go outside for fresh air where it was too cold for his condition. He would catch cold and would come near to developing into pneumonia.

During the time this particular process was being developed, operators got used to the chlorine type odor. At this same time the self-contained breathing apparatus was not the popular item it is today. A chemical cartridge respirator was what they generally carried draped about their neck. Probably many times the trouble was located and the mask removed after the contaminated area was under control without the operators' having an exposure.

A number of times though, the capacity of the cartridge was unknowingly depleted by prior uses. Then again, the general contamination would instill in the operator the idea that his mask was O.K. when it really wasn't. The operator would then prolong his trip beyond limits and have an exposure. To sum up then an operator:

a. would not know the conditions of his mask because he was generally conditioned to the contaminant.

b. would not know the remaining capacity of the mask.

c. would realize that the mask was not working but would remain in the area thinking he could get by or hold his breath a moment longer in order to complete the job.

The second part of the problem refers to the people that do not use the equipment that is available. These are the "Smoke Eaters" or the ones that think they can chance it. Even today with the self-contained breathing apparatus available, this practice continues. I witnessed an entry to a contaminated area (FH fog).

This particular entry was made for no good reason at all. Two men were putting their self-contained breathing apparatus on and this fellow decided to go in with a handkerchief over his nose. It turned out that the men wearing self-contained breathing apparatus made the necessary emergency shutdown, ventilators soon decontaminated the area, and normal entry could be made.

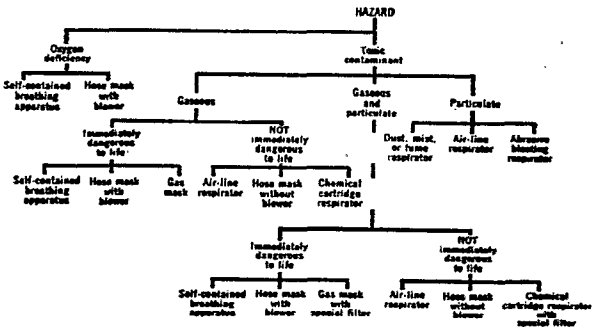
1957 National Safety Congress

SOAP DUST

Our operation is essentially a soap manufacturing plant and the air in our factory is frequently contaminated with soap dust from detergents and dust arising from fine woodflour and cornmeal. We issue our employees a dust mask (not Bureau of Mines approved). The filter element consists of a honeycomb construction of whipped foam latex.

This device does a modest job of filtering, however, we have never been completely satisfied. Despite the fact that we have issued masks to all personnel about half of our personnel prefer to use an ordinary handkerchief wrapped about their face which appears to do a satisfactory job without the unpleasantness of the dust mask.

OUTLINE FOR SELECTING RESPIRATORY PROTECTIVE DEVICES



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LABORATORY AND PILOT PLANT SAFETY

(A Symposium)

LABORATORY BARRICADING OF HIGH PRESSURE AND EXTRA HAZARDOUS REACTIONS

by GODFREY J. MOLL

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Safety engineers are often called on to formulate or approve plans for laboratories in which high pressure or extra hazardous reactions will be safely operated. In these designs the protective shield or barricade is the only fixed piece of safety equipment which will remain operable 100 per cent of the time. Equipment, instrumentation, and safety devices are all apt to fail at any time regardless of maintenance and inspection. The judgement of the best-trained operating personnel need only be wrong once. The barricade may be considered as the primary safety device.

High pressure and extra hazardous research projects are being carried out in unbarricaded laboratories in many universities and at some industrial research centers in the United States. Workers at these installations will point with pride at their perfect safety record, but tomorrow might yield their first and last accident. The management of CIBA Pharmaceutical Products Inc. of Summit, N. J., has recognized the risk involved in not barricading high pressure reactions.

Our high pressure laboratory was constructed in a built-up area presenting the problem of not only protecting the operating personnel but also the personnel of adjacent buildings from the effects of missiles and shock waves. A suitable barricade was constructed of 16-inch reinforced concrete with a reflector wall of similar construction eight feet from the frangible wall. Further protection was provided by hanging one-half inch wire rope blast mats between the building and the reflector wall, which would operate on the ballistic pendulum theory in stopping missiles and dissipating shock waves. This is but one approach to the problem of barricading.

The question often arises as to what should be considered hazardous enough to warrant the expense of barricading. Some authors feel that when equipment is installed to handle inflammable materials at pressures greater than 500 psi the use of some form of barricade should be considered. When research at high gas pressures or work on known explosives is conducted the protection of personnel and other facilities with an adequate barricade must be considered.

In small-scale flow experiments where the amount of material in process is small, it is common to use pressures as high as several thousand pounds without special barricades. Once it has been decided to build a barricade there are still many questions to be answered. The two most important as far as the barricade is concerned are the materials of construction and their thickness.

MUST KNOW MISSILE

If we knew the velocity, weight and shape of the missile and the maximum force expected from an explosion, we could design a barricade using a minimum wall thickness. Barricades must be designed to prevent penetration by large missiles at low velocity, such as reactor heads, and also small missiles at high velocity, such as tubing, nuts or other small fittings. Penetration is dependent upon the velocity of the missile at impact, the physical properties of the missile, and the characteristic of the material used to construct the barrier.

The speed of sound has been suggested as a velocity, as most objects when propelled through air decrease in velocity to the speed of sound. If missiles of higher velocity are expected, the modified Petry equation for penetration can still be used to calculate a

satisfactory wall thickness. Ballistic tests have shown that if the velocity of missile is twice that of sound, the depth of penetration is almost quadrupled. High pressure autoclave heads have sheared eight-inch "I" beams without being stopped and have penetrated as much as 40 feet into dirt embankments before being stopped.

A barricade which will prevent penetration if designed properly can withstand the blast effects of explosive gases and the shock waves of a detonation within the equipment. The thrust of an explosion should be absorbed by the main framing of the building behind the barrier and the floor of the cubicle should be of sufficient thickness and weight to resist the turning moment created by the pressure on the barricade. It is assumed that some form of frangible wall or relief area will be included in the design with a recommended minimum of five square feet of relief area for every 100 cubic feet of volume.

Many formulas have been proposed to find the resistance to penetration of various materials. Although most of them have a theoretical basis, practically all involve constants for different types of materials. The formulas which seem to be the most logical are the sectional pressure formulas. The formula proposed by Petry in 1910 with additional constants arrived at by Bazant in 1937 for more recent building materials were the standard used in British bomb shelter construction. Knowing the weight and area of contact of the largest probable missile it is possible to calculate the minimum thickness of any desirable building material to be used as a barricade.

CONSTRUCTION METHODS

There are seven basic methods of constructing effective barricades in use today:

1. Earth embankment or underground cell
2. Sand bag barrier
3. Rope or steel matting
4. Steel boiler or armour plate
5. Various sandwich-type constructions
6. Reinforced concrete
7. Protection based on the ballistic pendulum theory

Of these reinforced concrete and steel in various forms are the most widely used.

For extremely hazardous reactions the use of earthen or underground barricades provides a maximum in protection at a minimum in cost. For every eight feet of sandy soil placed between an operator and a reactor the equivalent of one foot of reinforced concrete is realized. The added cost of complete remote control operation in some instances might offset the savings afforded by the use of the natural barrier earth. The advantage of soil over the other types of materials can be realized in the construction of embankments as safety or reflector barriers to protect the surrounding area. Army and Navy Ordnance have long made use of this type of barricade.

As a temporary protective shield a three-foot thick wall of sand bags filled with dry sand cannot be beat in cost and availability. When a hazard is recognized and a shut down would cause delay of a research project, a sand bag wall would solve the problem until a more permanent installation could be constructed.

ROPE, STEEL MATS USED

The use of rope mats as protection against missiles has been practiced many years. Steel blast mats have found their maximum use as missile-proof ceilings in installations where the roof is part of the relief area. Mats are also hung a few feet away from frangible walls to deflect missiles. As an additional or auxiliary protective barrier the steel mats cannot be excelled.

Modern tanks require a minimum of five inches of steel armour plate to stop high-velocity armour piercing shells. Fortunately the missiles encountered in a normal laboratory explosion do not have a propellant to maintain their velocity and will decrease in velocity to the speed of sound in air. Steel plates may therefore vary in thickness from a quarter inch to one inch according to the severity of the hazard. Accidents involving barricades of the riveted or bolted type construction have shown that the weakness of the rivet or bolt can produce additional missiles on the operating side of the barricade.

It has been found that a continuous weld on both the inside and outside of the steel plate will provide five times the resistance to shock wave damage as a single weld on the outside. Steel panels should be fastened to angle irons or structural members that are an integral part of the building and not bolted to the concrete floor with expansion bolts which would not prevent the entire barrier from being overturned by a major explosion. Care must be exercised to prevent corrosion of the steel which would rapidly lower its effectiveness as a barricade.

Field tests performed by the Ordnance Department of the U.S. Army have shown that two steel plates with an air space in between are 20 to 30 per cent more resistant to penetration than a single plate whose thickness is equal to the two plates. This essentially is a sandwich-type construction and eliminates the necessity of bracing to increase the steel plates' resistance to shock waves. The steel plates are often welded to two-inch pipes imbedded in the concrete of the structure or to four-inch "I" beams which are part of the structural steel.

REDUCE SHOCK WAVES

By introducing dry sand into this steel sandwich it is possible to reduce the shock wave transmitted to the outer member. Other fillers which will not pour through holes drilled for control purposes have been successfully used, such as cotton batting, rope, wood, and more recently fiber glass insulation which will also contribute to the warmth of the building.

Another method of reducing the shock from flying missiles is to place a wooden barrier on the inside with the steel on the outside. This may also be filled with a desirable filler. Where space is extremely limited the entire sandwich wall can be mounted on floor casters and overhead trolleys so that it can be rolled out of the way when not required. Steel has one distinct advantage over concrete as a material of construction in that it is able to absorb about 1,600 times as much energy per unit volume; hence, enormous masses of concrete are required to provide energy capacities equivalent to steel.

During the war it was shown that massive walls of concrete do not afford unlimited protection. A test missile with a velocity of 2,000 feet per second was able to penetrate 23 feet of reinforced concrete and emerge with a residual velocity estimated at 300 feet per second. Missiles of this velocity are not likely in laboratory work, and walls of this thickness are out of the question. Many factors determine the effectiveness of reinforced concrete as protection against penetration by missiles. Concrete with a crushing strength of less than 4,000 psi should not be considered for barricade construction. To obtain resistance to penetration, one-half to three-quarter inch reinforcing rods should be placed in both faces of the wall with a maximum spacing of six inches in both a horizontal and vertical direction.

Lateral reinforcement with three-eighths to one-half inch rods on a maximum of 12 inch centers would decrease scabbing on the outside of the wall. One laboratory uses an "anti-scabbing" plate of steel on the operating side to guard against spalling. Welding at all intersections would provide additional protection against penetration. Data from the Bureau of Yards and Docks on the use of reinforced concrete is included in the Appendix.

There is a wide spread of opinion as to what is an adequate barricade, which is evidenced in the manner in which the various laboratories have constructed their barricades. The type of research conducted determines the best type of barricade to use. One research laboratory has an extremely flexible system using one-half inch steel plate as the barrier. The high pressure equipment is mounted on a one-half inch steel plate welded to two pieces of six inch channel iron to which a front one-half inch steel plate is welded and braced. This assembly is placed into a cubicle which has a frangible wall and relief type ceiling.

The necessary facilities are connected from the outside through steel overhead hatches. The front panel is fastened rigidly only at the top which in case of an explosion will allow the unit to take advantage of the ballistic pendulum theory developed by Robins in 1740. This flexibility allows the shock wave time to burst the frangible wall without creating undue stresses in the barricade wall.

Having established a satisfactory method of barricading a reactor, care must be taken not to reduce the effectiveness when introducing the remote control systems necessary for operation. Openings for tubing, control rods, visual inspection, and other

necessary breaches of the barrier must be engineered so as not to weaken the wall. If the method of entry to the hazardous area is to be through the barricade wall, the closure used, whether it be a sliding or swinging door, should be designed to withstand the same conditions as the barricade itself. Baffled entries leading into an operating area have not proven satisfactory for stopping or dissipating blast waves which are not affected by turning corners. It takes only about one pound per square inch to hurl a person about and at seven pounds per square inch the ear drums are fractured.

LOOSE ITEMS DANGEROUS

The hanging of control instruments and other accessory equipment on the outside of a barricade wall has proven to be a dangerous condition. Shock waves passing through the wall are transmitted to these relatively loose items casting them about the operating area. If at all possible the barrier wall should serve only one function and that is to protect the operating personnel. It should not be weakened by drilling and tapping to support items which could be easily supported in other ways.

The physical location of the high pressure or extra hazardous laboratory will determine the type of construction and the need for a safety or reflector wall. Regardless of the amount of open space behind the frangible wall the hanging of a steel blast mat curtain or the forming of an embankment should be considered to protect personnel who might accidentally wander into this area. When a laboratory is located in a built-up area the reflector wall should be at least as heavy as the barricade itself.

Barricades are too often based on the make-it-big and make-it-thick principle. If the operators of high pressure and extra hazardous laboratories would pool their accident histories, it would be possible to evaluate the various barricade designs and check the validity of the application of ballistic information on missile penetration.

APPENDIX

Sand Bag Walls—Filled sand bags are 20 inches by 10 inches by five inches and contain one-half cubic foot of sand. These walls require about 40 to 50 bags per foot of length.

Proportions, Strength Requirements for Portland Cement Concrete

Nominal Mix	Minimum resistance to crushing (cube strength) in lb/in² within 28 days after mixing	
	Preliminary	*Works*
1:1:2	5250	4500
1:1-1/2:3	4375	3750
1:2:4	3500	3000

Empirical Expression for Penetration

Petry Formula

$$D = KA_p \log_{10}\left(1 + \frac{V^2}{215{,}000}\right)$$

D = depth of penetration, ft.

K = experimentally determined coefficient of penetration ft²/lb

A_p = sectional pressure, weight of missile divided by its maximum cross-sectional area, lb/ft²

V = impact velocity, ft/sec

Values of Penetration Coefficient (K) for Various Materials

Material	*K, ft²/lb*
Soft soil	0.0732
Soil with vegetation	0.0482
Pine wood	0.0410
Sandy soil	0.0367
Oak	0.0328
Gravel	0.0205
Brickwork	0.0205
Stone masonry	0.0117
Concrete (1)	0.00799
Limestone	0.00538
Reinforced concrete (2)	0.00476
Specially-reinforced concrete (3)	0.00282

1. Mass concrete with a crushing strength of 2,200 psi
2. Normal reinforced concrete with a crushing strength of 3,200 psi and a 1.4 per cent of reinforcement
3. Specially-reinforced concrete with a crushing strength of 5,700 psi and 1.4 per cent of reinforcement.

When calculating the depth of penetration, D, the effect of relative thickness must be considered. If the barricade thickness is only 2D, the wall will be penetrated. The thickness must be not less than 3D to prevent penetration.

Various Barricades Used by Industrial Research Laboratories

Steel

1. 3/8-inch all welded steel plate with 2 x 2 x 1/4-inch angle iron stiffeners welded with 3-inch welds every 6 inches.
2. 1/2-inch steel plate fastened at the top and weighted-down by the weight of the reactor attached to a steel platform welded to the front plate and braced by angle irons.

Steel and Wood

3. 1/2-inch steel plate with 3/4-inch plywood fastened to inside wall.

Double Steel

4. 1/4-inch steel plates welded to 4-inch "I" beams, no filler.

Double Steel, Sand-filled

5. 3/8-inch steel plate inside and 1/4-inch steel outside welded to 4-inch "I" beams with space in between filled with dry sand.

Steel, Wood, and Sand

6. 1/2-inch steel plate with 2-inches of wood on the inside and 4 inches of sand in between.

Reinforced Concrete

7. 8-inch reinforced concrete.
8. 12-inch reinforced concrete, two companies.
9. 12-inch concrete with 3/4-inch steel reinforcing rods on 6-inch centers, both horizontally and vertically in both faces of wall.
10. Same, except with 1/2-inch steel rods.
11. 16-inch concrete with 1/2-inch steel reinforcing rods on 6-inch centers, both horizontally and vertically in both faces of wall. 3 companies.
12. Same, except with 3/4-inch rods on 4-inch centers, and lateral reinforcement with 3/8-inch rods on 12-inch centers.
13. 18-inch reinforced concrete.

Reinforced Concrete and Steel

14. 18-inch reinforced steel with a steel plate on the operating side to prevent injury from scabbing.

FLAMMABLE MATERIALS—SYSTEM FOR RATING

by **WILLIAM S. WOOD**

safety engineer, research and development dept., Sun Oil co., Marcus Hook, Pa.

The purposes of this committee as set up last spring were as follows:

1. To review published information on flammable materials.
2. To collect ideas from the members of the laboratory subsection by means of a questionnaire.
3. To present information on flammable materials as applied to laboratory and pilot plants.
4. To study the definition of flammable hazard in the hope of improving standards of use in laboratories.

This last objective could permit the most realistic recognition of flammable hazards in laboratories and lead to better control of amounts, improved procedures for safe use and the optimum in protective measures.

Perhaps the most promising approach is that taken by the National Fire Protection Assoc. Committee on Classification of Materials under the chairmanship of J. Sharp Queener. The three part proposed classification system is briefly outlined at the bottom of the page.

A questionnaire was made up by the committee to find out how laboratory safety men evaluate the flammable hazard of materials frequently found in their areas of work. About 150 questionnaires were mailed out and 30 were returned answered. A few declined to answer because of insufficient experience. Others were unwilling to answer the questions as presented and expressed their reasons.

A number of notes and comments on the questions and their answers are listed following the question. These remarks were perhaps the most important gain from this effort.

NEW NFPA COMM. ON CLASSIFICATION OF MATERIALS

Flash Point & Vapor Pressure	*Stability*	*Health Hazard*
1. Flash above 140°F	1. Normally stable	1. Low hazard. No injury if no treatment is given.
2. Flash 100-140°F	2. Reactive with strong contaminant or catalyst.	2. Light hazard. Minor injury if no treatment is given.
3. Flash 73-100°F	3. Reactive with contaminants including water. Self reactive at elevated temperature or pressure.	3. Major injury if no treatment is given.
4. Flash below 73°F a. BP over 100°F or RVP below 14.7. b. BP under 100°F or RVP above 14.7.	4. Detonate with shock.	4. Major injury in spite of prompt treatment.

QUESTIONNAIRE ON FLAMMABLE MATERIALS

1. Please indicate below in order of importance the factors you consider in evaluating the flammability hazard of a material.

	Gas			*Liquid*			*Solid*		
	1st	*2nd*	*3rd*	*1st*	*2nd*	*3rd*	*1st*	*2nd*	*3rd*
Flash Point	3	2	2	16	4	1		4	
Fire Point		1			4	2	4		1
Vapor Pressure	1			2	9	2	1		2
Lower Flammable (Explosive) Limit	13	5	2	2	4	6	1	1	1
Upper Flammable (Explosive) Limit		6	2			2			
Spread of Flammable Limit	3	3	2		4				
Autoignition Temperature	3	3	5	3	1	3	5	2	2
Vapor Density		2	3		1	1			
Boiling Point					1				
Melting Point								1	1
Water Solubility						1			
Particle Size								5	3
Special Properties									
Impact Sensitivity	1			2			4	2	2
Spontaneous Heating					2		2	2	2
Friction Ignition		1	3					2	
Ignition by Moisture Absorption						1	1	1	2
Spontaneous Ignition in Air	1		3				4	2	3
Ignition by Moderate Heating		2				3		1	5
Other (Specify)									
Compatability with other chemicals									
Decomposition during storage									
Means of fire fighting									
Rate of flame spread									
Toxicity									

Comments: The order of importance varies with material and also with environmental circumstances. The relative importance of a characteristic depends on its test value. NFPA Committee on Classification of Materials had 35 hazard characteristics.

2. In your laboratory, do you limit quantities of flammable materials on the basis of items marked in (1)? Yes 25 No 2

	Single factor	*Combination*
a. In laboratory areas	10	15
b. In process in glass	5	9
c. In process in pilot plants	1	7

If combination, give an example showing relationship.

Comments:

—Limit solvents in glass to 1 quart.

—Generally keep less than 1 liter of volatile materials.

—Limit solvents in safety cans to five gallons.

—Five gallon limit—avoid five gallons in glass where possible.

—Limitation based on amount of damage possible if all of the material were to catch fire.

—Should be limited, usually on a combination of factors but occasionally on one outstanding.

—NFPA classification (which?)

—Would allow methanol in dry ice traps in areas not explosion proof since the methanol temperature would be below the flash point.

—Due to nature of work we must disregard lower explosive limit and provide more than adequate ventilation.

—Sodium, metal hydrides, aluminum alkyls, sodium amide and extremely toxic materials are segregated.

—Raney nickel in glycol is not hazardous, in acetone it is a great hazard.

3. Do you specify safety cans or other containers for use in laboratories based on the properties indicated in (1)?

Yes 23 No 3
Single factor 13
Combination 10

Comments:

—No Class I or II liquid in glass larger than one quart.

—Original suppliers metal containers not larger than five gallon.

—All solvents must be stored in safety cans.

—Safety cans specified for more volatile flammable liquids, acetone, ethyl acetate, etc.

—Should require safety cans for larger quantities. Small amounts in glass or plastic may be justified to avoid contamination.

—Specified in some cases for large quantities.

—Containers specified primarily for insurance and toxicity reasons—based on volume of use.

4. Do you provide special or additional fire equipment based on the properties indicated in (1)? Yes 20 NO 5

Single factor 5
Combination 15

Comments:

—Provide automatic dry chemical units in hoods where 5-12 liters of flammables are used.

—Combination of extinguishers for various materials.

—Provided on basis of flammability and reactivity of the chemical with the extinguishing agent.

CO_2 extinguishers used throughout. May be supplemented by dry chemical or powdered sand for metals.

5. On what basis do you specify Class I Group D electrical equipment in areas where flammable materials are used?

Do not specify 3
Do specify 22

Comments:

—National Electrical Code, Article 500.

—Local state laws.

—Plant standards.

—For all test cells from floor level to about four feet.

—Where Class I flammables are used or stored.

—Where Class I or II flammables are used or stored.

—Where extremely flammable materials are to be used.

Where high vapor pressure, low explosive limit gases or solvents are used.

—where highly flammable liquids or gases are customarily used.

—Where flammable vapors may be present in the atmosphere.

—Where large quantities of volatile flammables are used.

—Where oxidizing or flammable metal powders are used.

—Quantity of gases and liquids and degree of hazard in (1).

—Where spills will occur.

Each area analyzed separately and classification made on basis of all factors considered in (1).

—All centrifuges and vacuum pumps are equipped with explosion proof motors so they can be used anywhere.

6. How would you rate the following with regard to flammable hazard? Check in proper column.

Gases	*Extreme Hazard*	*High Hazard*	*Moderate Hazard*
Acetylene	21	7	2
Ammonia	—	3	27
Butadiene	11	11	7
Carbon Monoxide	5	14	10
Coal Gas	4	17	4
Ethylene	7	18	3
Hydrogen	24	6	1
Hydrogen Sulfide	9	5	15
Methane	2	17	6
Oxygen	5	8	9
Propane	5	15	5

General Comments: (apply to gases, liquids and solids)

—NFPA Committee on Classification of Materials has four categories.

—Hazard depends on circumstances of use.

—An explosives laboratory considered that none represents more than moderate hazard assuming (1) Control of quantity. (2) Skilled and trained personnel and (3) Proper laboratory equipment.

7. How would you rate the following with regard to flammable hazard?

Liquids	*Extreme Hazard*	*High Hazard*	*Moderate Hazard*
Acetic Acid (Glacial)	—	4	25
Acetone	8	15	8
Benzene	7	18	6
Carbon Disulfide	22	7	1
Cellosolve	—	8	21
Cyclohexane	7	14	7
Diethyl Ether	21	6	3
Ethyl Alcohol	1	13	17
Gasolune	10	14	7
Isopropyl Alcohol	1	11	17
Kerosine	—	2	29
Methyl Alcohol	3	14	14
Methyl-ethyl-ketone	3	19	8
n-Hexane	6	18	6
Oleic Acid	—	—	25
Stoddard Solvent	—	6	22
Turpentine	—	4	22

Comments:

—Low hazard category designated by one respondent for 10 liquids including MEK.

—Very moderate hazard designated by another for cellosolve, cyclohexane, kerosine, oleic acid.

—Alcohols, methyl, ethyl and isopropyl were considered extremely hazardous because of flammable limits.

8. How would you rate the following with regard to flammable hazard?

Solids	*Extreme Hazard*	*High Hazard*	*Moderate Hazard*
Benzoyl Peroxide	18	6	4
Cellulose Nitrate	15	9	3
Excelsior	1	7	18
Li Al Hydride	12	9	3
Lithium	8	12	4
Magnesium Chips	4	16	7
Paraffin Wax	—	2	23
Phosphorus Yellow	14	4	5
Potassium	16	10	2
Raney Nickel	8	13	2
Sodium	14	11	2
Sulfur	—	6	21

Comments:

Cellulose Nitrate Dry—extreme hazard
Wet—moderate hazard

General comments on the entire questionnaire.

Cannot be rated without knowing conditions of use. The questionnaire showed how little we knew about properties of hazardous materials. Most standards are based on NFPA recommendations. One NFPA subcommittee is covering "dangerous reactions."

Demonstration of flammable hazard of alcohols suggested. (Put alcohol on rag, place in can, shake, ignite.)

Conclusions from results of the questionnaire.

Although flash point and flammable (explosive) limits are the most widely accepted criteria of flammability, most people take other properties into consideration as well.

Sometimes one particular property other than flash point will carry great weight as for example, shock sensitivity, reaction with water, spontaneous ignition or low ignition temperature.

Notations as the questionnaires returned showed that knowledge of the environmental conditions and of the properties of the individual material are essential to the proper evaluation of flammable hazard.

Some answers indicated a lack of information about the properties of materials and also an insufficient grasp of the significance of the properties listed in literature. Laboratory safety men need the best in educational background, adequate information sources and then constant study to prepare them to do an adequate job.

Recommendations:

I suggest that this committee be continued and that it work closely with others such as the NFPA Committee on Classification of Materials contributing such ideas as may stem from laboratory experience.

To this end a complete bibliography and library of information on classification systems should be maintained as a service to the subsection. Information on new compounds and materials should be sent to the committee for general reference or distribution.

Another suggested activity is the collection from many people in the laboratory subsection of accounts of fires they have had involving flammable materials. Large or small they would help instruct all of us in proper measures for fire prevention and extinguishment.▲

TOXIC CHEMICALS

by R. V. MONTELLO

Research division, National Cash Register co., Dayton, Ohio

We do not have to let them die!

Many millions of man-hours with no lost time due to serious injuries to employees are being worked in one of the most hazardous occupations of all times, the field of atomic energy. This is possible only because the hazards are recognized and the proper precautions to preserve human life are faithfully observed.

Great strides have been made in overcoming many occupational diseases which a few years ago due to a lack of safety knowledge meant a serious loss of health and even death.

This improvement has come about not without much personal effort on the part of many individuals either singly or through committee action.

The laboratory sub-section of the Chemical Section of the National Safety Council has appointed a new committee to study the problem of Toxic Chemicals. The members of this committee are John E. Fox, Monsanto Chemical company, Texas City, Texas; Robert A. Quisno, Hill Top Research Institute, Inc., Miamiville, Ohio; and Ralph V. Montello, National Cash Register company, Dayton, Ohio.

INFORMATION DECENTRALIZED

Today there is much good and useful information on the toxicology of dangerous chemical materials. The unfortunate part is that this information is not available in any one place. Talk to any two people on the subject of toxicology and you soon realize that each will have some different source of information about dangerous chemicals. A study of the availability of information regarding the hazards of chemicals used in the chemical laboratory or pilot areas shows a rather varied list of sources for this type of information.

Virtually every technical magazine features articles from time to time on some hazardous chemical or process which yields hazardous chemical by-products. A check on the number of scientific magazines estimated by one librarian revealed 50,000 current world-wide publications. When we consider the field of insecticides, pesticides and herbicides, we find important safety articles in magazines that are distributed in the suburban and farm home.

If we move over to the field of paints and organic coatings and finishes, we find in addition to the technical magazines, interesting articles in such magazines as the *Ladies Home Journal*. Countless articles covering a wide number of hazardous chemicals are published by various governmental agencies. It is indeed fortunate that manufacturers of new chemical products both raw and finished materials go to great lengths to thoroughly analyze their products to obtain toxicological data.

COLLEAGUES EXCHANGE NOTES

This information is available through the manufacturer and may not appear in published form anywhere else. The practice of writing to a colleague with particular experience in the field of the new chemical is believed to be widespread. Supplementing all this information on dangerous chemicals with books on specific fields like the solvents, with the many excellent safety articles in safety magazines, and with the wealth of unpublished information in private, university, and industrial laboratories, we are impressed with the formidable task required to be well informed on toxic chemicals.

The tremendous growth of chemical research in recent years has created an expanding field of industrial toxicology. One author estimated that more money was spent on chemical research in the past eight years than was spent in all of the rest of this century.

This committee aims to cooperate with all persons promoting safety in the use of toxic chemicals so that the hazards of these materials to human health can be recognized and proper protection used to meet these hazards in the most efficient manner.

Deciding which chemicals are toxic and those that are not depends upon the definition one chooses. *Webster's* dictionary, for instance, defines the word, toxic, as "1. of, pertaining to, or caused by poison or a toxin 2. Affected by a toxin 3. Poisonous."

Handbook of Dangerous Materials by Sax lists "toxicity as the sum total of all harmful effects upon a warm-blooded animal." It goes on further to explain that "toxicology is the study of the manner in which these toxic materials produce their poisonous effects on the body."

VARIED DEFINITIONS

In the new, completely revised and enlarged edition of the *Handbook of Dangerous Materials* by Sax which is entitled "Dangerous Properties of Industrial Materials" toxicity is defined as "The ability of a chemical molecule or compound to produce injury once it reaches a susceptible site in or on the body."

It goes on to state that "Toxicity hazard is the probability that injury may be caused by the manner in which the substance is used." The new definition of toxicology is: "In simple terms, toxicology may be defined as the study of the action of poisons on the living organism. Industrial toxicology is concerned with the human organism and consequently lies within the broad field of medicine. Since medicine cannot be considered an exact science in the same sense as chemistry, physics or mathematics, toxicologic phenomena cannot always be predicted with accuracy or explained on the basis of physical or chemical laws. It is this unpredictability which frequently reduces conclusions and decisions to opinion rather than fact."

The Manufacturing Chemists' Association states in their Manual L-1, under Warning Labels, "POISON—A chemical or mixture of chemicals which falls within any of the following categories:

a. Produces death within 48 hours in half of a group of 10 or more laboratory white rats weighing 200-300 grams at a single dose of 50 milligrams or less per kilogram of body weight, when administered orally; or

b. Produces death within 48 hours in half or more than half of a group of 10 or more laboratory white rats weighing 200-300 grams, when inhaled continuously for a period of one hour or less at an atmospheric concentration of two milligrams or less per liter of gas, vapor, mist, or dust, provided such concentration is likely to be encountered by man when the chemical product is used in any reasonably foreseeable manner; or

c. Produces death within 48 hours in half or more than half of a group of 10 or more rabbits tested in a dosage of 200 milligrams or less per kilogram body weight, when administered by continuous contact with the bare skin for 24 hours or less."

The writer has associated toxic chemicals as those materials which enter the body by the nose, mouth, or skin and produce an adverse effect on the blood composition. This change in blood composition is such that the vital organs (liver, heart, kidneys, etc.) are restricted in performing their life-giving functions and death can result.

TOXIC CHEMICALS ABSORBED

If the above can occur to the operator through absorption into the body by any chemical handled in a routine fashion which is normal for that class of chemical materials generally considered non-toxic, then the material is a toxic chemical.

The committee has received many valuable suggestions on areas of interest to our subject.

One letter suggested that a large compilation of references on toxic chemicals available to all interested persons would serve immeasurably to further the cause of safety in the chemical field. There is so much new information being printed that the books that we have become accustomed to using are soon out of date. Work has already started on this idea. A list of references has been compiled and is available. While the list is extensive, it is not believed to be complete.

Another letter suggested an index of toxic chemicals. Such an index may be a refinement of just a straight-forward compilation as suggested in the first letter above. The references could be catalogued according to the chemical name, the common name, or perhaps by the type of industry in which the laboratory or pilot plant is associated.

PUBLISH CASE HISTORIES

Still another letter recommended publishing actual case histories of the misuse of toxic chemicals and their results. Since the same toxic chemicals are used in many laboratories or pilot plants, it would no doubt be worthwhile to make available information of this kind.

Setting up a toxicology chart was another idea received. This chart could contain columns giving the name of the toxic material, maximum allowable concentration, appearance, the type of operation where this material would be used, how it is absorbed by the body, the symptoms, first aid and the safe way to use the chemical.

These are all good ideas but your committee on Toxic Chemicals needs more information both on an expansion of the preceding ideas listed as well as new ones.

It is the responsibility and moral obligation of each of us to do what we can to further the cause of safe practices which will prevent suffering and the loss of human life. Please send your ideas on the use of toxic chemicals to R. V. Montello, Research Division, National Cash Register Company, Dayton 9, Ohio.▲

A BIBLIOGRAPHY OF TOXIC CHEMICALS

Prepared by: Toxic Chemicals Committee, Laboratory and Pilot Plant Group, Chemical Section of the National Safety Council

This compilation of references on toxic chemicals is made possible through the cooperation of the following committee members: John E. Fox, safety director of the Monsanto Chemical co., Texas City, Tex.; Robert A. Quisno, president, Hill Top Research Institute, Inc., Miamiville, Ohio and Ralph V. Montello, head, materials dept., Research Div., National Cash Register Co., Dayton, Ohio. Assistance was also given by J. B. Black, department of health, education, and welfare; A. H. Christian, American Viscose Corp.; H. H. Fawcett, General Electric Co.; and J. N. Romine, Phillips Petroleum Co.

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WASTE DISPOSAL

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Editor's Note: The information presented in the following "summary of waste disposal questionnaire" should not be construed as recommended procedures. Many of the methods reported are not in keeping with safe standards. The summary was presented primarily as a beginning of committee activity to develop a good, recommended safe disposal data sheet or recommended procedures which could be used by all industries.

In order to report to you on the subject of waste disposal, a questionnaire was sent out asking for information dealing with waste disposal methods throughout the mailing list of the Laboratory Subsection. Approximately 50 corporations are represented in our mailing list and of this group 36 companies answered the inquiry.

Many of the companies who answered the questionnaire indicated the definite need for assistance, and it is my hope that this group can, through the ensuing discussion, come up with information which can be presented to industry at large as a published report through the National Safety Council's Chemical Section.

Dealing with, first, flammable liquid disposal, we find that more companies are using the incinerator method of disposal than ever before. This method may vary in its actual application, but, in general, the system operates by using an oil burner nozzle in the combustion chamber through which the flammable liquids are vaporized and burned.

Many flammable liquids can be redistilled for recovery at a fairly nominal cost thereby providing a continuing source of material for reuse or sale.

Open field burning of flammable liquids is used by many, although it is felt by some that this system presents hazards which might best be removed. The hazards of premature ignition, of odd winds and of smoke, are among those to be considered.

Today, with the high rate of community growth, indications are that available space for open field burning will be lessened considerably in the near future.

Certain groups bury flammable liquids and here, I think, we might make a note for general discussion later in the program to determine if possible the hazards of burial of flammable liquids.

Plant sewer disposal of flammable liquids is used by many, but most of those have indicated that only water miscible materials are so disposed and always with copious quantities of water.

Radioactive wastes are presenting problems to many today who, a short time ago, had no idea such a problem would exist. In this case, the best source of adequate information on disposal, we believe, is the Atomic Energy Commission.

Rivers are not used for frequent disposal of any industrial waste by nearly all plants reporting. Most plant waste water systems are operated today on the basis of well engineered and controlled systems where harmful materials (to fish, wild life, and humans) are removed. Treatment plants for industry are proving themselves valuable additions to the company's holdings.

Many hundreds of organic and other materials were forwarded with the questionnaire together with other valuable information which we hope will prove to be of some later value to our groups and others.

BURY

Rubber Dope
Vinyl Dope
Aluminum Chloride
Fluorides
Radioactive Wastes
Sulfur
Tetraethyl Lead
Radioisotopes
Parathon
Cans, Drums
Acid Cleaning Solution
Used Oil
Acetone
Mixed Solvents
Sulphuric Acid
Chromic Acid
Concentrated Sulfur Cake
Caustics

Phosphorous Oxychloride
Metallic Sodium
Aluminum Hydrides
Potassium Cyanide
Lead Acetate
Benzene
Alcohol
Styrene Syrup
Solid Noncombustibles
Fine Organic Chemicals
Tar Acids
Research Chemicals
Spent Zinc
Carbon
Radioactive Wastes
Thionyl Chloride in Chloroform
Unreclaimable Mixtures

INCINERATE

Laboratory Animals
Paper, Rags, Boxes
Paper Waste
Non-miscible Wastes
Explosive Wastes (20 gms).
Highly Toxic Wastes
Ether
Ethanol
Benzene
Radioisotopes
Solid Propellants
Radioactive Oil
Garbage
Alkyl Aluminum
Chromic Acid
Fluorides
Zirconium
Vinyl Cyanide
Phenol in water solution
Metallic Sodium
Solid Combustibles
Paint, Varnish and Lacquer Thinners
Research Chemicals
Solvents

BURN OPEN FIELD

Chlorosilanes
Resins
Varnishes
Lithium Hydride
Flammable Solvents
Cyanide Waste
Alkali Metals
Acetone
Potassium Dispersions
Metallic Sodium
Powdered Metals
Acrolein
Magnesium Dust
Titanium
Zirconium
Organic Solvents
Fuels
Lacquer Sludge
Resins
Tars and Oils

REDISTILLATION

Butanol
Acetone
Methanol
3A Alcohol
Styrene
Petroleum Solvents
Chlorinated Solvents
Mineral Spirits
Solvents

CONTROLLED VENTING

Ether
Benzene
Alcohol
Acetone
Petroleum Ether
Ethyl Acetate
Barium Trifluoride
Carbon Bisulfide
Piperazine
Vinyl Chloride

SETTLING BASIN

Trichloroethylene
Viscose Dope

SLUDGE PIT

Acids, Unknowns, and Reactive Chemicals

SEWERS

Waste filtrates from organics
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- Chlorine Gas

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ATMOSPHERE
- Phosgene

SOLD
- Methanol
- Methylethyl Ketone▲

ACIDS AND HEAVY CHEMICALS

Discussion Report

R. L. ALLINSON—Discussion Leader

director of safety, Texas div., The Dow Chemical co., Freeport, Tex.

The first subject was presented by a gentleman who had asked in last year's meeting if the group felt it was reasonably safe to transfer strong acids from carboys by using air pressure. The reaction of the group at that time was negative and the gentleman on this occasion described a new system he had since set up that still utilized compressed air.

This system has a gauge in the line, then a valve, next a pressure regulator set at 2.5 pounds, then a 3/8 in. T in the line with one opening venting air to the atmosphere. The line then goes through the stopper into the canvas covered carboy but also has a leg going into a mercury seal that is an additional safety and will blow at 5 lbs. This rig is operated by the simple method of "thumbing" the small open T while visually watching the flow of acid from a dip pipe.

Another man attending suggested the use of Thompson hand pumps for this service.

The next question was on fire fighting techniques on fires around or involving storage of chlorosulphonic acid. There was no one present familiar with this problem and it was suggested that the DuPont company might be able to help.

USE OF LARGE HOSES

A discussion on the use of large hoses brought out the following points:

1. This is a specialized field because of the variety of services but in general, we have learned to use the best available for the specific purpose.
2. In attaching hoses to flanged nozzles it is wise to secure clamps to flange by steel straps.
3. The use of hose made with the rubber flanges vulcanized in place was recommended.
4. High pressure testing of hoses is practiced. There was no sure answer to the question, does this weaken the hose?

The next question dealt with the affect of ammonium nitrate on steel cables. This man has guy lines on large towers that are being deteriorated by ammonium nitrate fumes. No one present knew of anything easy to apply that would protect the steel. Coverings of rubber or plastic were suggested.

The next discussion subject was snap-on or quick couplings for small hoses. This apparently is not a problem in most plants represented. Those who did use a good many quick couplings said it is best to confine specific makes and types of couplings to specific uses to eliminate the danger of using hazardous materials in equipment and tools operated by water or air.

In answer to a question on new loading racks, one man stated that they had installed a Nichols rack and were well-pleased with it.

The next series of questioning dealt with *phenol*:

Question—any experience of fires where substantial quantities of phenol are involved?

Answer—no experience.

Question—are two people desirable in unloading phenol?

Answer—yes.

Question—is ethyl alcohol being used for first aid?

Answer—no—water is best first aid for this.

The next question resulted from the above and was, "Do any medical people recommend the neutralization method in field first aid on chemical burns?" No one present knew of any medical doctor that recommended anything other than water.

The subject of heating water for eyebaths and safety showers was discussed briefly. Tracing with steam and resistance heaters was suggested as well as holding tanks with regulated heat.

The techniques of fighting fires in bulk ammonium nitrate was discussed. There was little experience evidenced on this but *simple water extinguishment* was suggested.

Radiation was introduced but the group as a whole had little experience as yet in the use of radiation sources. One man explained the use of an elementary educational plan for employees that is available from A.E.C. The point was also made that the technical people who actually use the sources are the ones most apt to become injured due to familiarity.

One simple little test of use to people not too familiar with solvents was mentioned. This was the old trick of putting some solvent in water to determine if it is *chlorinated. If it does not float, it is chlorinated.*

The next question was on the use of electronic guards for machinery. There were several affirmative answers and the feeling was that most applications had worked out very well at a reasonable cost.

The next question was on the use of capacitance probe. These are used a good deal and no hazards were reported in their use.

Returning momentarily to radiation, one man stated that they had discovered that *through a periodic (four times a year)* dental X-ray of some employees, these people were receiving more than the recommended amount of radiation.

Floor grating was the next subject. Very few thought that common checker plate was much good. The new plate with embedded abrasives seems *to work well; others* recommend plates with beads welded on them for stair treads. Some of the adhering abrasives are good but need replacing periodically.

A new method is to punch plates with small holes and then invert the plate. It was also mentioned that twisted rod was superior to round stock for ladder rungs. Someone stated that they used reinforcing steel for rungs. Welding characteristics might be a problem here.

Life jackets for use around water were discussed next. Evidently not much exposure represented except some barge loading. In most cases jackets were available here and sometimes their wearing was compulsory.

The next question was on the availability of "break-away aprons." By this was meant *a chemical resistant apron that could be* ripped off easily. No one knew of any commercially available▲

INDUSTRIAL GASES DISCUSSION GROUP

H. F. REINHARD, Discussion Leader
manager, Safety Codes dept., Union Carbide & Carbon corp., New York city

The meeting opened with a brief resume of the notes from last year's meeting. Some of the important safe practices mentioned in these notes were re-emphasized.

The compressed gas industry has been interested from the beginning in the safety of people who handle and use its products. The Compressed Gas Assn. and several other associations such as the National Safety Council, Manufacturing Chemists Assn., National Fire Protection Assn., National Board of Fire Underwriters, International Acetylene Assn. and The Chlorine Institute publish pamphlets on the safe handling of compressed gases. A list of 35 commonly used pamphlets published by these associations was circulated among the group. During the past year, the National Safety Council revised and reissued its Safe Practice Pamphlet 95 entitled "Compressed Gases."

Compressed gas cylinders are safe containers provided they are handled with reasonable care. Valve protection caps, if provided, should be on the cylinders hand-tight except when the cylinder is in use. Also, cylinders should not be dropped with great force on hard surfaces. Several pictures of special pallets, troughs and other devices used for the safe handling of cylinders in plants were circulated. Some of these pictures appeared in the article "Safe Practices for Handling Compressed Gases" by Messrs. H. F. Reinhard and F. R. Fetherston, published in the October issue of Industrial and Engineering Chemistry.

SULPHUR DIOXIDE FACTS

A participant asked if there is any new data on the toxicity or physiological effects of sulphur dioxide. The MAC for SO_2 which is the maximum concentration that can be safely endured for eight-hour periods is about 10 parts per million. Although he was unable to obtain a reading of one part per million in his plant, the employees complained of headaches, nausea, sore throat, etc. Since the SO_2 concentration in his plant was far below the MAC, the group felt that other factors must be responsible for the discomfort of the employees in his plant.

There is no special cylinder valve outlet thread for breathing air. The outlet connections described in American Standard B 57.1 are arranged so that each connection is used for a group of gases rather than for an individual gas. The exception to this rule is Connection 540 (.903"—14-R.H.—ext.) which is used only for oxygen, industrial and medical. Connection 580 which is recommended for water pumped (breathing) air, is also used for argon, helium, crypton, neon, nitrogen and Xenon when water-pumped.

Fetherston suggested that people interested in using small breathing air cylinders for deep sea diving etc., consider the adoption of the pin index system as used on small medical gas cylinders equipped with standard flush outlet cylinder valves. Two holes are drilled in the valve at specified locations for the particular gas that is in the cylinder. Matching pins are installed in the yoke connection so that only a matching yoke may be connected to a particular valve. The present system provides pin locations for eight different medical gases.

The familiar question of rocketing cylinders was raised. It was revealed that industry experience over the past 15 years includes only two or three instances where high pressure non-liquefied gas cylinders had apparently rocketed. The last instance occurred in Norway, a year or two ago. A cylinder valve is installed in such a way that it will shear off when struck with a sharp blow, leaving the valve inlet in the cylinder. The hole in the valve inlet is small, usually 3/16 to 1/4" which restricts the flow of gas so that the cylinder may move but will not rocket. However, the escaping gas or moving cylinder may injure nearby personnel and therefore, it is strongly recommended that valve protection caps be kept in place on the cylinders except when in use.

The question was asked if the functioning of a safety device would cause a cylinder to move. On high pressure industrial cylinders, the safety device discharge ports are designed so the flow of gas produces opposing forces. Thus a cylinder may fall over or move when a safety device functions but it will not cause dangerous propulsion. Acetylene and other low pressure cylinders will not move. However, the group agreed that cylinders should be secured at all times.

In handling a flammable gas cylinder which is involved in a fire, it is recommended that general fire fighting principles be followed. First, evacuate all personnel except those actively engaged in controlling the fire. Second, use water to cool exposed materials and the cylinder. If the flame is impinging upon structural steel or another cylinder, use a hose stream or other method to move the cylinder so that the flame does not impinge upon the steel or other cylinder. Do not extinguish the flame unless the flow of gas can be shut off because the escaping flammable gas might cause an explosive mixture which is to be feared far more than the burning of gas from a functioned safety device.

If a cylinder is involved in a fire, the user should bring this fact to the attention of the owner by attaching a tag to the cylinder valve. Fire might weaken the cylinder wall and therefore, the ICC requires that all fire damaged cylinders be retested before being charged with gas. Above all, do not try to hide the fact that a cylinder has been fire damaged by painting it.

Most compressed gas cylinders with the exception of acetylene must be periodically tested or inspected to requalify them for service. Oxygen and other high pressure cylinders are subjected to a non destructive hydrostatic test in such a manner that the permanent expansion resulting from the hydro test is measured. If the permanent expansion is below a certain limit the cylinder is suitable for continued use. Cylinders are not discarded or removed from service after a specified number of years. As long as a cylinder can pass the retest requirements it remains in service.

HELIUM IN "AIR" CYLINDER

"Is there a chance of getting nitrogen or other gas in a certified breathing air cylinder purchased with self contained breathing apparatus?" was asked. One member of the group reported that in 20 years experience of using several cylinders a year, only one such mistake had occurred. In this case the "air" cylinder was filled with helium.

Howard H. Fawcett, who presented a paper, "Living in the Air We Breathe," at the Chemical section of the Congress, mentioned that a similar mistake was made a short time ago. He recommended that "no cylinder should be put on a demand breathing apparatus or air supplied respirator, hood or suit, until the contents have been checked for purity." An orsat gas analyzer, or a Beckman paramagnetic oxygen analyzer are often used for this purpose.

A discussion on color coding of cylinders resulted from a request for information on color coding of cylinders in international service. The group indicated that color coding of cylinders was not desirable for many reasons including the fact there are more than 100 different compressed gases used in industry making it necessary to use up to four different colors on each cylinder. The only positive way to identify the contents of a cylinder is by the name of the gas printed on the label.

LIQUID OXYGEN CODE

Receiving departments should check cylinders as they are unloaded to be sure that the label is legible and intact on the cylinder. Unlabeled cylinders should be returned to the supplier without using the contents. Cylinders in international service should be labeled with both the name of the gas in the language of the country of origin and the chemical symbol of the gas. Details for labeling of cylinders are described in American Standard Z48.1 "Method of Marking Portable Compressed Gas Containers to Identify the Material Contained." This standard is available from the Compressed Gas Assn., 11 West 42 Street, New York, N. Y.

At last year's meeting of this group, a member of the missile industry pointed

out that liquid oxygen is commonly referred to as LOX in the Missile and Rocket Industry. The oxygen manufacturers were not aware of this practice but felt that it should be discouraged because for many years the term LOX has stood for liquid oxygen explosives in which liquid oxygen is only a part. Also, tanks, sold under such trade names as LOX and LOXETTE, may be used for the storage and handling of many liquefied gases such as oxygen, nitrogen, argon, hydrogen, etc.

At that meeting the group suggested that the secretary of the International Acetylene Assn. take steps to discourage this usage. The secretary of the IAA wrote several letters to principals of the Rocket and Missile Industry. A safety engineer in the Air Force read the minutes of last year's meeting in the Chemical Section Safety Newsletter and contacted the IAA. Through his efforts, the Air Force has taken steps to discontinue the use of the term LOX. This was reported in the October 1957 issue of Missiles and Rockets in an article entitled "Liquid Oxygen Replaces LOX Abbreviation in USAF."

The Air Force is undertaking this action to prevent dangerous and possibly disastrous results of the use of the term LOX for liquid oxygen. The term LOX will be deleted from all USAF technical orders and contracts including re-identification to the Department of Defense that it also take steps to abolish the use of the term LOX.

A member of the group reported they had received a full tank car of helium, compressed in long tubes manifolded together. In attempting to open the single outlet valve, they twisted the stem off. He wanted to know how to release the pressure. It was the group's recommendation that the gas supplier be contacted in any case where the valve is found to be inoperative, whether it be on a tank car or individual cylinder.

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Volume 6

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COAL MINING INDUSTRY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

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Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE COAL MINING INDUSTRY

This volume is a record of the sessions held at the 1957 National Safety Congress by the Coal Mining Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Coal Mining Section carries on in behalf of its members, and for the benefit of accident prevention work in the coal mining industry generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of coal mining companies.

The activities of the Section are under the direction of its executive committee, the members of which are listed at the close of this volume.

PROCESS IN CEMENTATION OF COAL-MINE ROOF

by E. R. MAIZE

mining methods research engineer, Bureau of Mines, Pittsburgh, Pa.

Inasmuch as more than 70 per cent of the roof-fall fatalities have occurred within 25 feet of the working face and 60 to 70 per cent of these occurred beyond the line of permanent support, attention has been focused upon the necessity for better roof support in this relatively small area. In the search for better means of supporting and controlling coal-mine roof many methods and devices were, and still are, being considered and evaluated.

One of the first ideas presented as a means of controlling or preventing falls in this area was a movable shield. The idea of a shield is sound; however, to design a practical workable model for use in each working place has been almost impossible. There is still the possibility that a shield attached to mobile face equipment can, and will, be developed. However, a movable shield used for temporary support or protection does not solve the problem of when and where permanent supports should be placed.

After a great deal of investigation and review of the reports of fatalities, the conclusion was reached that an attempt should be made to strengthen coal-mine roofs further since roof bolting has given such favorable results. It was conceived that it might be possible to strengthen the roof over passageways, and possibly the roof in advance of a face, if a high-strength adhesive material could be injected into the bedding planes of the roof strata to bond the stratum, thus preventing lateral shifting and increasing the strength of the structure as a whole. In fact, if this system should prove successful, a type of permanent shield would result.

ROOF SUPPORT METHOD

The proposed method of strengthening the roof with a bonding material may be compared to the process of making plywood, wherein thin, structurally weak, layers of wood are bonded together to form a member that is stronger than a like thickness of a solid wood.

When the proposal to study this means of roof support was approved, it was decided first to determine if fluids under pressure could be injected into a coal-mine roof. The preliminary work of injecting fluids was, after a few setbacks, successful. This work has been reported in Bureau of Mines Report of Investigations 5304, Cementation of Bituminous Coal-Mine Roof Strata, Part I, Determining Penetrability of Mine Roof by Injecting Oil and Water.

The tests received sympathetic reception from all phases of the industry. Manufacturers, particularly the Joy Manufacturing co., the Rockwell Manufacturing co., and the Bakelite co., loaned equipment and manpower and gave advice without which it would have been impossible to advance to the present stage of development. Coal companies, National Mines corp., Bethlehem Steel co., and Pittsburgh Consolidation Coal co., willingly provided test areas and manpower. The mine workers' officials, particularly in the safety division, voiced sympathetic understanding of the tests, but the interest of the individual miners and their ready personal help in the underground tests were most astonishing.

INJECTING OIL, WATER INTO ROOF

Here are the highlights of the Report of Investigations 5304:

The first injection tests were made at the Experimental Coal Mine of the Bureau of Mines at Bruceton, Pa., where water from a tank was forced into the mine roof through a sealer or packer by admitting compressed air into the water tank at 80 to 90 p.s.i. In these tests water flowed readily through the bedding planes of the strata. In two instances the flow measured 54.7 and 45.9 gallons in two nine-minute periods.

In most tests the water, other than a small quantity that emerged from test holes, was contained in the strata. Attempts to duplicate the tests in freshly exposed roof of a commercial coal mine were unsuccessful because of the low pressure of the test equipment. At this stage the high-pressure equipment was developed and used in all subsequent tests.

The high-pressure equipment consisted of a permissible four horsepower motor directly connected to a hydraulic pump with the necessary electric and hydraulic controls. With this equipment it was possible to reach injection pressures of 1,150 p.s.i.

Using the high-pressure pump, tests of the penetrability of the roof strata were made in several commercial coal mines operating in the Pittsburgh and Upper Freeport coal beds. In these tests hydraulic oil was injected into the strata, and pumping was continued until oil emerged from the roof. The procedure follows:

1. A roof bolt was removed from a hole near the face.

2. The injector, which consisted of two rubber sleeves mounted on an expanding bolt which forced the rubber against the sides of the hole, was inserted and tightened in the hole.

3. The lead from the pump was connected to the injector, and the oil was pumped into the strata.

Four tests were made in a mine in the Upper Freeport coal bed, which were typical of many of the tests in other mines.

Test 1

The injector was inserted to a point 12 inches from the collar of the hole. After the pressure was increased 100 p.s.i. every 30 seconds up to 1,000 p.s.i., oil began to flow into the roof. After 35 seconds, during which 0.6 gallon was utilized, oil emerged from the three nearest boltholes. Pressure in the hole was released; after a 10 minute pause the hole was repressured at 1,000 p.s.i. for an additional 30 seconds, and flow was obtained to three additional boltholes, utilizing 1.3 gallons of oil.

Test 2

Test 2 was at the face of another entry. The injector was installed 12 inches from the collar of a 60-inch-deep hole. After the pressure was increased 100 p.s.i. every 30 seconds up to 500 p.s.i., oil began to flow into the roof. After two minutes and 30 seconds, during which 0.8 gallon of oil was pumped, oil came out bolthole one. The hole was repressured an additional three minutes at 500 p.s.i. and had utilized 0.9 gallon of oil when flow developed from holes two and three. In hole four water drippers developed and increased in amount.

Test 3

Test 3 was at the face of a crosscut. A roof bolt was taken out, and the injector was inserted 18 inches in the hole. The pressure was increased 100 p.s.i. every 30 seconds. At 900 p.s.i. oil began to flow and after the pressure was maintained for 30 seconds, using 1.2 gallons of oil, flow was observed from hole one. Shortly thereafter oil appeared in holes two, three, and four, and after eight minutes water drippers were noticed in hole five.

Test 4 was at the same location as test 3. Holes A and B were drilled 1¾ inches in diameter and 35 and 75 inches in depth respectively. After the injector was installed eight inches from the collar of hole A, the pressure was increased 100 p.s.i. every 30 seconds. At 500 p.s.i. oil began to flow into the roof. When oil flowed from the adjacent boltholes, 0.9 gallon had been pumped. Flow could not be obtained in hole B at a maximum pressure of 1,200 p.s.i. maintained for five minutes.

SELECTION, INJECTION OF EPOXY RESIN

Following the successful oil penetration of roof strata in commercial coal mines in two coal beds, our next problem was to find a material that, having been pumped into the stratum, would bond the members together and form a competent plate, or beam, as the case may be.

Through correspondence with numerous chemical manufacturers and from visits to their research departments, the conclusion was reached that an epoxy resin appeared to have the desired characteristics of low viscosity, rapid setting time in thin layers, and high adhesive as well as cohesive qualities, and should be tried. Other bonding agents were suggested, but to date we have not had the manpower or equipment to test them.

Epoxy resins are complex organic compounds in liquid form, requiring a second solution, called an "activator," to be mixed with it just before use to start the process of solidification. The speed of the solidification can be regulated through the selection of the activator or catalyst, several of which are available.

The activator used in our tests was hydroxyethel diethalene triamine. The resin and activator were manufactured by the Bakelite co. and are designated as resin ERL 2795 and hardener ZZLD 0814.

Test 1

The first injection test of the epoxy resin was made on January 7, 1957, in an area of Renton mine of the National Mines corp. that was being developed into blocks with entries on 80-foot centers and rooms on 100-foot centers, all of which were driven 14 feet wide. The immediate roof was coal overlain with laminated carbonaceous and sandy shale.

Under normal operating conditions the roof is supported by six foot-long roof bolts, four bolts to the row and rows on four foot centers. In many instances, because of roof fissuring, it was necessary to supplement the bolts by posts and crossbars. In this test area the roof was exceptionally good, and additional supports were not being used.

CROSSBARS SUPPORT ROOF

To prepare the test area roof bolts were not used. The roof was supported by crossbars set on stub-hitched rails on five foot centers. Twenty-eight 72 inch holes were drilled in pairs in a regular pattern spaced approximately two feet from each rib and the pairs on 14 foot centers parallel with the direction of the opening. The injectors were installed in each of the holes before pumping operations began.

A 4-to-1 mixture of resin and hardener was hand-mixed in batches of 1.75 gallons as needed and was injected into the roof at a pressure of 1,150 p.s.i. in the order of the numbered holes. Each hole, except Nos. 14 and 20, was pumped to refusal; hole 20 refused fluid; and water dripped from hole 14 during the pumping of hole 13; therefore, it was decided to miss this hole. The elapsed time of pumping the area was four hours and 10 minutes.

The total amount of resin and hardener used was 29.75 gallons. One and one-half gallons of fluid was injected for each 14 feet of entry, or ¾ gallon per hole and 0.107 gallon per linear foot of exposed roof. It must be realized that the amount used per hole was not uniform. The roof at intersections had sagged, leaving greater voids than in areas of better natural support. In hole 13, 8.75 gallons of resin were used, and 3.50 gallons in hole 23. Resin was extruded from boltholes 10 feet from hole 13 during the pumping operation. On the day following the tests, it was noted that resin had migrated to hole 14.

The crossbars supporting the roof of the test site were removed on the first shift of operations, and the area was dangered off following the pumping. The area was standing intact without roof falls up to the last report on about September 6, 1957.

The equipment used to pump the resin was rather crude and consisted of a hydraulic cylinder driving an identically sized cylinder which forced the resin into the roof. The hydraulically driven cylinder was actuated from the pumping equipment used during the oil-injection tests.

Test 2

The second test of the injection was made in an area two blocks away from test area 1. The test was made to determine the effectiveness of the resin in stopping a fissure that had developed in the entry. The roof was supported in a normal manner with roof bolts; the center posts had to be added when the fissure developed. The equipment for injecting the resin was the same as that used in the previous test.

During this test approximately 26 gallons of material were injected into the roof through 10 roof-bolt holes spread over a distance of 55 feet along the fissure. Bolts were removed from their holes along alternate sides of the fissure. On the day following the injection the area was dangered off and the center posts removed. As of this date the area has remained stable, with no further fissuring.

During the injection the flow of resin was across the fissure, and in several instances resin emerged from boltholes on the opposite side of the fissure. None of the resin emerged through the fissure.

FLORESCENT DYE INJECTED

It was not possible to determine accurately the flow pattern of the resin in the previous tests. For this reason an attempt was made to inject resin containing a quantity of florescent dye, sodium florescence, into another test area so that the flow pattern and the number of horizons could be determined. In this work, four 72-inch injection holes were drilled in the roof during normal development of the entry. These holes were spaced similarly to those of test 1.

Five gallons of resin were pumped into the four holes. The pumping time was seven and one-half minutes. Following injection of the resin into the roof, the roof was cored with a lightweight Joy core driller using a bevel wall N.X. diamond core bit. The vertical cores contained resin in the bedding planes in the contact between the carbonaceous shale and white shale approximately 28 inches above the normal roof line.

We were fortunate in obtaining one core which showed that resin had filled the vertical cleats. An attempt was made to drill angle holes in the roof to search for more filled vertical cleats, but it was not possible to obtain good cores while angling across the bedding planes.

Test 3

This test was made in an area of the mine where the normal roof conditions were extremely bad. The general area consisted of eight entries being driven on the face course, with openings 14 feet wide. The entries were driven on 60-foot centers and the crosscuts on 80-foot centers. Normal roof support necessitated bolting with four bolts per row with rows on four-foot centers, and in most instances the bolt-supported roof had to be reinforced by the use of steel crossbars set on about five-foot centers.

Crossbars were erected in this area immediately after the next cut of coal was removed. The normal pattern of bolting was discontinued and crossbars were spaced on three-foot centers. Two vertical holes, one and one-half inch in diameter and four feet in depth spaced two and one-half feet from the coal face and three feet from either rib, were drilled in the roof and injected with the resin mixture after each cut had been loaded out.

Inasmuch as the average depth of each cut was 10 feet, the pairs of holes were on approximately 10-foot centers. The work was begun June 26 and completed July 23. A total of 179 gallons of resin was injected in the two entries and the crosscut for a total distance of approximately 140 feet. The amount of resin per hole ranged from 0.3 to 24 gallons.

While hole seven was being pumped, resin was forced out of holes in the shale strata in the left rib; this is an area in which the roof fell above the normal roofline. Where resin emerged from fissures or breaks in the roof, the pumping was discontinued. Under normal conditions the holes were pumped to refusal; this occurred in 19 of the 32 holes. The other holes were not pumped to refusal for varying reasons.

The test work proved that resins could be injected easily into the roof strata over entries of the Upper Freeport coal bed. The flow pattern of the resin has not been accurately determined, nor has the depth of penetration over solid coal found, but the work indicates that favorable results can be obtained.

The effectiveness of the resin in bonding roof structure has not been completely determined, but test results lead us to feel optimistic on this point.

Additional tests must be made with equipment able to provide higher pressures and tests must also be made in other coal beds before definite conclusions can be drawn.

THE EFFECTS OF CORROSIVE ELECTROLYSIS ON METALLIC ROOF BOLTS

by JOHN M. MUCHNOK

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The support of roof strata of underground excavations is a major factor in mining. As long as wood props were used the miner depended upon his experience and judgment in adapting the supports for the varying conditions. Wooden supports carried weight up to a certain point; when loaded further the prop split, dropped the load and the support pattern was lost.

Props with higher strength and elasticity made of iron, steel or light metals were tried and showed advantages over wooden timber. Some of the advantages of this type of support were:

1. Safer because of higher mechanical strength.
2. Installed more easily.
3. Re-used repeatedly.
4. Paid for themselves in a very short time in spite of the higher initial cost.

As mechanization began to increase, efforts were made to find a roof support that would increase production efficiency so that mining machines could advance more rapidly under safer conditions. This method led to the exploitation of the steel bolt inserted in a split rod or an expansion unit.

The basic principle is the reinforcement of mine roof with steel rods imbedded and anchored in the strata at points least likely to be affected by stresses. This holds the strata together preventing ordinary sag and forming a strong consolidated beam by the mine roof. In the overall picture, bolting is effective when properly applied. As with any innovation it has not been a panacea. Although it eliminated some undesirable features it created others that need attention.

Bolts to be fully effective in supporting a mine roof must be uniformly stressed when anchored. Any variation in stress or anchorage weakens the roof support and renders it ineffective. Where conventional props were usually placed under the mine roof, metal bolts were inserted into the roof strata. Metal bolts imbedded in the earth can then be literally described as ground rods driven into the earth. Since all metals have an electrical potential, and more so in contact with the earth, there arises the problem of corrosion by electrolysis. To maintain a safe and sound roof control program we must consider corrosion.

CORROSION REVERTS METALS TO THEIR ORIGINS

A definition of corrosion is, "the destruction of a metal by chemical or electrochemical reaction with its environment." It is a precipitation of ferruginous metals back to their natural state. Corrosion is, therefore, nature's efforts to revert refined metals back to the forms they were originally found in the earth. The corrosion of metallic bolts by electrolysis is a chemical decay under environment influences in which nature reverses the process by which man obtains his construction materials.

The rapid formations of iron rust when a clean metal is brought in contact with air and water can be classified as ordinary oxidation and is retarded when ferrous oxide forms a protective film. The rusting of iron has been looked upon as the same reaction under all conditions. We now find it complicated by many variables, the majority of which have not always been taken into consideration.

The electrochemistry of corrosion is relatively simple. First there is the metal; it is hard, dense, opaque, firm, insoluble in water and is a conductor of electricity. But metals can exist as ions, soluble in water, charged positively and help carry an electrical current through a solution. When metals change to ions we have the fundamentals of transporting metals in an electrolyte.

When two metals are immersed in water a voltage is set up. Adding salt, acids and placing dissimilar metals in the solution, increases the voltage. Combining two metals or electrodes in an electrolyte constitutes an electrolytic cell. A cell that generates its own voltage is called either a voltaic or galvanic cell. Placing metals in earth we create such cells when one or more rods are used. Earth does not have equal properties as an electrolyte. The more active the earth as an electrolyte the more current will flow and the rate of corrosion will be faster.

When current from an outside source is forced through a cell we have what is called an electrolysis cell. A good example of this would be stray DC currents from the mine distribution system.

A concentration cell forms when a metal passes through areas of unequal electrolyte. This can be caused by natural soil changes, by the additions of chemicals from the surrounding environment or by the intermixed strata of the mine roof. Variation in the concentration of a solution in contact with metal tends to localize corrosion. When different concentrations are in contact with a metallic structure, the area of metal in contact with the more dilute solution will become anodic and corrode.

When a current flows through a cell a chemical change takes place. To simplify corrosion work current flow is designated as flowing from anode to cathode. The current flow from anode to cathode in an electrolyte is the same under all conditions. The flow of current from a metal causes loss of metal but at differing rates depending upon the type of metal involved. For example, one ampere of current flowing from iron for one year carries 25 pounds of iron, whereas 75 pounds of lead are carried by one ampere in the same period.

Therefore, unless certain precautions are taken, corrosion can be a continuous process that can ultimately cause serious damage to roof bolts and produce dangerous conditions in a number of ways. The seriousness of this may not always be realized. Usually the hazards are not readily apparent because the action, whether slow or rapid, cannot always easily be detected. This situation can ultimately cause serious hazardous conditions for the personnel.

The preceding paragraphs are the basic fundamentals why corrosion occurs. It must be remembered that all metals possess an electrical potential. Since all mines use metal to a greater or lesser degree, they are all susceptible to corrosion in one or more forms. . . . . none can deny this. This paper deals mainly with roof bolts but the fundamentals can be applied to any metallic structure such as track, pipe, trolley hangers, beams, armored cables and any other metals offering a path for electric current.

WAYS CORROSIONS OCCUR

There are a number of situations favorable to corrosion. The following could be elaborated upon a great deal more but has been made brief and condensed so that it can be covered in the space allocated:

ENVIRONMENTAL CORROSION: When metals are exposed to locations containing chemical elements such as salts, alkalis, carbonates and acids, corrosion occurs.

GALVANIC CORROSION: The contact of dissimilar metals or dissimilar parts of the same metal structure in an electrolytic medium will create corrosion. It is also created by contact of metals in dissimilar electrolytes, dissimilar concentrations of the same electrolyte and any number of atmospheric dissimilarities. Dissimilarities form galvanic cells which permit the flow of electrical current in an internal generating unit permitting the transfer of metal in an electrolyte.

STRAY CURRENT CORROSION: When current from an external source flows or is impressed upon a metal structure, a polarity difference is set up within the structure. The metal then becomes a conductor. No difficulty is encountered where the current enters the metallic structure. Where current leaves corrosion occurs; corrosion can be very rapid and extensive if any great amount of current is present.

STRESS CORROSION: Tensile stresses build up at metal surfaces under static loading. Stresses, either by applied loads or of a residual nature, can influence the rate, nature and distribution of corrosion in some of the following ways:

1. By shifting the electro-chemical potential wherever the greatest point of strain occurs
2. By accelerating the rate of corrosion

3. By damaging protective films
4. By changing the characteristics of the metal and precipitating solutions
5. Increasing corrosion by mechanical effects, i.e., elongation of the roof member

Stress corrosion through research has been analyzed as the most destructive and difficult to control.

Corrosion of iron and steel depend on different factors that control environment. Three common types can be considered as atmospheric, water and soil corrosion. Associated with coal bearing measures are large quantities of sulphur bearing materials. Shales and geologic formations above the coal measures contain precipitation of solutions of sulphate of aluminum, ferrous iron, ferric iron, calcium, magnesium, sodium, potassium and chlorides. These are some of the most highly corrosive elements known to man. The mining environment is, therefore, nature's ground bed for an exceptional corrosive atmosphere.

The two conditions that cause the most difficulties in underground corrosion of bolts are stress and concentration cells. Metals subjected to constant stress fall considerably below their static ultimate tensile strength. For carbon steels this endurance limit is about one-half tensile strength. Even a small amount of corrosion with cyclic stress will considerably reduce the endurance of the metal. Concentrated cells and stress tend to accelerate the rate of corrosion. The combined action of stress and corrosion is called, "corrosion fatigue". Corrosion fatigue is independent of tensile strength. The combination of stress and galvanic corrosion can be construed as probably the most destructive form of corrosion found anywhere.

WAYS TO PREVENT CORROSION

Thus far, there has been demonstrated only the destructive effects of corrosion, but as with everything else there can be some protective measures applied. Deterioration of metals can be prevented or reduced in three ways:

1. By using a more resistant metal
2. By the application of a suitable protective coating
3. By making the environment less corrosive

There can be effective protective means employed and designed to meet the particular conditions prevalent in each mine. A recognition of the corrosion problem affects the design, choice of materials and application and general maintenance and economy. We cannot do too much about mining environment, but we can institute protective coating that has:

1. High insulation resistance
2. High dielectric strength
3. Unaffected by acids, alkalis, salts, organic solvents and soil and metal stresses
4. Manufacturing bolts with alloys that resist or reduce corrosion

We encounter similar difficulties with wooden props. The original props were green timber with preference given to wood cut in the fall or winter season because the moisture was in the root system. This gave a higher tensile strength and some resistance to deterioration. Little attention was paid to timber in short-lived face areas, but where timber on haulageways and air courses had to stand indefinitely the resultant deterioration became a matter of concern.

To alleviate this situation it was treated with a preservative which increased immeasurably the life of the timber. Some of the same treatment can now be applied to bolts, especially where entries will stand for long periods of time. The rate of corrosion will vary with the change of seasons, change of atmosphere, the kind and extent of environment, and the concentration of cells reacting with stress and elongation of each bolt.

To conclude, here's a brief summation of how some of the findings of this paper came about. When Honorable Joseph T. Kennedy became Secretary of Mines and Mineral Industries of Pennsylvania, he recognized the merit of roof control programs. He felt that if improvements were to be made, it would be necessary to analyze roof problems more thoroughly.

Secretary Kennedy felt to reduce the number of fatalities we must understand the causes that lead to the fatalities. He alerted the Deputy Secretaries and Inspectors to investigate to find *WHERE* and *WHEN* men were injured and killed and at least to theorize *WHY*.

Concentrated efforts have already shown results. We recognize that future improvements will have to have the best efforts of all of us. Safety with the Pennsylvania Department of Mines and Mineral Industries is not an effete and vicarious slogan. Working together with labor, management and other safety-minded organizations we are trying to alleviate unecessary suffering and distress by all lawful means.

Corrosion is one problem that deserves considerable attention and research to be reduced to safe proportions. The mining industry cannot afford to ignore it. Applied research and technology can begin to visualize the broad field that corrosion covers. These are not the potential hazards created by electrolysis. But if enough emphasis is placed upon the subject, mankind can answer some of its problems in electrolysis and other related fields. Regardless of what is accomplished now it should lay a foundation for a clearer understanding of our present problem and a better tomorrow.

MINING WITH THE COAL PLANER INCLUDING SAFETY ASPECTS

by ROBERT J. MARRS
general inspector, Eastern Gas & Fuel Associates, Mount Hope, W. Va.

At our Stotesbury operation of Eastern Gas and Fuel Associates, we use what is called retreating semi-longwall in the 39 inches Pocahontas No. 4 seam. We develop parallel sets of three butt entries 2200 feet deep by conventional mining method leaving a solid block of coal 130 feet wide between these entries. The back ends or inby ends of these butts are connected by two entries, one used as a bleeder and the other as the longwall.

From this point the planer retreats to within 260 feet of the main entries leaving the butt entry chain pillars unmined. The right hand entry of each butt has slated bottom and is used for belt haulage and track supply haulage; it also carries the necessary compressed air, power, and communication lines. The head end of the planer moves down this entry, while the left hand entry of the other butt carries the tail end.

STRUCTURE OF PLANER

The machine itself consists of a headpiece, tailpiece, armored double-chain conveyor, and plow. The conveyor is built up of pans 39 inches long, and is flexible at each joint to the extent of five degrees in each direction; the continuous chains carry flights every 42 inches and move at a speed of 150 feet per minute.

Attached to the conveyor is a heavy guide tube which carries the plow. The plow chain is continuous also, the return strand carried inside the guide tube. Chain sprockets at both ends of the conveyor pull the plow at 75 feet per minute while it planes in either direction to a depth of 2 inches to 6 inches. Drive units are located at each end of the conveyor and are called the headpiece and tailpiece. The number of drive units depend on the length of face, each end using either one or two 50 H. P. motors.

Power is transmitted through a fluid coupling to a gear reducer which runs the chain sprockets for plow and conveyor. An air-operated clutch allows the conveyor to move while the plow is idle. Air cylinders spaced at 20 feet along the conveyor keep the conveyor advanced to the face. The headpiece and tailpiece can be advanced by an automatic ratchet shifting device or by separate electric hoists.

Control of the machine is achieved at two stations. The main control panel is mounted on skids about 300 feet back from the face. These controls are set at the beginning of the shift and actual operation of

the planer is effected at the headpiece by a small four switch panel.

Coal from the conveyor spills into a speeded-up standard mother line chain-conveyor where it goes to the panel belt and is loaded into mine cars in the main entry.

We in the coal mining industry are interested in production. But our primary objective is or should be the safety of our men. Some of the safety advantages planer mining offers over other types of mining can be seen in our Stotesbury operation in southern West Virginia, the only planer set-up we operate.

SAFETY IN PLANER

Some safety features in planer mining that are advantageous over other types of mining at Stotesbury are:

1. Timbering and roof control
2. Ventilation and mine gases
3. Coal dust and rock dusting
4. Explosives and blasting
5. Electricity
6. Communication
7. Planning

TIMBERING AND ROOF CONTROL

Roof support along the Longwall face is designed to provide three things:

1. Protect men and machinery.
2. Allow subsidence of the roof under the dead weight of the overburden.
3. Lower the roof to the floor in a systematic manner.

At Stotesbury we support an 11 foot width of roof along the face. Five feet of this area are taken up by the planer conveyor and must be prop free. This is effected by the use of steel collapsible props with steel roof bars projecting over the pan line. The remaining six feet of the face area are roof supports where the miner works.

In starting our panels, the first roof falls usually occur after planing about 50 feet of coal. The falls are usually preceded by the unsupported roof sagging, working with considerable noise, and then sections of the unsupported roof falling.

After the immediate roof falls and the face has retreated further, falls involving the higher strata occur, accompanied by the strong cracking noise of normal pillar falls that practically all miners are familiar with. When 300 feet of coal has been mined out, a good break line has been established and subsidence can occur as it should for the remainder of the panel.

MINOR FALLS

Subsidence or minor falls of the immediate roof usually occur in four feet to six feet wide blocks. They are seldom more than four feet thick and vary from 10 feet to 40 feet in length. These minor falls, usually accompanied by smaller debris from the crevices, come in soon after supports have been removed but sometimes they drop during the process of removing the last jack and the debris covers it.

However, all steel supports are recovered. The condition that governs the line of break is usually a crack that forms over the face. Since there is about three inches of convergence from the face to the gob line, the rock must break. At times this break will shear a few inches making an off-set in the roof. If the breaks are close together, about 12 to 18 inches apart and there is no support between them, slabs of rock are liable to fall onto the conveyor necessitating fore-poling.

The *props* must incorporate four important features:

1. They must be of adjustable height to allow for variation in the thickness of seam.
2. They must be set under a load, usually five to 10 tons, to secure an even resistance to further load.
3. They must yield mechanically as the load increases. Our jacks have a total yielding pressure of approximately 60 tons.
4. They must collapse instantly to facilitate removal.

Because each mine has its own characteristic roof conditions, the preceding requirements have been met in a variety of ways. Six different makes of props have been used at Stotesbury, all of which are manufactured in Europe. They are either of the hydraulic type or the mechanical type.

Mechanical props are the most popular type today because of their higher load-carrying capacities. Friction is the principle behind the yielding feature.

These jacks are set in staggered rows of two jacks to the row, about 42 inches apart and are set on a maximum of 30 inch centers along the face. Approximately 330 jacks are used across a 330 foot face, set on a staggered pattern. In other words this equals one jack for each lineal foot of face.

We support only 11 feet of roof behind the face and by using 330 jacks to 330 feet of face the place is timbered about as closely as possible to leave working space for the men to move about.

Further support is offered by the props through the use of steel headers called cantilever bars. At Stotesbury we use a 13 inch "H" section bar weighing 55 pounds. Lugs on the bars mesh with the lugs on the head plates of the jacks to keep them from kicking out under weight. Two-thirds of the length of the cantilever bar extends toward the face offering support over the conveyor line.

Further forward support can be effected by hinging another cantilever bar to the end of the first bar and then loading it against the roof with a special drive shoe. This process is called fore-poling. When the conveyor has moved forward enough, a jack is set under the fore-poled bar and the shoe is removed. At our mine we do not normally connect the bars or use fore-poling.

OTHER WOOD REINFORCEMENT

Secondary reinforcement is offered by wood cribs set 10 to 20 feet apart as conditions warrant. They have a four-fold purpose:

1. Prevent props from penetrating soft bottom.
2. Lessen the danger of any side thrust of the roof.
3. Provide additional reinforcement when used with props.
4. Allay the fears of the miners psychologically.

Thus, at Stotesbury we use cribs for psychological reasons as well as reinforcement. A man works only as safely as he thinks he is; therefore, it has proven advantageous to use cribs at all times. They are built from 6x8x24 inch wood blocks, with one tier comprised of steel chock releases to facilitate their removal. Tripping is accomplished with a hammer, at which time the crib collapses and is then rebuilt against the conveyor.

I will venture to say for the amount of roof exposure, a planer face when timbered to our standards is better protected than most other types of face mining. Not only from the standpoint of the quantity of jacks and cribs used in the timbered area, but also from the total weight carrying capacity. For the last inventory of jacks on our 330 foot face, the total weight carrying capacity was around 20,000 tons.

VENTILATION

The ventilation for a planer face is simplified by a positive ventilation at all times without the use of line curtains. Only 6,000 to 8,000 c.f.m. are required to ventilate the face adequately and keep the methane percentage below ½ of one per cent.

Positive pressure is maintained against the gob line toward a bleeder and a return entry. Two flame safety lamps are in use at all times, one on the return side of the face and one carried by the foreman.

Intake emergency escapes are established in entries on either side of the face. The men farthest from an escapeway would be the men working near the middle of the face or approximately 165 feet away.

COAL AND ROCK DUSTING

Practically all coal dust accumulations are eliminated by close pillar falls. Suspension dusts are at a minimum due to the plowing effect of the planer along the face allowing the coal to turn over gently on the pan line, and, of course, the short distance the coal falls is another factor. Water sprays are maintained at the dumping point.

The many hazards connected with handling of explosives and blasting are totally eliminated since none are required in this type of mining.

All electric cables crossing the face are installed in double chanel irons in sections to the conveyor line. No cables are on the floor to get cut, bruised or otherwise damaged by falling objects or by moving equipment. This greatly eliminates the possibility of short circuits, electric shock and cable fires.

Communication across the face and from head to tail piece consists of yellow non-

glare signal lights installed 20 to 25 feet apart along the line. All workmen can see these signal lights and can give signals from any point, all the way across the face.

Telephones are installed at both the head and tail pieces.

Six trolley phones serve as a public address system across the face. These phones operate on a different frequency than the dispatching and haulage phones and the units are spaced about 50 feet apart. All men can clearly hear instructions given at any point across the face. If trouble arises at any point along the face everyone is informed.

PLANNING OPERATION

While one face is on retreat, another set of butt entries is being driven with bleeder entries established at the back end of the new section. We also have another complete plow unit which we use as a standby. While one unit is retreating, the other unit is completely repaired and set up on the next section.

This gives management time to make a complete move, try out the equipment and correct any faults before the new section is put into operation. Thus, the change over from a worked out to a new one is orderly and the rush usually accompanying major moves is eliminated.

To get clean even roof falls behind the face of the planer it is necessary to keep the face even and on a 90 degree angle to the butt entries. To keep the face straight, paint marks are made on the ribs of the head and tail entries. These marks are 25 feet apart and serve to keep the headpiece on one entry even with the tailpiece on the opposite entry.

The planer went into operation September 1953 and has mined 1,000,000 tons of clean coal, an average of 250,000 tons per year. During this time 17 injuries have occurred, the large majority being finger accidents while handling jacks and most of these during the first year of operation.▲

SAFETY AND OPERATING PROBLEMS OF A MODERN HAULAGE SYSTEM

by WILLIAM KEBBLISH
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The importance of a safe and efficient haulage system is invaluable to any coal mine. Coal must be produced at a fast rate at the face and transported to the cleaning plant safely and without unnecessary delay.

Analyzing the 82 haulage fatalities that occurred in the bituminous coal mines in the United States in 1956, it is found that 71 occurred underground and 11 on the surface. Motormen accounted for 20 of these fatalities and brakemen 24 or nearly 54 per cent of the total haulage fatalities.

These accidents occurred by collisions, contact with low roof or crossbars, derailments and workers being caught by moving haulage equipment or being squeezed between the equipment and the rib.

Of these fatalities 72 per cent occurred on the haulage roads, 28 per cent to men with nine years or more of job experience, and 30 per cent of the victims had less than one year job experience.

The average age of the victims was 44 years and the average mining experience was 21 years. This shows that well-experienced men as well as others are susceptible to fatal injuries in haulage accidents.

A study of the principal causes of fatal accidents indicates that 29 per cent of the victims were caught by moving haulage equipment, 23 per cent came in contact with low roof or crossbars, 16 per cent were squeezed between haulage equipment and the rib, 13 per cent occurred by collision, 10 per cent by derailment, and nine per cent from other minor causes. Nearly one-third of these accidents occurred between 9 a.m. and noon.

VIOLATED SAFETY CODE

Of the 82 haulage accidents, 44 per cent were violating the Federal Mine Safety Code. Nine accidents were in violation of section 6-g of Article VII, which states that no person should get on or off moving locomotives or cars moved by locomotives provided, however, that the brakeman may get on or off the rear end of a slowly moving trip.

Nine accidents were in violation of section 6-f and 4 violations in section 4-1. Fifteen other accidents violated various sections of Article VII, which deals with transportation.

Since 54 per cent of the haulage accidents affected motormen and brakemen, the management at Mathies Mine planned to develop a safe and efficient haulage system to reduce haulage accidents.

Mathies Mine was opened in 1944 and 18 million tons of coal have been produced. No fatalities have occurred involving rail transportation although a few minor accidents each year involved motormen or brakemen.

One haulage safety feature at Mathies is the two main parallel tracks, one for traffic in and the other for traffic out. This permits fast, safe and efficient handling of coal trains with minimum interference between the loaded and empty trips. Double track requires fewer mine cars, no passing siding and no dispatcher.

BLOCK LIGHT SIGNALS

Trolley phones are installed on all main line locomotives as well as gathering locomotives. The motormen keep in touch with one another and when passing certain known points along the haulage road their location is given to other motormen in that vicinity. Each working unit in the mine has a telephone. When a shortage of cars exists the lampman is called and he relays the message to the swing motorman or main line motorman.

At all main intersections, face entries, and crossovers Cheatham electric switches align the switches for fast transportation. Block signal lights are also installed at these intersections to stop traffic in all other directions. These block signals are also installed on down grades and around turns.

At Mathies Mine only one locomotive is allowed in one set of block signals at one time. Each motorman must get his own green light before moving the trip. As a result, a constant flow of empties and loads without interruption are taken into and out of the mine.

In 1956, five per cent of the haulage accidents in the United States occurred because the motorman failed to get a clear track from the dispatcher; as a result three men were killed.

Many mines with a small daily output and a limited coal reserve could not install two main haulage roads due to the high initial cost. At Mathies Mine, a large reserve and a large tonnage are produced and two haulage tracks are necessary. In case of a derailment or wreck traffic can be rerouted over the other track until the first is cleared.

DRAINING WATER FROM TRACKS

A high standard of track installation is followed. A. C. E. 85 pound rail is used exclusively on the loaded road and on all radius curves. On the empty track 60 pound rail is used. With the introduction of the 50-ton locomotive both main line tracks will use 85 pound rail. All main line track joints are welded.

The thermit-welded joint gives a stronger and more durable joint than the electric arc welded joint. Practically all the frogs on the main line connections are number five with number three and four on the face entry tracks.

Creosote treated six inch by eight inch by six foot ties are laid on 24 inch centers in slag ballast. The slag is forced down under the ties to a minimum depth of six inches by using air tamping hammers. Rail is carefully aligned, and the track spikes driven by air hammers.

In 1956, five fatalities occurred in the United States due to derailments, two because of the poor condition of the track. At Mathies Mine, well laid track is stressed.

Additional measures are taken to keep the track properly drained. Wherever water appears on the road a sump five to six feet

is dug in the nearest breakthrough, preferably between the two main haulage roads. The sump is covered with three inch plank or a concrete slab and a small automatically operated centrifugal pump is installed.

In a parallel entry an eight inch cast iron universal pipe follows the main line and also the face entry track. This eight inch line has fire connections at frequent intervals to provide fire fighting protection along the entire length of track. This eight inch line acts as a discharge line and water can be pumped back through the line in case of fire along the main line tracks.

For adequate roof support, roof bolts four or five feet long are placed three and one-half feet apart and the rows are on four foot centers. Whenever doubtful roof is encountered six inch by six inch steel "H" beams are set on a minimum of 10 foot centers, supported by pin rails or cement block piers. Salt treated planks three inches thick are placed either in the webbing or on top of the beam.

In the last 10 years these beams are never placed lower than 70 inches above the top of the rail. Adequate clearance above the track is necessary for a safe haulage road. Last year 16 fatalities occurred in the United States coal mines because men came in contact with low roofs or crossbars.

Levels are taken on all the track entries to determine whether to grade bottom or top before laying the track. Minor bumps are leveled by shooting off the bumps or leveling the track. The empty track is not graded to the same extent as the loaded track. It has been possible to maintain a grade of two and one-half per cent or under against loads. At one place it was necessary to remove 13 feet of bottom and 10 feet of top within a 1500 foot distance.

To overcome this two and one-half per cent grade which acts against the loads, 50-ton locomotives are used. At present three locomotives are used and each hauls 45 to 50 loaded mine cars up this grade. These cars are of eight-wheel swivel truck design, 320 cubic foot capacity with a tare weight of 4.25 tons and a gross weight of 14.25 tons. They are 17 feet long inside and seven feet wide, 46 inches above the top of the rail and measure 18 feet 10 inches center to center of the Willison Automatic couplers.

Whenever cars are pulled up grades, spring latches are placed at intervals of 500 feet to derail the cars in case they are separated. These derails are possible with single direction track and eliminate the need of a trailing locomotive.

SAFETY IN LOCOMOTIVES

Since Mathies Mine has grown in size a locomotive was needed that would have little trouble on adverse grades and could handle 45 or 50 loaded mine cars at one time. Three 50-ton locomotives were purchased and good results have followed.

These 50-ton locomotives are at present the largest single unit locomotives being used in the coal mines today. They are 37 feet long, have eight wheels—four on each swivel truck, a draw bar pull of 25,000 pounds, a 31-inch wheel diameter can negotiate a 55 foot radius of curvature, a nominal weight of 100,000 pounds, operate on a 44 inch track gauge and 500 volts D.C. current.

The more important safety features on this locomotive are:

Dynamic braking.

It has ten steps of parallel motoring and seven steps of dynamic braking. Movement of the handle clockwise from OFF, arranges control circuits for motoring, cutting out increments of resistance until the tenth step which has no resistance and is a free running position. Movement of the handle, counter clockwise from OFF, arranges control circuits for braking.

Dynamic braking is used mainly for holding trains at uniform speed on grades, and decelerating trains. Operation for dynamic braking can be continuous at 175 amperes or below. Operation must be intermittent above 175 amperes. If speed of train is under four mph dynamic braking is greatly reduced and air brakes stop the train. With a loss of power dynamic braking is interrupted.

Trolley Retractor.

When the trolley retractor valve is depressed, air enters the retractor housing causing the plunger and plunger shaft to rise and relieve spring pressure on the trolley pole. This allows the trolley pole to drop down and clear the overhead wire. Removing hand pressure from the trolley retractor valve cuts off the supply of air to the retractor housing, and spring pressure again raises the trolley pole.

End Sections.

Both end sections of the 50-ton locomotive are rounded and the sides are tangent to both ends. The end section on the operator's side is two and three-eighths inches thick of a heavy duty steel. The end plates conform to the height of the side frames. A small opening in the side of the end section allows the motorman to enter the locomotive safely.

Head Lights.

Both head lights in front and rear of the locomotive are recessed into the end sections and a five-eighth inch steel plate surrounds the light inside the cab.

Fire Extinguishers.

On each main line locomotive as well as each gathering locomotive a 20 pound dry chemical fire extinguisher is carried for fire protection.

Rerailers.

Rerailers together with tacks and chains are standard equipment on all haulage locomotives.

HAULAGE PLAN

At present coal is hauled two miles to the cleaning plant from the furthest face entry; the shortest haul is five miles. The number two locomotive, a 50-ton tandem, hauls coal 38,000 feet to the cleaning plant and averages five round trips of 50 cars each. A one and one-half per cent grade for a distance of 4,000 feet is in favor of the loads. This main line locomotive serves six working units in this face entry.

Each main line locomotive is manned by one operator and the side tracks are arranged so the empties are pulled into one side track and the loads are immediately picked up from another one. If it is necessary to make up a coal train from two side tracks the gathering haulage crews give any necessary help.

The number three locomotive serves five working units in two face entries and travels 30,000 feet to the cleaning plant. This 50-ton locomotive averages 45 to 50 cars per trip and makes four round trips per shift. Another 50-ton locomotive which hauls from a farther point in the mine takes any excessive amount of loads that accumulate in either of the three face entries. Empties are dropped off on the return trip in proportion to the amount of loads taken out.

Two 50-ton locomotives number four and five, haul coal 38,000 feet to the cleaning plant and serve eight working units in two face entries and one main development entry.

The number one locomotive, a 30-ton tandem, is a spare locomotive in event of a breakdown on any of the main line locomotives.

Within a year and a half three of the nearest face entries from the cleaning plant will be worked out and these 10 units will move into two of the new face entries now being developed. It will then be possible to confine all of the working units into two or three face entries and one main development entry. As the main haulage entries are developed, the third main face entry to the south will be turned to the left of the present haulage road.

This last face entry will naturally create a haulage problem since the coal will be hauled 18 miles underground to the cleaning plant. Although this problem will not be faced until 10 years from now, plans must be made now to avert any future bottleneck.

DERAILMENT PROBLEMS

Derailments of coal trains also cause serious haulage problems. Traffic can be rerouted over the empty or loaded road. But this practice is not followed unless the derailment can be corrected within two hours. The majority of the more serious derailments involve the loaded mine cars.

The last one derailed 56 loaded cars and more than 1,000 feet of track. Since it would be inconvenient to reroute traffic over the empty track the next two operating shifts were idle. This derailment was caused by taking a trip over a broken rail. Failure of the main coupler pin on a mine car has also caused derailment of a loaded coal train.

The coal train was being pulled up a two and one-half per cent grade when the pin in the coupler broke. The loaded coal train drifted down the hill and was derailed by the first spring latch. This wreck prevented the mine from operating efficiently that day and mining operations were cancelled.

Whenever a broken rail is found the general foreman is notified immediately. He will send one or two trackmen with acetylene torches and splicing bar to repair the broken rail. This rail will be electric-welded on the first idle day.

A careful check on mine cars is made each shift at the cleaning plant. Whenever a car needs repairs, it is sidetracked, repaired and put into service as soon as possible. If mine cars need repairs in the working sections, they are clearly marked with chalk with the word SHOP and are taken outside for repairs.

A record is kept of mine cars that require new trucks and their performance is noted from year to year. Each mine car travels over 5,000 miles each year and 800 cars are now in service and the labor cost for mine car maintenance is .015 cents per ton.

The per ton mile cost for transporting coal at Mathies Mine is one of the lowest in the industry because of the large tonnage handled over a main line system. The cost includes installation and maintenance cost for track, annual locomotive costs and labor, power for locomotives, and mine car annual cost and labor maintenance costs. This installation track cost is high but is necessary to insure a steady flow of cars into and out of the mine at a high speed.

OTHER SAFETY FEATURES

Much planning and heavy expenditures are put into this haulage system. Entries are not driven more than 14 feet wide. Roof support is obtained with five foot roof bolts and where necessary beams, piers and three inch planks are used. All road beds are graded especially on the loaded track to maintain a two per cent grade or less. Haulage roads are drained by sumps and automatic pumps.

For much of the distance the two parallel main haulage roads consist of 85 pound and 60 pound rail. On all new roads now under construction 85 pound rail will be used exclusively. All rail joints are electric arc welded and/or thermit-welded. Creosote treated ties are laid on 24-inch centers with a slag ballast.

The sidetracks are located in each face entry to transport empties and loads safely and efficiently with a minimum amount of interference. Block signal lights and automatic electric switches control all main intersections.

Each haulage locomotive is equipped with trolley phones and the motormen communicate with each other constantly. Telephones are located at each loading point in the working sections. Messages from the working units are telephoned to the lamphouse and are relayed by trolley phone to the motorman.

It was necessary from the start of Mathies Mine to design a safe, fast and efficient haulage system that could handle up to 20,000 tons of material per day. The same principle has also been applied to the tipple and preparation plant. This high standard haulage system has practically eliminated haulage accidents at Mathies.

REDUCE HAULAGE ACCIDENTS

Management at every mine has the primary responsibility for haulage system. The 82 haulage fatalities that occurred in the bituminous coal mines in the United States in 1956 must be reduced. This can be accomplished by strict compliance with the Federal Safety Code, the State Mining Laws, and the various safety rules of the mine. Accidents can also be reduced by:

1. A high standard of track installation and maintenance.
2. Properly designed and protecting equipment for the safety of the workers.
3. A positive communication system with safety auxiliaries such as automatic switches and block signals.
4. Necessary accessories for safe operation such as skids, reraling device, lifting jacks, fire extinguishers, and other safety equipment.
5. A well engineered haulage system that will meet today's problems, as well as those in the future.
6. A preventive maintenance program whereby defective haulage equipment is taken out of service before it breaks down.
7. Selection of employees who are capable of performing their jobs safely and efficiently.
8. Establish good safety practices to govern all haulage operations.

By following such a program, coal mining men can greatly reduce haulage accidents.

HOW TO AUGER MINE SAFELY

by HARRY J. DUSZ
chief, Division of Mines, State of Ohio, Columbus, Ohio

Records of coal produced by auger mining in Ohio date back to 1954 when 940,915 tons of auger mined coal were produced. This was three per cent of the total production that year. Auger mined coal in Ohio in 1956 amounted to 1,364,303 tons or 3.44 per cent of the total. Strip mining accounted for 61.90 per cent and deep mined coal, 34.66 per cent.

Our mining laws do not specifically deal with auger mining. However, under the law, the Chief of the Division of Mines has broad discretionary powers. Section 4151.06, Revised Code, defining the powers and duties of the Chief, states, "He shall issue such written orders and permissions as will permit the owner, lessee, or agent of a mine to take advantage of the developments of new types of machinery and mining methods as they are developed, when demonstrated to his satisfaction by the owner, lessee or agent that they are in the interest of safety and efficiency." Under these provisions we formulated regulations for auger mining.

Much difficulty at the beginning of auger operation was because no regulations had been promulgated and each deputy mine inspector had his own rules. Augers were mining in 11 different inspection districts and operating under 11 sets of rules. In the early part of 1954, the 11 inspectors visited all auger mines in the state and each submitted a separate report.

A meeting was held to organize these reports and recommendations into tentative rules and regulations. A committee of six members and myself met with representatives of three auger manufacturers who agreed to place the requested guards and improvements on all augers delivered in Ohio.

RULES FOR AUGER MINES

The following regulations were established.

1. A safety light shall be kept at the workings while augering.

2. No person shall enter auger holes except to save a life or recover equipment.

Only experienced miners can enter these holes and a lighted safety lamp must be carried.

When augering first started workmen went into auger holes for various unnecessary reasons, one being "we just wanted to see what it looked like in there." Many of our auger mines are working the crop coal left after deep mining is completed. These worked out mines contain black damp, which diffuses into the auger holes when the auger cuts through. Often the roof is bad and is a hazard to persons entering the holes.

Even with the definite rules, on October 12, 1956 two fatalities occurred from disregarding rule 2. The first auger hole in a new series was cut through to an abandoned mine 38 feet deep. One workman entered the hole and collapsed, another workman then entered and also collapsed. They died in the hole and three others were overcome trying to rescue them. This accident was due to a complete disregard of safety rules.

3. All augers shall have a shield or protective device for material falling from the highwall. This shield shall be constructed of heavy screen or expanded metal so the

operator can see the condition of the highwall at all times. It shall be constructed to deflect falling material toward the highwall to protect workmen while changing bits or working on the auger near the highwall.

We have the highwall cleaned and prepared properly before augering is started, but small stones still fall from the highwall. The screen can protect against these but not against large falls or slides. Once approximately 20,000 cubic yards slid off a highwall that looked perfectly solid. This highwall consisted of a conglomerate of fire clay and shale intermingled with limestone boulders of various sizes. The auger and a large truck were completely demolished but luckily no one was injured.

4. Before beginning operations the highwall shall be cleared of loose material to be safe. Unsafe highwall areas shall not be augered.

RAILINGS, EXHAUST PIPES, WALKWAYS

5. Where men walk on equipment, such as along the auger pit, on top of the motor cab, on top of the chain conveyor, across the back end of the machine or in front of the motor cab, there shall be a hand railing erected.

When augers first came into Ohio no hand railing was provided. The manufacturing companies provided these safety requirements.

6. The exhaust pipe from the motor operating the hydraulic system shall be extended to keep exhaust fumes away from the operator. The exhaust pipe shall be guarded to protect persons from being burned by contact. Several workmen were burned by a hot exhaust pipe. These pipes are now covered with a shield of expanded metal or a heavy screen.

7. The fan of the motor shall be guarded. Previously many fans were not guarded and created a hazard.

8. A walkway shall be installed over the bit coupling directly in front of the motor cab. The larger machines were a definite hazard when workmen stepped across the moving bit.

9. Steps shall be provided on the large machines opposite the hydraulic motors.

10. The openings between the steps and walkway near the large upright post on left side of auger should be covered to make a larger landing for men to stand or walk. On some of the larger machines large holes in the walkway created a hazard.

11. If the auger is worked at night, lights shall be installed to illuminate the work. The electric wires shall be in conduit.

12. Rope drums, chain drives, shaft couplings and motor fans shall be inclosed to prevent persons from being injured by moving parts. The manufacturers are installing this protective equipment.

13. No person shall cross over the bits while they are in motion.

14. Mapping requirements: Engineers or surveyors should not enter the holes to make survey measurements. Therefore, mine foremen should record the depth of all auger holes, so the engineer or surveyor can show the excavation by cross-hatching on the map.

Besides the two men killed in 1956 no fatalities and very few serious injuries have occurred in Ohio auger mines. The fatality rate per million tons of coal produced in such mines in 1956 was 1.47 compared to 0.43 for all Ohio mines. As stated before, this accident would not have happened if the rules were followed.

OTHER AUGER MINING PROBLEMS

Another problem of the auger method of mining occurs when a solid tract is mined along the crop and no provisions are made to recover the solid coal beyond the auger holes. When the crop is augered completely along the crop line, it is impossible to reach remaining solid coal by conventional deep mining methods.

Our inspectors know that when this condition occurs, the operator should leave at least 200 feet of solid coal at intervals along the crop line. This is a minimum, since Ohio law requires one hundred feet of solid strata between all openings to underground mines. Our policy prohibits opening underground mines in augered areas where the necessary protective pillars cannot be provided.

Another bad practice is bootlegging coal after the augering is completed. Occasionally people living near these abandoned mines get coal for their own use from the pillars between auger holes. We discourage this and require that holes and face be covered after the augering is completed.

One occurrence demonstrates that the auger can be a life saver as well as a potential danger. Last June 26th a sudden cave-in trapped five men at an "island mine" being worked by a continuous miner. A 42 inch auger on the same property was taken to the location where the men were trapped and three angling holes were drilled from the highwall. The first two holes intersected the entry in the caved area. However, the third hole intersected the entry ahead of the fall and the five men walked out behind the drill. These men were trapped about 14 hours. However, had the auger not been available, it would have required at least three or four days to clean up and properly timber the caved entry.

We are not proud of our safety record for auger mining, but do believe that a strict compliance with the following recommendations will provide the maximum of safety.

——Proper preparation of the highwall. Removing all loose material including trees on the edge of highwall. Daily inspection of highwall including an examination on top of same for cracks or other signs of possible slides.

——Not entering auger holes unnecessarily and if holes are entered a lighted safety lamp should be carried.

——Proper guarding of all exposed moving parts.

——A shield to protect workmen from falling stone from highwall.

——Being alert at all times.

——Wearing protective shoes and hats.

——Careful, strict supervision by the foreman.

——Strict, efficient inspection by the mine inspector.

A COOPERATIVE PROGRAM IN ACCIDENT PREVENTION

REMARKS OF ARTHUR BRADBURY

assistant to manager, Coal Properties, Inland Steel co., Wheelwright, Ky.

The further advancement of safety and the prevention of accidents in coal mines will result in inestimable benefits to labor, management and the general public. The responsibility for safety should be shared by both parties chiefly concerned, labor and management. However, the responsibility for planning and initiating a successful program is up to management.

The coal industry has been plagued with high frequency and severity rates of accidents throughout its history, but great improvements have been made during the past 10 or 15 years. Much more remains to be done before we can point with pride and be completely satisfied with our accident experience.

Programs for the prevention of accidents have acquired increasing importance in all segments of the industry. In recent years great improvements have been effected in attitudes towards safety among management people and workers, which have resulted in excellent examples of cooperative and successful effort.

The operators of coal mines can obtain great benefits from a successful program effective in substantially reducing accidents. Safety and efficiency are inseparable. Fewer accidents result in increased production and lowered costs, direct savings through lower compensation charges and improved labor and public relations.

Present-day conditions are much more favorable for conducting a successful safety program than ever before. Some features, which in my opinion have contributed to this desirable situation, are:

- Operators' associations have organized safety departments rendering safety service to member companies.

- The United Mine Workers of America also have their own safety department with headquarters in Washington and officials in charge of Union safety activities in the various districts.
- Local Union mine safety committees have developed stature and display a more genuine interest in safety problems.
- Operators of responsible coal companies have conclusively shown that they want safe mines.
- The United States Bureau of Mines has expanded its safety education and research facilities.
- The greater helpfulness of the Coal Mine section of the National Safety Council.
- Improved state and federal mining laws.
- More frequent and thorough safety inspections by the United States Bureau of Mines and State Mining departments.

MANAGEMENT'S SUPPORT

When organizing for safety, the greatest possible use should be made of all available services. It is management's function to provide a safety department manned by an adequate and qualified staff, and it is vitally important that top management's unequivocal support of this department is recognized throughout the organization.

As long as we are dealing with human beings, hazards will continue to exist. The natural hazards involved in producing coal from beneath the earth's surface have not lessened since mining began on a commercial basis. Gas and coal dust are just as explosive now, but knowledge has been gained and techniques developed until explosions from these sources have been almost eliminated.

Roof falls have been for many years the principal source of fatal mine accidents, but we are constantly improving methods of supporting roof.

ABIDE BY RULES

Mechanization has created new problems. The handling of heavy face machinery and haulage equipment in confined spaces with poor illumination is conducive to a high accident frequency. The same thing can also be said for the tremendous growth in the use of electricity in coal mines.

New methods of combating these hazards must be sought constantly. Emphasis should be placed on providing the safest possible working conditions and insisting on their being maintained. Rules and standards embodying good safety practices should be established and an inspection service provided to insure that these are not relaxed.

When planning new mining operations, safety considerations should certainly play a prominent part in reaching decisions regarding mining systems and the type of equipment. These same considerations should enter into the plans for modernizing old mines.

The Wheelwright Mines operated by the Inland Steel company were started 42 years ago and for many years all coal produced was loaded by hand. The company has kept pace with the constant improvement in methods and equipment to remain competitive, and safety has shared largely in this improvement.

Evidence of this can be found in the progress in safety made by the company from 1942 until the end of 1956. Using the frequency rate as the yardstick for measuring this progress, we find that in 1942 the rate was 61.44 per million man-hours, which was steadily reduced during the 15-year period to 7.18 in 1956. This latter figure was the best in the history of the company.

SAFETY SUGGESTIONS

Among the noteworthy changes which have contributed to the safety and health of the workers are: increased ventilation, elimination of coal dust accumulations, more thorough rock-dusting, control of airborne dust, provision of special covered man-trip cars and increased use of roof bolts.

A major advancement in safety on the haulage system was recently accomplished at great expense by introducing large, modern mine cars equipped with automatic couplings and safety uncoupling device. Preparations for this change consisted of improving the track over miles of underground haulage roads and replacing timbers with roof bolts to support the roof over large sections of main line haulageways.

The employer and his representatives must do everything possible to neutralize the hazards and plan a safety program to arouse the interest of all supervisors and workers.

Many coal companies have successfully achieved this result with varied programs.

In my opinion, the individual components of the program are not too important. They have to meet the needs of the various types of operations. It is most important that they be presented in an attractive and appealing manner with evidence of sincere and genuine endeavor to prevent accidents. New means of maintaining interest must be constantly sought and variations adopted to meet changing conditions.

MAKE IT APPEALING

Some of the principal recognized aids to a program for reducing accidents include safety inspections, first-aid and mine rescue training and contest participation, safety meetings of various kinds, safety competitions incentive plans and special campaigns.

However, one of the most universally accepted aids to a successful program is the United States Bureau of Mines 100 per cent Accident Prevention Training course for workers and supervisors. This type of safety education has met with unprecedented success, has the approval of management and mine worker officials, and the cooperation of workers has been outstanding.

The employer should organize a program of safety which will utilize to the fullest practical extent all available services. This should include the active participation of the mine safety committees and all supervisors.

The key to accident prevention is the degree of interest that can be aroused and maintained among the entire working force, and this should be the objective of the program.▲

REMARKS OF CHARLES A. PURCELL

director, Indiana Bureau of Mines & Mining, Terre Haute, Ind.

The word "co-operation" means two or more people working harmoniously together for the attainment of a common goal. In this case, the goal would be to reduce and possibly eliminate, accidents in the coal industry.

Who are the co-operating parties? The two principals are management and labor, and I might add, management must take the lead. There are the various inspection agencies, who can do much with the right approach and attitude of being helpful rather than playing the role of a policeman. Then the mine suppliers and manufacturers of mine machinery should follow a "Safe it as you make it," policy.

Soon after I became director of the Indiana Bureau of Mines, in January of 1953, I was invited by the Lynch Reciprocal Coal Operator's Association, the insurance carriers for the majority of our operators, to participate in conducting a miner's First Aid contest. The contest was a success and everyone was pleasantly surprised to see all the segments of the industry working together. It was then suggested that we meet once a month and discuss ways and means to eliminate accidents. In a short time these meetings led to the organization of "The Indiana Joint Committee for Coal Mine Safety."

Those co-operating to form this committee are, the United Mine Workers of America, through their district officials and Charles Ferguson, safety director of the United Mine Workers of America; the Indiana Coal Operator's Association, through some of their officers and mine superintendents; Harry Gandy, safety director of the National Coal Association; the Lynch Reciprocal Coal Operator's Association, the Federal Bureau of Mines and the state Bureau of Mines.

Since its organization, we have met every month discussing accidents with ways and means of preventing a re-occurrence and planning First Aid contests, slogan contests, incentive programs, first aid and mine rescue training.

Recently, in addition to our monthly meetings, we have planned to meet three times a year and to invite mine supervisors, local union officials and safety committeemen to participate in a Saturday morning meeting. We feel these meetings have done much to bring about a better understanding with the men working in the mine of the things we are trying to do.

FATALITIES DECREASED

We feel there has been a definite improvement, not only in our accident record, but in relations between the various agencies charged with safety in the industry and everyone connected with the mining and marketing of coal.

When I became director of the Indiana Bureau of Mines, there was more or less the general feeling that at least 12 men were predestined to die each year in our underground mines. However, the last annual report, which covered a period from July 1, 1951 to June 30, 1952, reported only seven deaths, for which my predecessor was feeling very happy and justly proud, because that was the lowest record our state had in fatalities.

At the same time, I recorded six fatalities in my first annual report, ending June 30, 1953. We finished that year with 11 fatalities; 1954 showed 10. In 1955 our new law went into effect, and it called for an annual report based on a calendar year. To keep the records straight, we reported both a fiscal year and a calendar year. The fiscal year showed two, the calendar year showed three. Our 1956 report showed no fatalities. In fact, we went from November, 1955 to May, 1957, without a fatality.

A word of explanation, these figures come from under-ground mines only, and may vary from other reports which include all mining. The reason for this is that the Indiana Bureau of Mines, under our State Coal Mining Law, has jurisdiction, receives reports and keeps records of under-ground coal mines only. When it comes to non-fatal accidents, we do not fare so well, though we do show some improvement since we have been working co-operatively.

The following report was taken from the files of the Lynch Reciprocal Coal Operator's Association and represents about 80 to 90 per cent of our total production.

We do not feel that we have the answer to all of our safety problems, and good records have no value unless they inspire us to greater effort and achievements. My purpose has been to be helpful by showing the tremendous and unlimited benefit that comes from honest co-operative efforts.

	1953	1954	1955	1956
Tons produced	5,587,702	4,084,109	4,474,896	4,678,668
Man hours exposure	4,446,984	2,930,315	3,087,282	3,108,546
Total days lost	42,017	21,948	18,492	21,688
Reported accidents	1,436	844	1,111	819
Time lost accidents	410	234	191	259
Compensable accidents	275	126	79	147
Fatal accidents	6	4	3	0
Permanent accidents	2	1	4	3
Fatality—per million tons produced	1.07	.979	.67	0
Severity (average)	9.45	7.47	6.06	6.97
Frequency (average)	92.20	76.29	58.67	83.32

REMARKS OF LOUIS W. SCHULER

assistant director, Safety Div., United Mine Workers of America, Washington, D. C.

The Safety division of the International Union since its inception in June, 1947, has had one primary goal—increased safety in the industry and a resultant decrease in the accident rate. However, to increase safety in coal mines, cooperation is an essential requirement.

There are few things which can be accomplished as individuals, whether it be in our own personal lives or the business world. In the field of safety, it is an absolute necessity that we act as a group with one thought in mind—"the saving of lives."

A safety program to be successful must enlist the help of everyone and the safety division recognizing its share of the responsibility for such an undertaking works in conjunction with the membership of its local unions and district offices, representatives of the U. S. Bureau of Mines, coal producing companies, safety directors headquartered in Washington, D. C. and other correlated agencies or organizations that promote coal-mine safety.

The most compelling reason for a safety program is the welfare of the men who produce the nation's coal, and the job of promoting safety is one at which everyone must work all the time. Safety should be one of the most important considerations in the efficient operation of any business and certainly this precept is especially applicable to the hazardous coal-mining industry.

UNION SAFETY WORK

In an effort to gain cooperation, the safety division of the International Union has done everything within its power to bring about a closer understanding among the agencies. We have engaged in a multiplicity of activities, none of which by themselves is an answer to the entire problem, but taken as a whole, have made major contributions to the safety movement. The following are some of these activities:

More than 163,000 members of our organization have taken the Accident Prevention course sponsored by the U. S. Bureau of Mines. This number includes many safety committeemen and the total membership of approximately 255 local unions. The entire membership of one district was awarded a certificate for 100 per cent completion of the course. This was District Four in Pennsylvania.

Another cooperative keystone to safety which benefits the membership of the United Mine Workers of America is the Bureau of Mines' First-Aid Training course. Several local unions have completed this course as their contribution to the safety program.

We have joined with and participated actively in the formation and perpetration of Holmes Safety councils and chapters throughout the nation. We have affiliated with the National Safety Council and have participated actively in furthering the programs of this organization.

FIGHT ROOF-FALLS

We have joined the Council and the industry in a campaign to reduce roof-fall accidents—the number one killer. It is gratifying to note that more than 1,000 mines enrolled in this campaign to reduce roof fall-injuries by 50 per cent. This campaign commenced on July 1, 1957 and will terminate on June 30, 1958. The Federal and State agencies, coal operators association, together with the United Mine Workers of America have joined hands in an attempt to make this campaign successful.

There exists in Washington, D. C. a group comprised of safety directors from the National Coal Association, the Southern Coal Producers Association, the Bituminous Coal Association, the United Mine Workers of America and the Assistant Director of Health and Safety of the U. S. Bureau of Mines. These gentlemen meet monthly to discuss problems of safety and the accident and fatality rates of the coal-mining industry. The group informally discusses all problems pertinent to safety, mindful at all times that cooperation and understanding is the key to many a knotty problem.

The safety division of the International Union to clarify its position on safety grievance procedures inaugurated a program outlining specifically the steps to be followed by local unions and districts involved. The primary thought was to extend cooperation in adjudicating safety matters as they arose at the respective levels. This program has been accepted widely throughout the industry and has done much to avoid confusion which existed on previous occasions.

DISTRICTS WORK ALONE

In addition to the above, our various district organizations which are authorized to function within their jurisdictional areas have initiated and carried out programs designed to meet their particular needs. One of these programs is currently in effect in our West Virginia District Twenty-Nine. Many coal-producing companies in that area and the district safety department launched a new program which required the creation of joint safety committees on the local mine level.

The committee consisting of eight members—four representing the personnel of the local management and four representing the local union—works on a cooperative basis to advocate full and strict compliance of the company's safety regulations, the Federal Mine Safety Code and Act and the State Mine Law, together with whatever safety regulations the committee adopts to combat any existing hazard at the mine.

The committee's first obligation is to have all physical violations of the mine corrected,

and secondly—encourage the performance of work in a safe manner. If there should be a tendency on the part of any workman to be careless, this committee attempts to rehabilitate the individual to become a safer worker. Further, the committee is authorized to draft its own program in addition to other safety requirements to be observed by persons employed at the mine.

INDIANA'S EFFORTS

In District Eleven, located in Indiana, a program of cooperation has proven to be highly successful. This program stems from a permanent committee which meets monthly to discuss means and ways of furthering it. The committee is composed of top management from the underground mines, top district officials, the insurance carrier and representatives of the State and Federal Bureau of Mines. The idea has recently spread to the strip mines of that state and has been equally successful.

It is an impossibility to give a more detailed outline of our safety program. For instance, I have not mentioned the thousands of miles traveled each year to extend our cooperation at safety meetings, the numerous conferences involving our membership held with state and federal authorities and representatives of management, seeking to achieve a better relationship and a more cooperative approach in the settlement of safety problems.

The cooperation we have extended and the cooperation extended us has had much to do with the advancement of our safety program. We shall continue our cooperation along this line to further promote and expedite safety in the coal mines of America.

However gratifying results may seem, statistics for the year 1957 show beyond a doubt the necessity for an unceasing search for an even better safety program than that now in existence.

REMARKS OF JAMES WESTFIELD

assistant director, Health & Safety, Bureau of Mines, Washington, D. C.

Webster defines cooperation as "collective action for mutual profit or common benefit." This definition fits the objectives of the health and safety activities of the Federal Bureau of Mines.

Throughout its 47 years of existence, the Bureau has been essentially an educational institution. Yet, none of its efforts to promote health and safety in the mineral industries coal mining being the most hazardous ——— could have produced results if the companies and employees had not cooperated with the Bureau and with each other.

In the Bureau's early days the cooperation was obtained from necessity and desperation. Personnel of the original Safety Division literally went from one coal-mine disaster to another, rescuing the dead and injured and restoring mines to normal operation. The industry soon realized it must have trained rescue and recovery crews and people trained in first aid, since mining towns in those days were largely "off the beaten path" and difficult to reach. Many coal-mining people soon realized the advantage of having their own trained personnel on the scene if or when disaster or injury struck and not depending solely on outside help.

BUREAU "SELLS" SAFETY TRAINING

In the early days, however, the Bureau had quite a "selling job" to convince others to have trained first-aid and mine rescue men on the job. On the whole, the mining industry has cooperated admirably, and recently this sales work has been materially reduced.

Nearly two million people have taken Bureau of Mines first-aid training and more than 100,000 the basic mine rescue course. Although a substantial percentage was trained by Bureau personnel, most training was conducted by persons qualified according to Bureau standards. The large totals could not have been achieved without the cooperation of the teachers, the companies, and, most important, those who took the training.

First-aid and mine rescue training is fundamental in arousing safety consciousness. But more was needed for a substantial reduction in accidents and injuries.

In the 1930's the Bureau instituted its first coal-mine accident-prevention course, mainly for supervisors. This was accepted with reasonable enthusiasm; but during World War II, it was necessary to recess this work. In 1947 the course for supervisors was reactivated, and in 1950 a course for mine-safety committeemen began. The demand for this course was so great that it was expanded to include all mine workmen.

Since safety promotion depends on united effort, it was realized that for better results the workmen and their supervisors should train together. Also the best results could be obtained if every employee took the course. Since 1947 approximately 195 thousand workmen and supervisors completed the Bureau's Coal-Mine Accident-Prevention Course; more than 95,000 of these represent 100 per cent participation. Without the cooperation of the coal-mining companies and the United Mine Workers of America, this record would have been impossible. The Bureau provided the instructors, text material, and visual aids.

Recently we had numerous requests for relatively brief "follow-up" courses. For most follow-up work, the Bureau provided instructors and instruction materials. In a few instances the Bureau was asked to furnish textual material or assist the company in preparing it.

COMPANIES MUST PROVIDE INSTRUCTION

The Bureau has a limited number of qualified instructors. Therefore, once the Bureau's basic accident-prevention course is completed—preferably with 100 per cent participation, the companies themselves should keep interest alive by continuing this work through their supervisory and engineering staffs. The Bureau, of course, will always give advice and help prepare texts for instruction.

Other aspects of the Bureau's work are: development, testing, and application of permissible explosives and blasting devices, permissible electric equipment, permissible respiratory-protective equipment, and permissible dust collectors.

The Bureau also does research, experiments, and investigations of the causes and prevention of mine explosions and fires, particularly at the Bureau's Experimental Coal Mine, and research, investigation, and service on roof-control problems, including roof bolting. The director plans to extend the mine-safety-research program and increase the Bureau's services to the coal-mining industry.

Although these activities are mentioned only briefly, the Bureau has done marvelous pioneer work in these areas. In some instances it conducted educational campaigns to gain acceptance by the coal-mining industry. Nevertheless, significant accomplishments would have been impossible without the wholehearted cooperation of the industry, including workmen and supervisors, in testing new ideas and equipment.

Again the definition of cooperation—"collective action for mutual profit or common benefit." In the broad sense, accident prevention increases profits since accidents are wasteful and costly. The common benefit accrues to all in a very material way by avoiding the loss of skilled manpower and the suffering that accompanies all injuries.

The Bureau benefits because, in soliciting the cooperation of industry and helping to improve the accident and injury record, the Bureau fulfills its obligation both to Congress, which votes the funds to conduct its work, and to taxpayers, who pay the bill.

SAFETY FEATURES IN THE DESIGN AND DEVELOPMENT OF IRELAND MINE

by G. W. McCAA

general manager, Hanna Coal co., Div. of Pittsburgh Consolidation Coal co., Moundsville, W. Va.

The Ireland Mine is a new operation of the Hanna Coal company, division of Pittsburgh Consolidation Coal Company, and is located in Marshall County, W. Va., seven miles South of Moundsville, and adjacent to the Ohio River. This mine was developed to meet the demand for coal in the industrial expansion of the Upper Ohio Valley.

The coal from Ireland Mine will supply the Kammer Power Plant of the American Gas & Electric System, a large power plant built primarily to supply power for the new Olin-Revere Aluminum Plant. Plans for the design and development of this mine were started in November 1955. Construction of the surface facilities, shafts and slopes was started in January 1956; first coal was produced October 15, 1956. It is expected to have the preparation plant completed and in operation in December 1957.

In designing and developing this mine our aim has been to make it the safest and most efficient mine possible. Safety in the design of all equipment and mining plans has been given primary consideration to protect the lives of the employees. It is also self-evident that you cannot have an efficient mine without having a safe operation. The fact that Ireland Mine is a completely new mine with all new equipment, has made it possible to incorporate the safest possible methods and devices in its development.

There are many different operations and facilities to be planned and constructed in the operation of a new mine and safety has been considered in every individual case.

FALLS OF ROOF

The most serious safety consideration is the protection of the underground employees from falls of roof and rib in the working face area. The Ireland Mine is being developed in the Pittsburgh, or No. 8 coal seam, and in this area the seam is approximately five feet thick and immediately above the seam is a strata of draw slate that ranges from 0 inch to 48 inches. The draw slate strata is weak and must be supported if mining is to be conducted under it.

Above the draw slate is a seam of coal from one to two feet thick. The next strata is a mixture of shales from eight to 10 feet thick, which is a poor structure. Above this strata is a thick bed of limestone which is strong and fairly uniform.

In our original mining plans we decided that we would employ continuous mining machines to the fullest extent possible. We would try to operate them under the draw slate safely by the use of roof bolts, or the combination of roof bolts and timber. At the time the coal was reached in the development of the mine, the only type continuous miner applicable to the height of seam and could be adapted to supporting the roof was the ripper type of continuous miner.

The manufacturer had not designed roof bolting equipment to be used on this machine. When the original mining was started, we supported the draw slate with crossbars and posts. We found that the draw slate could be supported with crossbars and posts, but the draw slate soon became loose and sagged down on the timbers presenting a dangerous condition in case a post or bar was knocked out by any of the mining equipment.

The continuous miner was followed up with a conventional rubber-tired roof bolting machine, which installed five-eighth inch —1040 steel bolts six feet long, and which successfully held the draw slate. The places were approximately 16 feet wide and bolts were placed on four foot centers four feet apart. When this was done we found that the draw slate did not become loose and the support appeared adequate. The roof bolting, however, was a separate operation and did not protect the operator of the continuous mining machine while he was working at the face.

HYDRAULIC ROOF BOLTING

By utilizing the power from one of the cutter motors to drive a hydraulic pump with V belts, it was possible to design hydraulic roof bolting equipment that would fit within the space available on the machine. Two roof bolting units, one on each side of the machine, were installed in place of the hydraulic timber jacks. This permitted roof bolts to be installed ahead of the operator and within 13 feet of the working face.

The hydraulic timber jacks were moved to a position approximately two feet ahead of the roof bolters, and two No. 60 rails were installed on the jacks as crossbars to protect the roof bolters. This unit was put in operation with two bolts installed eight feet apart through a two inch by eight inch by 12 feet hardwood plank. These planks were installed on approximately 36 inch centers. This was purely an experimental method of supporting draw slate, and at the start crossbars and posts were installed between the planks. Several crosscut lengths were driven in this manner.

It was soon evident that the planks and bolts were supporting the draw slate and the posts and crossbars were not necessary. When the bars and posts were removed, it was found that there was no movement of the draw slate and the bolt and planks were doing an adequate job. Since that time approximately 50,000 lineal feet of entries and crosscuts have been driven using this method, and although we have experienced slate falls at the face ahead of the roof bolting, there have been only five small falls of roof where the area has been bolted.

THICK SLATES CAUSE FALLS

These falls have generally occurred where there was a slip or abnormally thick draw slate. One item of interest is that in all cases there has been warning of the impending fall, and the bolt and planks worked for a considerable time before the fall occurred. Some of these falls can be attributed to improper installation of roof bolts or spacing planks too far apart under heavy draw slate.

We are, at the present time, experimenting with a continuous miner of the boring type, using the same type of roof support, except in this case it is not possible to attach the bolters to the machine as the machine is continuously moving forward. The bolters are satellite units which operate independently but are attached to the machine with a hydraulic jack and rope. The roof bolters install the bolts and planks as the miner continues to advance. When the bolting operation is completed, the bolting units are pulled ahead with the rope and hydraulic jack to the next position.

The roof of main haulage roads and air courses cannot be supported for the life of the mine in the above manner. Additional height is also required on haulage roads. Since Ireland Mine will possibly have a life of from 50 to 100 years, it is necessary to plan the best possible method of maintaining the main entries. Our original plan was that we would shoot down all the strata above the coal to the limestone and use the limestone as a permanent roof.

The ribs and roof would be protected from weathering with wire mesh and gunite. At the bottom of the supply slope the construction of our main entries was started in this manner. Removing the strata above the coal proved to be a slow and dangerous job. The scaling of the ribs after the shooting and a subsequent loading of this material was hazardous. We experienced one fatality due to the operator not taking down a rib which had become loose in this operation.

CONTINUOUS MINER PREVENTS WEATHERING

Shortly after this method of developing the main line began, we observed that the ribs and even the limestone, started to weather and there was a continuous loosening of ribs and roof. In adjacent places which had been mined with a continuous miner and the draw slate bolted. Little weathering of the draw slate was observed and no falls were encountered. We soon decided that the shooting of the roof had opened up cracks which was conducive to the weathering of the ribs and roof.

The only strata between the coal and the limestone that does not readily weather is the one to two feet of roof coal directly above the draw slate. If this coal strata could be held by roof bolting, safe haulage roads and air courses could be maintained. A continuous miner was taken off of production and placed on the job of ripping down the draw slate which had been left up in primary mining.

The roof coal was then bolted, wire meshed, and gunited. To obtain haulage height, the bottom was graded with as little shooting as possible. We now have about 1,500 feet of this construction work completed and an additional 3,000 feet where the draw slate has been ripped out with a continuous miner and rebolted.

STOP DOUBLE OPERATION

In comparison with the haulage entries that were taken to the limestone, it appears that this method of supporting the main entries will be more successful. It is our belief, that the fact that we are not doing any shooting which would tend to crack the roof or ribs, will greatly reduce the number of falls in air courses and along the haulage road.

When the preparation plant is in operation we plan, on main haulage roads and air courses, to rip the slate down when the coal is mined. This will eliminate the double operation of mining the coal and brushing the top separately.

The use of continuous miners and the heavy cover over the coal seam at Ireland Mine made it necessary to consider changes in the mining practices as compared with the conventional plans normally used in the Eastern Ohio Section of the Pittsburgh, or No. 8 seam. Pillaring has never been successful in this area, and although pillaring will be tried in this mine, the general plan of mining is projected for partial recovery.

Observations of the mining conditions and the methods used in the relatively shallower cover in Eastern Ohio and the West Virginia Panhandle, convinced us that the wide room with the narrow pillar would not work successfully under the 1,000 foot cover encountered at Ireland Mine.

FOR FAST EXTRACTION

The following plan for mining has been projected and will be started in 1958. It is planned to drive working panels of six or seven headings on 80 foot centers approximately 2,000 feet long. Each panel will be driven with three continuous miners with the coal hauled from the miner by shuttle cars to a 36 inch conveyor belt. The reason for using three continuous miners on a panel is to get the most rapid extraction possible. When the panel is developed, each of the 64-foot-square blocks will be split both ways, leaving four square stumps.

These square stumps will give the maximum roof support with a maximum amount of recovery. Three miners will be used also on the retreat work, and it will be possible to develop and work out a 2,000-foot panel in approximately 60 working days. The rapid extraction and the method of leaving square stumps on the retreat, we think is necessary if our method of supporting the draw slate with bolts and planks is to be successful.

Future experience will dictate the centers on which these blocks will be driven and the width of the places splitting the blocks. The variation of block centers and width of the places under different mining conditions will permit maximum recovery with maximum safety.

USE A.C. POWER

All the mining equipment at Ireland Mine except for the haulage, is operated with A.C. instead of the conventional D.C. power. The underground power will be distributed at 6900 volts through "Mine Power Cable" insulated for 8000 volts. One of the three underground wires is insulated to form a circuit to insure continuity of ground wires throughout the entire system.

In case of a ground circuit failure or a fault, the automatic breaker on the surface will disconnect all A.C. power in the mine. Air-cooled transformer units reduce the primary voltage to 440 volts for use in the working areas; 440 volt power is distributed through Type G Cable with ground conductors connected through relays and current limiting resistors to the transformer neutral.

This limits the voltage to ground and cuts off power to any circuit in which there is a fault. Distribution panels have ground trip devices so that all electrical failures are confined to a single piece of equipment or cable. With this system when there is a trailing cable fault, there is no arc or burning that usually occurs on conventional D.C. cables. This distribution system is practically the same as the 4160 volt system that has been used successfully in stripping operations for the past 15 years.

The main haulage system has been designed to be as safe as possible. The roof and ribs will be wire meshed and united; the main haulage track will be 85# welded rail on treated ties ballasted and drained; adequate clearance will be maintained on both sides of the haulage road; the trolley and feed wires will be installed six and one-half feet above the rail; automatic electric switches, electric block signal system, and trolleyphones will be used for control. Ventilation throughout the mine will be provided from dual fans with automatic controls. Newly designed wet rock dusting units are used in the working face and are followed up with the conventional high-pressure dry type dusting machines.

The three shafts at this operation were sunk using the method developed at Hanna Coal Company's Eastern Ohio mines. A ring of holes is drilled with a heavy-duty stripping drill around the perimeter of the shaft from the surface to below the coal. These holes are approximately 16 inches apart and eight inches in diameter, and their primary purpose is to act as breakers. Seven holes are drilled to form a shooting pattern inside the rings of breaker holes, and these shot holes are then filled with sand.

Approximately 10 feet of sand is blown out of each shot hole with an air line and each hole loaded with 25# of 60 per cent gelatin. A round is fired and the rock loaded out of the shaft with a power shovel on the surface using a clamshell bucket. In this method of sinking the only time that men are in the shaft is to scale the ribs and to blow out and load the shot holes. This greatly reduces the man hours of exposure of men working in the shaft.

Two slopes were driven at this operation, 600 and 1300 feet long. They were driven with mechanical equipment. Roof bolts were used to support both the roof and ribs in the slope driving. An exhaust fan was used and a curtain wall erected of corrugated sheet iron so that all the equipment was operating on intake air in the slopes.

In developing Ireland Mine the most serious safety feature that has been encountered is the training of employees. The United States Bureau of Mines conducted their Accident Prevention Course with a 100 per cent participation which was very successful. We are at the present time starting classes in safety and mining at the mine conducted by various members of the organization. First Aid and Mine Rescue classes are planned to train properly employees and supervisors.

At Ireland Mine we have received excellent cooperation from both the Local and District organizations of the United Mine Workers of America, U. S. Bureau of Mines, and the West Virginia Department of Mines; and with this assistance, we hope to make Ireland Mine the safest mine in the country.▲

DUST COLLECTION AT THE COAL MINE FACE WITH CONTINUOUS MINING OPERATIONS

by RAYMOND J. WACHT

product engineer, Joy Manufacturing co., New Philadelphia, Ohio

This paper summarizes the results of a two-year investigation on dust collection at a coal mine face as applied to continuous mining operations. Tests were confined to a portable high efficiency wet inertial type dust collector in conjunction with a continuous mining machine.

Comparison of dust counts using the collector alone and with additional face ventilation are made. Results show that the collector tested can supply total ventilation to the face area and remove most of the airborne dust from the airstream before discharging the air in subsequent mine areas.

When continuous mining equipment and methods are used, high production is confined to a small working face. Relatively high tonnage is extracted at a rapid rate and the resulting dust concentration, which is a function of the rate of coal breakage,

obviously increases with increased extraction. This is apparent regardless of the type of continuous mining equipment employed.

When this dust is permitted to accumulate, three hazards present themselves.

a. The danger of dust explosion.
b. The danger of accidents due to poor visibility.
c. Physiological effects.

PROPER VENTILATION

Adequate and proper ventilation can keep these hazards to a minimum. However, when a muning machine nine feet wide by four feet high, and five men are confined to a working face, 16 feet wide by six feet high, it is often difficult to get a good air sweep of the face to keep the dust count within acceptable figures.

Line brattice and adequate air supply combined with water sprays are used with success in keeping dust particle counts below one billion particles per cubic foot. This is well below the amount necessary to propagate an explosion; however, poor visibility and the physiological effects due to prolonged exposure are still present.

In customary ventilation practice, the dust from the face is normally diluted with incoming air and directed towards other working faces in series and ultimately arrives at the exhaust fan and discharges into the atmosphere. When there are several working faces ventilated with the same air in series, the faces downstream receive ventilation containing the dust generated from preceding mining areas.

Tests have been conducted where as little as 3,500 cfm of air in a face 14 feet wide by 6½ feet high, with a 4JCM continuous miner working, maintained dust counts as low as 17 million particles per cubic foot at the machine operator's location.

USE SUCTION TUBE

This was accomplished by extending a suction tube along the rib close to the face with a properly designed inlet bell at the end of the tubing. A vaneaxial fan located outby the tubing provided the negative pressure necessary to maintain the flow.

Forced ventilation is an effective means of eliminating the dust problem at a working face but does not remedy the situation at subsequent areas, unless of course, the tube or duct can be brought directly past these other working places. Generally this is uneconomical and impractical. A solution is to combine forced ventilation with a dust collector, not only to eliminate the dust problem at the face, but to dispose of the dust before the ventilating air enters the subsequent workings.

The obvious question which presents itself is: "What kind of a dust collector should be used?" The answer to this question is dictated by the characteristics of the dust handled, safety requirements, space limitations, portability, secondary dust handling and maintenance.

Here is the size range of typical airborne dust present with continuous mining operations. The geometric mean size is 1.7 microns which suggests the need for a collector with high collection efficiency in the minus ten micron range. A bag type of collector would meet the collection efficiency requirements.

However the tremendous physical size required because of low face velocities makes this type of unit somewhat impractical underground. A dry inertial type of separator such as multicyclones could possibly be made compact enough to be acceptable for the space limitations; however, its collecting efficiency in the minus 10 microns range would not be acceptable.

It is for the reasons mentioned above that the Joy Manufacturing company decided to investigate the possibility of applying a new type of high efficiency wet type collector for underground usage.

PRELIMINARY FIELD TESTING

A dust collector designed specifically for underground use was field tested in 1955. This unit was 10 feet long, three feet wide and three feet, four inches high with a maximum rating of 6,000 cfm at 11 inches water gage total pressure. The unit was powered with a vaneaxial type fan, using a 15 horsepower, 250 volt, DC motor.

The fan was mounted on the discharge or clean air side of the collector. Provision was made at the intake end of the collector to accommodate an 18 inch diameter flexible tube with a maximum tube length of 300 feet. The entire assembly was skid mounted so that it could be moved to various working faces as desired.

The dust collector was placed in a section of the mine operating on a modified room and pillar system. Three Joy Continuous Miners each equipped with an extensible belt, extracted the coal. Coal from the extensible belts was subsequently transferred to main haulage belts.

During mining operations the dust collector was placed in an open crosscut with a check curtain surrounding the collector. Flexible tubing in 25 foot sections was suspended from the roof timbers as the room was advanced. These rooms were driven to 1,000 foot lengths which means that the collector was moved at least three times to a different crosscut during the 1,000 foot advance. When brattice cloth was used, it was positioned on the return air side of the room. With this arrangement the tubing was kept within the return air course behind the brattice.

The ventilation normally supplied was 24,000 cfm into the first room. Of this amount 5,000 cfm was picked up by the flexible tubing and passed through the collector. The remaining 19,000 cfm passed behind the brattice and over the collector through the check curtain in the crosscut. This air then passed into the next room and supplied the ventilation for the subsequent working area where retreat work was in progress.

The results of these tests are condensed in Tables I and II. The tests conducted in Table I, reference 1, were made within the room neck before any crosscut was made. No line brattice was used; consequently no ventilation other than the 5,000 cfm supplied by the dust collector was available. The dust collector intake tubing varied in position from directly opposite the operator to six feet outby the operator.

TABLE I

Dust Concentration at Machine Operator

Ref.	Dust Concentration (MPPCF)	Ventilation (CFM) Total	Collector
1.	39		5,000
2.	71	24,000	
3.	10	19,000	5,000

The dust concentration at the machine operator ranged from 12 to 55 million particles per cubic foot. The higher dust figure corresponded to the time when the intake tubing was six feet outby the operator. This shows the need for keeping the tubing up close to the dust source.

Reference 2 shows the effect of using line brattice for return air without the dust collector operating and 24,000 cfm ventilation available. The end of the line brattice varied from directly opposite the machine operator to four feet outby during this test. The dust concentration varied from 51 to 91 million particles per cubic foot. The higher dust figure corresponded to the time when the line brattice was four feet outby the operator.

In Reference 3, the line brattice and dust collector were both operating with 5,000 cfm passing through the collector and 19,000 cfm passing behind the line brattice and over the collector. The intake tubing was three feet inby the operator, and the line brattice three feet outby the operator. The dust concentration varied from five to 15 million particles per cubic foot during this test.

TABLE II

Return Dust Concentration in Crosscut

Ref.	Dust Concentration (MPPCF)	Ventilation (CFM) Total	Collector
1.	156	24,000	
2.	14	19,000	5,000

Dust samples were also taken in the crosscut where the collector was situated. Table II shows the dust concentration in the total return air approximately 25 feet behind the collector discharge. Reference 1 is with line brattice and no dust collector operating.

A midget impinger sample indicated 156 million particles per cubic foot with line brattice and no dust collector. In the same location with the dust collector operating, the dust concentration varied from five to 22 million particles per cubic foot. The return air through the crosscut is the ventilation received at the second working face doing retreat work.

It is interesting to note from Table II that when only ⅛ of the total 24,000 cfm of air was diverted through the dust collector, the total dust concentration in the return air was reduced from 156 to 14 million particles per cubic foot. The reason for this

is in the proper placement of the intake tubing with respect to the mining machine.

The maximum amount of dust in this instance was generated near the roof. Consequently the position of the tubing up close to the face and to the roof was an ideal location for picking up the dust before it could spread.

The results of these early tests indicated that much less air than the 24,000 cfm could be used to keep the dust concentration below, say 25 million particles per cubic foot, at the working face. Likewise, practically all of the dust in the return air could be eliminated by passing all of the return air through an efficient dust collector.

CURRENT FIELD TESTING

A dust collector, embodying the precepts learned from past work unique to underground usage, is currently undergoing field tests. The portable Joy Microdyne Dust collector is 12½ feet long, three feet, eight inches wide and four feet high with a mean rating of 12,000 cfm at 11 inches water gage total pressure. Water consumption is approximately eight gpm at 60 psi. The unit is powered with a vaneaxial type fan using a 30 horsepower, 250 volt, DC motor.

The fan is mounted on the discharge side of the collector. Provision is made at both the intake and exhaust end of the collector to accommodate a 24 inch diameter flexible tube with a maximum length of at least 300 feet. The entire collector is mounted on pneumatic tires and is steerable by means of a draw yoke.

During operations the collector was placed in an entry which served as a return air course. No brattice cloth was used for room ventilation and no water sprays on the miner were used to allay the dust. Flexible tubing in 25 foot sections was suspended from the roof timbers as the room was advanced. With this arrangement the only room ventilation was the air handled by the dust collector which was held to 12,000 cfm.

When the dust collector was situated in the center of the return air entry, the tubing on the discharge side of the collector was used for sampling purposes only and was not necessary for operation of the collector. The eight gpm of water used by the collector was picked up by a gear pump from a sump in the mine and was delivered to the collector at 60 psi pressure.

The slurry was discharged from the collector into a shallow ditch at the rib and eventually found its way to the sump. Seepage from old workings also drained into this sump; consequently the water from the collector was essentially re-circulated. The working parts of the collector are constructed of Type 316 stainless steel; therefore, corrosion from acid mine water is held to a minimum.

TABLE III

Dust Concentration at Machine Operator

Ref.	Dust Concentration (MPPCF)	Ventilation (CFM) Total	Collector
1.	256		
2.	16	12,000	12,000

Tables III, IV and V are condensed results of current field tests at the Joy Experimental Station. In Table III, Reference 1, the dust collector was not operating; consequently no appreciable face ventilation was obtained. The dust concentration at the machine operator's position for this condition rose to 256 million particles per cubic foot.

Reference 2 indicates the improvement with the collector operating and pulling 12,000 cfm across the face and through the collector. The dust concentration varied from 11 to 21 million particles per cubic foot with an average of 16 million particles per cubic foot at the operator.

TABLE IV

Return Dust Concentration in Entry

Ref.	Dust Concentration (MPPCF)	Ventilation (CFM) Total	Collector
1.	6	12,000	12,000

The dust concentration in the return air entry behind the dust collector discharge was also sampled. From Table IV it may be seen that only 6 million particles per cubic foot were being discharged into the entry from the dust collector. The entire 12,000 cfm of room air was passed through the collector.

Samples were likewise taken at the inlet and outlet of the collector to determine the collection efficiency. The standard thimble method was used to determine efficiencies by weight and the Greenburg-Smith impingement flasks were used to determine efficiencies by count.

TABLE V

Dust Collector Efficiency

Efficiency %	Remarks
99	By thimble weight method
90	By impinger count method

Table V indicates the type of efficiency of the collector on typical airborne coal dust resulting from mechanized operation. By particle weight method, 99 per cent collection was the average efficiency obtained. An efficiency of 90 per cent by particle count was obtained. A microprojector with 1,000X magnification and resolution to .2 microns was used to obtain the count efficiencies.

This study indicates that a collector of a type used in this study can be used in conjunction with normal ventilation practice. Dust concentration at the face as well as dust in the return air can be materially reduced by dividing the air between the dust collector and the return air brattice cloth.

Tests indicated that with proper placement of the inlet tube with reference to the coal face and machine operator, the dust count at the operator was reduced from an average of 71 million particles per cubic foot to 10 million particles per cubic foot. The count in the return air, which was mixed with untreated air at the face, was reduced from 156 to 14 million particles per cubic foot with only ⅛ of the total ventilation being diverted through the collector.

This study also showed that by dispensing with line brattice and using the collector to provide total face ventilation, dust at the operator's position can be held well below 25 million particles per cubic foot while the dust in the return air can be as low as 6 million particles per cubic foot.

Collection efficiencies for the collector tested showed 90 per cent by count and 99 per cent by weight on dust normally found in continuous mining operations.▲

RESUME OF GAS IGNITIONS AND FIRES IN COAL MINES

Since Enactment of the Federal Coal Mine Safety Act;

RECOMMENDATIONS TO PREVENT RECURRENCES

by H. F. WEAVER

chief, Division of Coal Mine Inspection, Bureau of Mines, Washington, D.C.

Is the law of averages again catching up with the coal-mining industry?

This is a rather cryptic introduction to the subject but, referring to major coal-mine disasters, it should give the industry deep concern.

During the 4½ year period from the Federal Coal Mine Safety Act through 1956, only two major disasters occurred in coal mines. The first causing the death of five men in 1953, was a coal-dust explosion initiated by a blown-out black-powder charge in an Iowa mine. A temporary restraining order, issued by a State Court, had prohibited Federal inspectors from enforcing the ban on the use of black powder under the Federal Act.

The second, in a West Virginia mine, November 1954, killed 16 men. A violent explosion and fire occurred while explosives charges were detonated in pillar stumps near an explosive atmosphere, using power from a trailing cable.

Following a 26-month disaster-free period, two major disasters occurred in the first two months of 1957. In January, five men were killed in an Alaska mine when an explosives charge was improperly detonated in an explosive atmosphere. In February, 37 men died in a West Virginia mine explosion when electrical equipment was operated in an explosive atmosphere.

The aforementioned 4½ year period, with only two major disasters and 21 deaths and the subsequent 26-month disaster-free period are commendable and encouraging. But it is hoped they have not engendered a state of complacency or smugness in the industry.

Immediately after a similar disaster-free period beginning November 1948, the year 1951 numbered five major disasters, and 157 deaths. Thus my earlier reference to the law of averages is apparent.

Administration of the Federal Coal Mine Safety Act has reduced the probability of major disasters in coal mines. Nevertheless, the frequency of minor mine fires and gas and dust ignitions indicates that much must be done before the possibility of serious catastrophes can be controlled, and the law of averages—based on past experience—will not catch up with it.

334 FIRES REPORTED

Since the Federal Act (July 1952) through June 1957, 198 mine fires have been reported to the Bureau with eight fatal and 39 nonfatal injuries. Moreover, 136 gas or dust ignitions were reported with 91 fatal and 162 nonfatal injuries. Undoubtedly, others occurred, but the Bureau was not notified.

Fortunately, none of the 198 mine fires was of major-disaster proportions. But those combatting mine fires know that each has disaster potentialities, especially in gassy mines. Investigations indicate that, in many instances, injuries and extensive property damage were held to a minimum because alternate escapeways and fire-fighting equipment were available, as well as men trained in using equipment and reasonably good rock dusting in the areas where ignitions occurred. However, many others were not catastrophic only because of unbelievable good fortune.

Coal mines in general are in better condition today in ventilation, rock dusting, fire prevention, alternate escapeways, and other preventive measures. These reduce the probability of major catastrophes; nevertheless, the continuing frequency of minor fires and gas and dust ignitions presages eventual trouble, unless additional efforts are made for full-time compliance with accepted preventive measures.

A breakdown of the igniting agents reveals that electrical circuits and equipment should be of primary concern in reducing these occurrences. Of the 198 fires, 121 (61 per cent) were of electrical origin, and 53 (39 per cent) of the 136 ignitions resulted from electric arcs. Next in importance in initiating gas or dust ignitions is improper use of explosives. Friction on belt conveyors ranked second as a cause of mine fires.

Inadequate ventilation is the primary cause of gas ignitions. Next, but almost as important, is elimination of sources of ignition, by proper installation and maintenance of electrical circuits and equipment. Poorly made temporary splices in trailing cables, inadequate overload protection, run-over cables are all too common. Failure to make proper, suitable tests for gas where electric equipment is operated is another important contributor to these ignitions.

NO SHORT CIRCUIT PROTECTION

Technical electrical surveys by Bureau electrical engineers revealed that too few coal mines have adequate overload protection against short circuits in remote areas of the mine. Some mines have virtually no protection at all, although they have installed circuit breakers and fuses that are supposed to provide it.

These conditions exist because of inadequate current-carrying capacity of the conductors, caused by cables of insufficient cross-sectional area, poor or too many splices, and lack of proper rail bonding, as well as length of circuits. These build up the resistance to a point where a dead short circuit could occur any place and insufficient current would flow to trip the protective device.

The proper procedure to overcome these hazardous conditions is a periodic technical survey of all electrical circuits. When high resistance is indicated, this condition should be corrected. However, other signs forewarn dangerous conditions. For example, low-voltage conditions in working areas may be inadequately protected power circuits. Overheating of cables, sluggish operation of equipment, and excessive dimming of lights during periods of high power demand indicate low voltage.

Where power is supplied from more than one substation, observations should be made to determine whether there are periods when power is interrupted from a nearby station but not from a distant station or stations. This condition may be indicated by inadequate power for operating equipment and by lights connected to the power circuit becoming very dim. When such conditions are observed, the cause should be determined and remedied.

BUREAU FIRE PREVENTION PROGRAM

In addition to administrating the Federal Coal Mine Safety Act and conducting accident-prevention training for coal-mine personnel, the Bureau develops ways and means to eliminate the major causes of mine fires and explosions. Some features of this program follow:

1. With representatives of the industry, fire-control standards that define and explain the minimum requirements for providing "suitable fire-fighting equipment, adequate for the size of the mine," as said in Sec. 209(g)(1) of the Act, were published in the Federal Register of March 9, 1957.

2. Experiments on foam plugs to fight mine fires was started to supplement the extensive basic research in Great Britain. By spraying a dilute solution of a wetting agent on a tilted cloth net stretched across a mine opening as close as possible to a mine fire, a mass of foam bubbles is developed and carried along the entry by the air current.

The foam fills the workings and readily travels over obstructions, such as roof falls, and around turns, until friction halts its progress. Distances up to 200 yards have been achieved; within this distance, fires are quenched or quickly cooled to the extent that a direct attack can be made. A separate progress report describes the Bureau's experiments with foam plugs.

3. A study of causes of fires in underground conveying belts, and extensive research, resulted in Bureau of Mines Schedule 28 covering testing of conveyor belts for fire-resistive qualities; this schedule has been effective since November 1955.

4. Schedule 2E, Regulations Governing Permissibility Tests for Electric Face

Equipment, was revised and approved in August 1955 as Schedule 2F, to conform more nearly to the provisions of the Federal Coal Mine Safety Act.

NONFLAMMABLE HYDRAULIC FLUIDS

5. Late in 1955, a study began to determine the procedure to test for research and development of economical nonflammable hydraulic fluids for mine equipment. A cooperative program with mine operators and manufacturers of mining equipment and hydraulic fluids was started. The present flammable fluids in hydraulic-controlled equipment present serious hazards when fires occur. Bursting hydraulic systems have caused many mine fires to spread out of control. Development of an economical, efficient, nonflammable fluid would decrease fire spreading materially.

6. After research suggested by the Bureau, a cable manufacturer developed an incombustible, thermoplastic trailing cable that passed the flame and damage tests for fire-resistant cables under Schedule 2F. Favorable reports from field tests of these cables indicate that the cable durability exceeds some fire-resistant cables previously available to the industry. These cables should greatly reduce the frequency of cable failures—the most serious mine-fire hazard confronting it.

7. Mining-electrical engineers and electrical inspectors conduct special investigations and surveys of electrical facilities in coal mines and notify operators of hazardous or sub-standard conditions. These engineers also cooperate with the industry in research on electrical apparatus to design safer equipment. In addition, an electrical-safety course is available to train electricians and maintenance personnel in the fundamentals of electricity and proper installation and maintenance of electric equipment and circuits.

8. The reduction of effective insulation and the increased rigidity of trailing cables necessitated by incorporating an additional conductor for frame grounding have caused many trailing-cable failures, some with disastrous results. Through research by the Bureau and the cooperation of manufacturers improved equivalent protective devices to replace frame-grounding conductors have been developed and certified by the Bureau as acceptable. Personnel of the Bureau is making field surveys to determine the effectiveness of these devices in actual service.

9. Bureau studies have revealed that, when properly done, rock dust can be adequately applied to the roof and ribs of working places as a premixed slurry or by mixing with water at the nozzle of a hose. This permits application of rock dust close to the faces during mining without the hazards and inconvenience of clouds of airborne dust.

10. A substitute for rock dusting—a viscous spray material that will entrap mine dusts—is being studied by a company that manufactures such materials.

11. To improve illumination, the Bureau has established Schedule 29 for approval of fluorescent lamps installed safely in face areas.

SPOT CHECKS CONDUCTED

In addition, certain mines are spot-checked between regular inspections to improve between-inspection compliance with the provisions of the Federal Mine Safety Codes and the Federal Coal Mine Safety Act. Also, the Bureau investigates all mine fires and gas or dust ignitions, large or small, and distributes reports for the industry to prevent recurrences.

Experience reveals that most gas explosions in coal mines could have been prevented with adequately controlled, continuous, positive ventilation. With continuous mining, face ventilation poses a difficult problem that may have to be solved by auxiliary means. However, if we wait until explosive gas is detected before ventilation is improved (which, unfortunately, is still too often the general practice) disasters will be inevitable.

It should be an established operating rule that, when the ventilating system undergoes any major revision (involving volume, pressure, or direction of air flow), all persons affected should be given explicit information. Moreover, major changes in ventilation should be made during an idle rather than a working period, so that only those making the changeover will be in the mine at the time.

Means of preventing coal-dust ignitions are well known to all in the industry, but adequate cleanup of loose coal and coal dust and proper application of rock dust in areas that are not wet must be prompt and continuous. Spotty, intermittent enforcement of these regulations will not suffice.

Coal mines cannot be entirely freed from fire hazards. The mineral mined is combustible, wooden timbering support the roof, doors and brattices control ventilation, rubber in belts, tires and other accessories, flammable oils and hydraulic fluids are used, and many sources of ignition are present (of which electric power is of primary importance).

These hazards can, however, be so minimized that there will be little danger of fires disastrous to life and property by proper installation and maintenance of equipment, particularly electrical installations and belt conveyors, provision of safe, travelable, well-marked alternate escapeways, and maintenance of adequate, readily available fire-fighting facilities, with employees trained and familiar with their limitations.

Means of preventing mine fires and explosions are adequately covered in Federal and State laws. However, as with most safety laws, 100 per cent enforcement is virtually impossible, unless those affected do their own policing conscientiously. Safety-education training has proved of inestimable value in improving safety consciousness—an absolute essential if progress is to be made.

Spasmodic compliance with accepted safety practices is not enough, because each act of carelessness, thoughtlessness, or neglect could lead to a serious accident or disaster. Only unrelenting, constant vigilance by each person in the coal-mining industry can avert gruesome penalties involved when you gamble against the law of averages in safety. ▲

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NATIONAL SAFETY COUNCIL

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

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THE CONSTRUCTION SECTION
THE PUBLIC EMPLOYEE SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Construction Section and the Public Employee Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Construction Section and the Public Employee Section carry on in behalf of their members, and for the benefit of accident prevention work in the construction industry and public employment generally. These Sections give guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of construction companies and public agencies.

The activities of these Sections are under the direction of their Executive Committees, the members of which are listed at the close of this volume.

CONSTRUCTION INDUSTRY

THE ETHICS OF SAFE CONSTRUCTION

by REV. ROBERT C. HARTNETT S. J.
Dean, College of Arts & Sciences, Loyola University, Chicago

Safety is like democracy, a sort of permanent revolution. We cannot allow ourselves to drop our guard for a single moment. Indeed, we have continually to improvise greater safeguards against new hazards to life and limb.

In glancing through the 1956 edition of *Accident Facts*, I noticed that of the 90,000 persons killed by accident in 1954, a rather alarming number died from accidents connected with construction. For example, more than 19,000 died in falls. Nearly a thousand died from contact with electric current. The boy killed in our community by contact with a TV set dramatized how difficult it is to make new inventions absolutely safe.

More than 6,000 were killed in 1954 by fire and the explosion of combustible materials, and 1,600 died of mechanical suffocation. Of the 5,000 who died of drowning, quite a few died in floods. Some might have been saved had their houses been constructed better to withstand floods or had flood-prevention or flood-containment been established by appropriate construction.

I suppose similar statistics could be found regarding the causes of personal injuries—serious, though nonfatal, injuries causing permanent or temporary disabilities. In 1955 there were nine million such injuries, of which four million occurred at home and nearly two million at work.

SAFETY IS INTELLIGENCE

Now safe construction is in the first instance, a question of intelligence, imagination and technical proficiency. Architects and engineers try to design and build safe buildings and highways. Like the rest of us, they must learn from experience the kind of buildings and highways which will involve some people, accident-prone people, in accidents.

The approaches to and exits from Edens Highway leading north out of Chicago are wide arcs. A car driven at the 20-mile-an-hour speed posted as "safe" could make the turns in less distance. But the architects and engineers have learned from experience to maximize the safety factor by extremely gradual turns. I certainly would not suspect them of elongating the turns just to make a bigger job of it.

SAFETY—MORAL OBLIGATION

In other words, I don't want to give the impression that safe construction is primarily an ethical problem. It is primarily an engineering problem. As far as zeal for safe construction is concerned, the desire and determination of architects and engineers is to build buildings and highways to minimize dangers to life and limb. The construction industry, both out of self-interest and out of public interest, give the highest priority to human safety.

On the Ohio Expressway the designers not only provided a parkway between the Westward and Eastward highways but hollowed it out so that no one would even be tempted to make a U-turn where it would be dangerous and is forbidden.

My topic, however, is the ethics of safe construction. So let me enumerate a few moral considerations which may help to fortify us in our determination to design and construct buildings and highways in as safe a way as possible.

The first moral consideration is that human safety is an integral part of everybody's job. Nobody can ever become so specialized a technician as to divest himself of responsibility for the safety-aspect of what he does. There is a very important principle in moral philosophy dealing with what is called cooperation.

According to this principle of cooperation, moral cooperation, an agent is guilty of wrongdoing if he is in any way involved in it, if he participates in it, without doing whatever he reasonably can do to prevent it.

Moral cooperation includes many actions besides those of the principal agent. For example, a person who gives bad advice cooperates in evil. A person who supplies bad material, or even good material which he knows will be badly used, cooperates in moral evil. Even a person who remains silent when he ought to speak up against an evil transaction is tarred with the guilt of moral evil.

Now this business of moral cooperation becomes extremely complicated. The fundamental moral principle is simply this: every human person is morally obliged to do what he reasonably can to prevent moral evil. If he is reasonably certain that nothing he can do or say will have any effect on the transaction whatsoever, he may be justified in letting things ride.

But we have to be very careful not to kid ourselves, not to lull our consciences by jumping to the conclusion that there is nothing we can do to prevent what we know is wrong. Self-interest such as the desire to make a handsome profit, is no justification for cooperating in moral evil. A person who goes along with unsafe construction without doing what he can to prevent it, just because he is too greedy to take a chance on losing business, is guilty of moral cooperation in an immoral action.

TAKES MORAL COURAGE

The second moral consideration is this: it takes a lot of moral courage sometimes to take a firm stand against politicians and business colleagues—especially your boss—when you know full well that you are cooperating in unsafe construction. Sometimes I think that the greatest need of this country today (maybe it's the greatest need of every country in any age) is moral courage.

People are afraid of getting hurt, especially in their pocketbook. Sometimes it seems as if they have adopted a purely utilitarian moral code according to which money excuses everything. In their own way, such people worship a golden calf.

They would never for a moment enunciate their philosophy of life as consisting of a worship of money. But when the chips are down, they always seem to put money first.

Now if the National Safety Council and this Congress mean a thing, they mean that *safety comes first.* They mean that human lives and bodily integrity are more important than money. Not somebody else's money, mind you, but your money and my money.

I wonder how a construction engineer feels when he reads that the floor of a building he is building collapsed, killing five men, all fathers of families—if he knows in his heart that he is partly to blame. *What doth it profit a man to gain the whole world and suffer the loss of his own soul?*

TECHNICAL ETHICS

Let me emphasize I am not talking about purely technical errors. An engineer could be guilty of many mistakes which would be honest errors of judgment—not too many mistakes, but quite a few in a life-time. I am talking only about deviations from what he knows to be the principles of safe construction, in cases where he failed to do what he could have done to prevent such deviations.

Moral courage, especially the kind needed to beat back the serpent of fear of loss of money, is an ethical must for safe construction. There are other kinds of fears, of course, that contribute to unsafe construction: fear of getting into a public hassle, fear of newspaper attacks, maybe even fear of one's wife when honesty would jeopardize one's income. We need moral courage to overcome all these fears. And I am not suggesting for a moment these are idle fears.

Now here is an ethical consideration which touches on technical ability. We are too much inclined today to divorce technical know-how from moral principle. This is unnatural. If a man is an engineer or an architect or even a bricklayer, *he has a moral obligation to acquire and apply whatever technical skill is necessary for him to do his work with full justice to the safety factor.*

For example, if an architect bids for a job when he knows that he lacks the skill to discharge it safety, he is being unethical. Anyone who neglects to apply all his skill to maximize the safety factor, to give it the No. 1 priority, is being unethical.

In other words, the moral principle that we must build safely, governs the use of technical skills. Technical skills are means, instruments, which must be directed by moral agents. A man's moral purposes are much more important than his technical skills. He must subordinate his use of skills to the paramount moral purposes of human life.

PHILOSOPHY QUESTION

Some people think that we Americans have become so proficient in technology that we have endowed technology with the halo of ultimate value. We no longer know how to think about means and ends in terms of man's ultimate purpose on earth, but only in terms of the here-and-now job to be done. If so, this lopsided fascination with technical achievement may completely undermine our allegiance to moral achievement. What are we made for, in the ultimate analysis, technical achievement or moral achievement?

The ethics of safe construction, like every other question of ethics, boils down to that unavoidable philosophical question: in what does the ultimate good of man consist? If it consists in making money, in our so-called high standard of material comfort or in any other purely temporal form of self-satisfaction, I do not see how we can expect architects and builders to make personal sacrifices, even very great sacrifices, in the interest of safe construction.

Any egocentric ethics would allow loopholes for unsafe construction if the price-tag were high enough. After all, people who worship the golden calf have never lost much sleep over a few dumb-cluck miners who lost their lives in explosions in unsafe mine shafts.

No, the ultimate reason for going all out for safe construction has to be respect for the moral worth and dignity of every child of God, respect for his bodily integrity and his right to "life, liberty and the pursuit of happiness"—in other words, to pursue his moral perfection as his highest temporal goal, as a means to the ultimate destiny the Creator of all mankind has put us on this planet to seek.

Doing all we can to prevent injuries to our fellow-pilgrims, whether fatal or non-fatal, is an important part of God's holy law for all of us.▲

SAFETY AND HEAVY CONSTRUCTION ST. LAWRENCE PROJECT AND THE HIGHWAY PROGRAM

by ELLIS L. ARMSTRONG

Utah director of highways, former ass't project manager, St. Lawrence power project, Salt Lake City, Utah

In this "Miracle of America" the progress in production of goods and services to make life better has reached a stage far above any other in the history of man. This evolved because we have begun to reap the benefits of harnessing the unlimited potentials of the human being, cooperatively pooled for the common good.

Man controls nature for his good more than ever before. If he can expand his concept that he is his brother's keeper to be all inclusive with his expanding ability [illegible] mar-ness the forces of the universe, perhaps we are entering the "Golden Age" of man.

There are many problems still unsolved —and solutions are not easy. Yet the history of civilization is marked by milestones where man recognized the need for cooperative effort to survive. Each construction feat in history advanced man along the path of civilization and cooperative effort was pitted against the forces of nature to control man's environment. Progress has been made by realizing that each man has a moral responsibility to respect and protect his neighbor.

Accomplishment of heavy construction requires the working together cooperatively of many men. The billion dollar St. Lawrence project is an outstanding example of what can be done when nations and states and groups of men, with some differences in objectives and interests, pool their efforts for the common good. The harnessing of power from the St. Lawrence in the International Rapids section will produce 2,200,000 horsepower of electrical energy and will open the Great Lakes to ocean-going ships, creating the "Eighth Sea."

NATIONS COOPERATE FOR PROGRESS

It is certainly a top achievement in man's struggle to improve his environment and harness the forces of nature. More important, perhaps, to the future of mankind, is the demonstration that international, national, local, and individual interests, can cooperate and can be co-ordinated for positive accomplishment. It is a successful practical demonstration of what is needed to solve many problems of our troubled world.

One of the major problems of our "Miracle of America" is the needless yearly loss of 95,000 lives and the crippling and maiming of nearly 10 million people by accidents. The National Safety Council has been a potent force towards reducing the appalling loss. Progress has been made. In the last 50 years the accidental death rate of all accidents has decreased from 100 per 100,000 population to about 53 per 100,000. However, the progress made is not enough —much remains to be done.

NOT "ACCIDENTS"—"MISTAKES"

In construction operations last year, 2,600 workers died in accidents on the job and 225,000 were injured, making construction one of the most hazardous occupations. Some 25 years ago, the rule of thumb quoted was that one man would be killed for each one million dollars worth of work accomplished. This was inevitable to get skyscrapers, dams, bridges, tunnels and highways constructed; a sacrifice of the life of man to the "God of Accomplishment." There was only a passive interest in safety, the same as the Sunday sermon on "Love Thy Neighbor." But safety was regarded as foreign to the rough, tough environment of heavy construction. A hard hat was regarded as "sissy" and taking unnecessary chances was a mark of distinction.

Fortunately, through the efforts of devoted, dedicated men in government, labor, and industry, safety today is recognized as an essential part of heavy construction. Accidents are no longer considered "Acts of God" but rather mistakes that can be corrected.

It has been demonstrated and accepted by the construction industry that "safety pays" in better worker performance, more production per man hour, less expense and certainly more happiness and well being for all concerned. Exposures of a million manhours without a lost-time accident still merit praise but are often accomplished; a record of 6,735,000 continuous accident-free manhours on a construction project has been established.

Improvement has not just happened. It has taken effort, work, perseverance, patience, sweat, vision and understanding of men and the cooperation of all concerned. It has taken the realization that there is an obligation to our fellow workmen that makes aggressive, positive effort toward accident prevention the only tenable course.

LOCKS AND CANAL WORK

The St. Lawrence project is unique in construction history. A large number of entities of international and national level are involved in one of the biggest, concentrated construction projects of all time. The work of constructing the dams and reservoirs to drown out the rapids and harness the power in the International Rapids Section will cost about $700,000,000.

This is being done by the Power Authority of New York and the Hydroelectric Power commission of Ontario. Engineering and supervision of construction on the American side was contracted to Uhl, Hall and Rich Engineers and on the Canadian side to the engineers of Ontario Hydro. To insure adherence to international treaty provisions of the river, several control agencies of an international character exercise review powers over all operations.

The two lock structures and the canal on the American side to bring deep water shipping into the reservoir are being constructed by the St. Lawrence Development corporation, a federal agency, at a cost of about $140,000,000. This agency utilizes the United States Army Corp of Engineers for engineering and construction supervision.

The St. Lawrence Development Authority of Canada is constructing the $25,000,000 lock at Iroquois on the Canadian side and the $280,000,000 canals and locks from the International Rapids to Montreal, utilizing largely its own engineering forces.

Most of the construction is being done by private construction contractors obtaining projects through open competitive bidding. In the 40-miles of the International Rapids more than 70 contractors, with about twice as many sub-contractors, have been in operation at one time. Approximately $80,000,000 worth of construction equipment and 17,000 workmen have been working around the clock to complete the project.

From a safety standpoint the following are factors of importance on the St. Lawrence:

1. Fast construction schedule.
2. Large number of workmen required in short time.
3. Relatively inexperienced heavy construction workmen.
4. Hazard of work in controlling the 250,000 cubic-feet-per-second flow of the St. Lawrence river.
5. Safety "written in" to construction contracts.

WORK AROUND THE CLOCK

The project was scheduled for the earliest practical completion date. The power portion was financed through the sale of bonds to private investors and there was a need and a market for power as soon as it could be produced. The schedule made necessary the pushing of all work around the clock and through hazardous winter seasons. Organizations were "under pressure" to get the job done.

With the fast start and the large number of contracts underway, it was difficult to man the jobs with experienced labor. Although the unions and the contractors did a Herculean job in getting workmen from all over the country, the carpenter reporting for work with new pair of overalls, a new hammer, and a meat saw was not fictional. This problem required additional efforts to teach workmen how to perform their tasks and to observe safety practices. Discipline presented a problem since a workman dismissed for safety infractions on one job, could immediately get employment on another.

The work of moving the large flow of the St. Lawrence river around to accomplish the construction presented hazards not usually encountered. The fast currents and the large constant flow of the river made necessary constant vigilance against the hazard of drowning. Wearing life jackets was mandatory on all operations over water. Winter work at the river produced the additional hazard of floating, grinding ice.

The specifications for the Power Authority of New York provided that:

> "The contractor shall at all times exercise reasonable precautions for the safety of persons engaged in the performance of the work.
>
> The contractor shall provide adequate equipment and facilities as are necessary or required, in the case of an accident, for first aid service to any person who may be injured in the prosecution of the work under this or other contracts for the St. Lawrence Power Project, and he shall have standing arrangement for adequate medical care, and for removal and hospital treatment of any person who may be injured or who may become ill. Such equipment or facilities and arrangements shall be satisfactory to the engineer.
>
> The contractor must report immediately to the engineer every accident to persons or damage to property, and shall furnish in writing full information including testimony of witnesses, regarding all accidents. The contractor shall comply fully with the provision of the booklet entitled, "Safety Requirements" as published by the U. S. Army Corps of Engineers and with N. Y. state laws. The contractor shall employ a full-time, qualified safety engineer, who shall report to and cooperate with the safety representative of the engineer."

Other agencies had similar provisions, thus recognizing that the owner, as well as the builder, has a moral obligation for the

welfare of the workmen. Further the specifications reflect the conviction that a safe job is the most economical job. The Corps of Engineers "Safety Requirements" is recognized as an excellent guide for job safety on heavy construction.

PLAN OWN SAFETY WORK

The engineers for the Power Authority instigated an aggressive positive safety program for their portion of the work, as did the other entities. A project safety engineer was appointed to head the program reporting directly to top management. He had assistants and acted as a staff advisor to top management with the prime function of providing advice and guidance for the program and directly assisting the various resident engineers. He was responsible for compiling the overall job safety records, statistics and reports, and to point up weak points in the program.

Enforcement of the safety requirements of the specifications was through the regular line organization, with each resident engineer held accountable for the safety features of his project through his field engineers and inspectors. Safety requirements were as important as requirements for quality of construction.

Each contractor had a safety engineer on its project to actuate the safety requirements of the specifications, working through the job superintendents, foremen and workmen. Contractors' safety programs were carried out as line functions.

At a monthly meeting with top management, the engineer and each contractor formulated policies, discussed weaknesses, reviewed accident records and devised improvements. Each contractor's project manager, the general superintendent, safety engineer and shift superintendents were required at these meetings.

NEW EMPLOYEES SCREENED

These meetings were followed by similar meetings at each job level with the resident engineers, their staffs, the job supervisors and foremen. Each project carried out a program of safety education through meetings of foremen, leadmen, and workmen. Probably the most effective means of furthering the safety program were the short "tool box" meetings between the foremen and his crew held daily or as required to cover the particular hazards of the crew.

On each job a new workman was given a list of safety rules for the project and an interview with a member of the contractor's safety organization who discussed the particular hazards of the project. The program provided for a similar discussion by his immediate foreman, who screened employees to prevent assigning unfit men to particularly hazardous work.

Large National Safety Council billboards were erected at each project and accident posters displayed. Smaller posters were displayed at the check stands where the accident record of the job was illustrated. Pertinent, timely safety reminders were issued with pay checks. The indoctrination lectures and the literature appealed to the workers' responsibility to his family and his fellow workers and to his pocketbook.

Area-wide competition was promoted for the best safety record of different crafts and for the different projects. The job with the best monthly record was awarded a large safety flag to fly for the following month. The awarding of the flag was done with ceremony and publicity.

Contractors maintained safety records of the foremen and presented them with awards when they reached admirable accident-free exposure totals.

The cooperation of the unions was obtained in promoting safety education in their meetings and in having them assist with safety indoctrination of new employees. The union stewards worked with the engineers and the contractors in policing safety regulations and devising safer methods and procedures.

The program was a coordinated all-out effort to further safety on the project. The result has been a record accident frequency of about half the national average for heavy construction in the approximately 60 million man-hours of exposure so far encountered.

Good accident records don't just happen —they are caused. And they are caused by formal, aggressive, positive safety efforts by all—by the owners, the engineers, the contractors, the insurance carriers, the governmental agencies, the unions, and the workers themselves. No halfway measure can be fully effective.

We, in America, are now embarked on a highway construction program that is the largest public works endeavor of all time. One of the program's main objectives is to reduce the appalling accidents, death and destruction on our present crowded inadequate highways. These accidents have aroused public indignation so an all-out effort for reduction is now underway.

HIGHWAY CONSTRUCTION PROJECT

However, embarking as we are on this unprecedented construction program, we should not overlook our obligation to reduce accidents during construction. Actually the progress in reducing the accident rate of highway travelers has been better than the reduction of our accident rate on construction.

The size of the construction program will attract new contractors into the field and expand existing organizations. Many of these will not have the experience or the personnel to carry out a good safety program and they will need help. Some undoubtedly feel that adequate safety precautions will mean added expense; particularly so from the standpoint of safety of the traveling public through the construction areas. While this may be true from a short-range, individual contractor approach, from the overall standpoint adequate precautions and safety measures must be taken. This will require that reasonable safety requirements are an integral part of the contract to place all competitive bidders on an equal basis.

In my state, as in many others, there has not been a formal safety program on highway construction work. This has been left to the contractors' insurance carriers and the states' industrial commissions or labor departments. The results have not been good. The accident rates are high, the insurance rates are high.

We are proposing to "write in" safety requirements in our specifications—not just general references to state statutes—but specific reasonable safety requirements included in a safety manual to be specifically patterned to highway construction with its additional hazard of the traveling public through the construction area. We are proposing a better record of our construction accidents so that we can better define our problems.

We are in the process of defining in writing our safety policy and in working out the details of a program to accomplish that policy. This will include an educational program through all the chain of command. It will make a safe job as important to our inspectors and engineers as a quality job.

With the big construction program ahead of us, we cannot do less—and still fulfill our obligation for the welfare of our fellow workman, and to the taxpaying motoring public to see they get the most highway possible from their tax dollar.

The St. Lawrence project illustrates what can be done in a formal, positive safety program made an essential part of construction. The same type of approach should provide an equally favorable record on our highway construction—a program bringing the governmental agencies, the engineers, contractors, the unions, the insurance carriers, and the workman into a coordinated, cooperative all-out effort to reduce needless accidents.

MEN, MACHINES AND METHODS

by DONALD B. WILCOX

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Accident prevention is one of the best, and certainly one of the most humane and socially desirable ways to increase profits. Industrial engineers, by virtue of their unique training, are well qualified to decrease costs. They are prepared to lead in accident prevention efforts in addition to performing their primary function of coordinating, facilitating and expediting production.

Accidents are extremely costly. Even the basic minimum expenditures demanded under compensation laws are an appreciable item in most cost estimates. Insurance covers these expenses, but what about damage to vital equipment and materials, delays to the job, liability to third parties and other "indirect" costs resulting from every accident?

The insurance companies cover these costs through the premiums paid by the contractor. These premiums are usually set through experience ratings and thus successful efforts to eliminate personal injury accidents bring a prompt and direct reduction in the cost of doing business, which results in increased profits.

The construction industry presents a complex picture. Representatives of large and small concerns, representatives of government, insurance and various other types of agencies concerned with the problems met in building a wide range of structures covering industrial, residential and public works all have certain interests in common: getting the job done—quickly, safely and economically.

NEW TYPE ENGINEERING

Most everyone is familiar with the basic divisions of engineering—mechanical, civil and electrical. Industrial engineering is relatively new, established less than 50 years ago, and only coming into prominence as a result of World War II. Many learned authorities have propounded elaborate and detailed definitions of the field, but I would choose to describe it more simply.

The collegiate industrial engineering curriculum is an outgrowth of mechanical, is based on a solid grounding in the fundamental sciences, and includes survey courses which acquaint the student with the principles of surveying, structures, electrical and mechanical equipment.

However, and here is where we offer something different, and something which employers seek and appreciate, the industrial engineering training places emphasis (1) on human nature and considerations of the physical capabilities and adaptabilities of workers and (2) on cost considerations and the vital importance of producting goods and services efficiently and economically to sell at a profit.

Some of the earliest investigations in the field of industrial engineering were made in the construction industry. Mr. Frederick W. Taylor, one of our pioneers, was struck by the waste effort and fatigue in the methods then used by the bricklayers. He devised a scaffold to deliver bricks to the worker at the working level thus eliminating back-bending fatigue and also increasing production.

TRAIN, EXAMINE MEN

To get down to cases, let me take up my topics in order. First of all: *Men*. The selection, training and ultimate job assignment of the workers has been a fertile and rewarding area of investigation and study. Native intelligence, education, and physical limitations or capabilities should be evaluated and the findings intelligently used.

Countless accidents have been traced to the fact that the injured man was poorly adapted to the type of work in which he was engaged, either through failure to comprehend and deal with certain hazards, or because he lacked necessary coordination, dexterity of physical strength and stamina.

Pre-employment physical examinations, properly made and recorded will reveal many potentially expensive hernias, back injuries and other types of claims. Many concerns are enlarging their preventive medical program to include periodic physical examinations to detect incipient allergies and progressive forms of physical ailments which might otherwise culminate in accidents or industrial health claims.

The supervision of men is the keystone of successful production. A job is as good as the supervision wants it to be. If management is truly interested in turning out good work and makes clear to its supervision that it demands accident free conditions, a supervisor, be he superintendent or foreman can transmit through education, enforcement and example an enthusiasm which will make the job proceed smoothly.

GOOD SUPERVISOR QUALITIES

There is much help available to those who would be good supervisors. An understanding of human nature, its motivations, the inter-relationships of fatigue, worry and the personal needs for an occasional word of commendation, discipline and instruction are all involved. Taylor once conducted an interesting experiment on the psychological requirement of the average workman to understand his part of the job in the scheme of things.

He hired a group of common laborers to carry a large number of "pigs" of iron from one end of a long yard to the other. When they had finished he asked them to carry them all back. Then again to carry them back to the other end, and again to return them, whereupon they tried to quit. He offered them more money, but with little success. They just didn't want to do a job where they could see no accomplishment from their efforts. Pay alone is not enough.

Workers' cooperation in an accident prevention program cannot be purchased outright. They must feel it is a team effort. There must be recognition of accomplishment and incentive to improve the record.

The industrial engineer can select and enforce the use of suitable protective equipment for your men. This is a field where technical knowledge is important. Hazards are elusive and the "hunt for the hazard" is only the beginning. It remains to select proper protective devices to reduce exposure without interfering with production. Finally, there are problems of making equipment available where and when needed, seeing it is used as intended, and maintained and accounted for.

UTILIZE MACHINES EFFICIENTLY

Now consider the topic of *Machines*. The contracting industry has been slow to take advantage of modern mechanization. Many material handling methods are still primitive. On other jobs equipment is used which was not at all suited to the work being done. Other sites have equipment needed and, although owned by the contractor, was not available either because of preventable breakdown or because it was standing idle on some other job site.

We have a big contractor in Florida who reportedly had similar items of equipment pass each other en route on long hauls simply through failure to plan and know where his equipment was, and where and when it was needed.

There was an item in the paper about a laborer who took off in a company truck, painted out the sign and engaged in his own independent hauling operations for several weeks. Finally he parked it on a side street where the police eventually found it. When it was turned back to the owner they found it had never even been missed. This is inexcusable and extremely costly. Some solid industrial engineering planning and control can prevent such occurrences.

I make no claim that we industrial engineers know all about the great variety of types of equipment encountered in construction work. But industrial engineering training prepares the graduate, after a little experience with your organization, to keep abreast of the technical press, make economic studies and recommendations on selecting proper equipment, adequate depreciation charges and replacement policies. Scheduled, preventive maintenance will yield more efficient production, with the very important by-product of preventing the possibilities of many expensive accidents.

Machinery is expensive, accidents involving power equipment are usually serious ones, and the exigencies of building operations demand ingenuity, resourcefulness and accurate, positive and informed decisions.

Have you ever had anyone in your organization analyze the feasibility of using flight conveyors or straddle trucks in handling your materials? Have you attempted to standardize procedures and methods? What about maintenance?

A foreman worth his salt will devote most of his time to supervising the progress of the work. This embraces assigning work, arranging for needed materials and equipment, instructing the workers, coordinating with various crafts and other working groups, and making a multitude of on-the-spot decisions. If he is to accomplish all this effectively and efficiently, little time is left for other matters.

SAFETY BY MECHANICS

An industrial engineer can use his mechanical background to devise needed guards, evaluate and counteract hazards and promote safety through training, inspection and protective measures. Working with the foreman he can see that barricades guard floor openings, that operators are properly trained to use power equipment, and that neither circuits, machines nor men are overloaded —with consequent expensive breakdown.

The inherent perils of construction machinery can be practically eliminated by enforcing a few simple measures.

1. Only trained operators should be permitted to operate power equipment—be it a swing-saw in the yard, or a crane swinging a head-ache ball. A man unfamiliar with the controls can forget to set a ratchet, tip over the equipment or snap a cable.

Also the operator should be able to see clearly the entire area of his maneuver or he should be assisted by reliable signal-men. I have seen many near-accidents due to faulty or sloppy signals.

2. Crane operators must realize that high tension usually means instant death and that they must stay clear of all power lines.

3. Personnel must not ride the equipment. In Florida seven men were killed and 12 seriously injured in one material hoist accident. Steelworkers often elect to ride the ball down. In Miami, when two men did this and the operator momentarily lost his view of them and applied his brake suddenly, both were jarred off and serious injured.

4. When equipment is closed down all pans, blades, buckets and booms should be lowered and the machine be made inoperative should children or other trespassers tinker with the controls.

The communication of these and a host of other important management policies can best be effected through an organized, continuing, supervisory training program. Such a program does not have to be formal but must be practical, up-to-the-minute and authoritative. The development of your supervisors will yield more and better production at less cost.

Equipment will be better cared for and fewer accidents will occur. Insurance companies and governmental agencies are prepared to help in such efforts, but an industrial engineer on your own staff can keep abreast of current conditions and put real vitality and value in your employee training.

Now as to *Methods*. Industrial engineers have had to live down the epithet of "Efficiency Experts." Unfortunately, in the early stages of our field there were certain unqualified and unscrupulous individuals who wanted to get on the band-wagon and make a fast buck. These men went about the country claiming to work miracles in reducing costs and increasing production.

METHODS DETERMINE PRODUCTION

Many of their recommendations were ill-conceived and poorly worked out, with catastrophic results for some of their unfortunate clients. Labor resented the so-called stretch out of work and the practioners were dubbed in derision as "Efficiency Experts." This has been, extremely unfair because the respected industrial engineer of today is truly an expert in efficiency and his abilities in methods improvement have much to offer construction companies.

First consider the matter of layout. You have all seen job sites where material is piled helter-skelter, all over the place. After the first few consignments of brick, pipe, lumber and reinforcing steel are delivered, it becomes every man for himself as each new truck drives up and looks for a place to dump its load of material.

Materials have to be moved from place to place before they are finally used. Those on top are shoved aside; material gets broken, lost, stolen, mis-used,—and people get hurt in the confusion. Extra efforts are needed to get what is needed, when it is needed, where it is needed. Sub-contractors get sore when their material is made inaccessible, or when they are required to trot way around the job every time they need an elbow or require a piece of conduit.

How much better it would be if the superintendent on the job would make it his first order of business to plan the site and consider proper storage provisions and space requirements for materials handling. A little attention given to the segregation of various sizes of brick, block, steel, pipe and conduit can save time and crushed fingers or toes when material is needed in the course of erection.

Proper methods of piling will pay similar dividends. Bricks, blocks and lumber can all be palletized or otherwise prepared for mechanical handling. Reducing hazards is enough to justify such treatment, but if you are interested in more immediate profits you will find they come from reduced labor costs incidental to unloading and handling materials by modern power equipment.

GOOD SCHEDULING EASES JOB

Another approach to this same general problem, employed by industrial engineers, is that of scheduling. Material delays can certainly hold up a job and incur payroll expense for idle workers and so we try to stockpile in advance, but this is an elementary approach. Good purchasing involves dealing with responsible suppliers through binding contracts.

Deliveries can then be scheduled to reach the job when and as needed—not six weeks before. Should weather or other conditions require changes, or should the job proceed more rapidly than anticipated, good scheduling demands that progress be related to plans in a realistic manner and prompt and complete coordination be effected. This the industrial engineer is trained to do.

The industrial engineer is indoctrinated in his undergraduate curriculum in the intricacies of legal relationships. Contracts and contracting procedures, real estate law including easements, riparian rights, rights to vertical and lateral support, and liens, workmen's compensation and public liabilities, purchasing, common carriers, labor law and insurance are all encountered daily on the job.

The maintenance of complete and accurate records and the ability to estimate quantities and costs are invaluable when making progress reports, submitting certificates of completion, or analyzing costs. An industrial engineer on the job will far more than repay his cost through recommendations developed by analysis of accident reports, material utilization and payroll audits. His familiarity with budget procedures, cost control and accounting is invaluable.

GOOD PUBLIC RELATIONS

In public relations, again the industrial engineer is especially effective. Although contractors do not deal with the man-on-the-street as a day-to-day customer in the sense of the corner druggist or delicatessen, they should be keenly concerned about their relationships with the general public.

Their reputation as conscientious, considerate, competent builders will do much to foster trouble-free labor relations, attract better grade help, facilitate favorable legislation and financing, and counter-act the probability of criticism for the public nuisance complaints which accompany most jobs.

The paving contractor who displays a large sign calling attention to his name and then puts a sloppy looking, disagreeable, uncouth individual at the job of flagging traffic can turn every driver that passes into a surly critic. If a little care is taken in selecting that flagman and he is properly instructed to explain necessary waits to delayed motorists and caution them to drive safely, lawsuits and litigations which might otherwise arise may be avoided.

Construction work is notoriously of interest to pedestrians. You have no doubt shared my frustration at passing jobs which were secreted behind closed board fences, and my satisfaction at pausing a moment at peep-holes thoughtfully provided by a contractor who was conscious of the importance of good public relations. I have known cases of such vantage points creating the initial interest of some excellent job applicants.

The attractive nuisance problem with its attendant liabilities is still another facet of public relations. Warning signs, explanations, press releases and attention to barricades and watchmen can do much to educate parents in the neighborhood to assist in keeping children away from dangerous areas.

Every contractor who knows his business will agree that housekeeping is one of the

most important aspects of the well-run job. Yet almost invariably I have found more alibis than efforts in this direction. Accident statistics readily reveal that a great many accidents which cost money and interfere with production, are directly traceable to poor housekeeping. Debris should not be allowed to accumulate.

HOUSEKEEPING SAVES DOLLARS

It is penny wise and pound foolish to kid yourself that you are cutting costs by reducing the labor force assigned to clean-up. Three dollars an hour, or $2, or $1.85 is too much to pay for a craftsman's time in pawing through a pile of scrap to clear a place to fasten a brace, or to place a ladder. The up-turned rusty nail, the littered stairs, and the stumbling block await their victims on too many jobs.

The fire hazard is vastly increased by the presence of trash piles of empty sacks and scrap lumber. Temporary wiring should be kept up off the floor and out of the way. I would like to see the pop bottle banned for it has led to falls and broken bones.

Good materials are wasted, possible salvage is ignored and accidents breed when trash is left lying around. Why not turn to an industrial engineer to devise a system of segregation, removal and disposal?

May I conclude with a little rhyme penned by Mr. Rudyard Kipling:

"I keep six honest serving men
(They taught me all I knew)
Their names are What and Why and When,
And How and Where and Who."

These six are combined in the person of the capable industrial engineer, and he has much to offer your industry.▲

LOOK UP AND LIVE

by RAYMOND W. WHITE

manager of claims and safety dept., Pacific Gas and Electric co., San Francisco, Calif.

This slogan has been adopted as a theme to help in the elimination of deaths and serious injuries resulting from contact with overhead electric power lines by equipment, tools, and other mobile objects. If all persons engaged in work which involves the raising of objects into the air will first "look up" and then take the proper steps to avoid contacts with any overhead electric power lines in the immediate vicinity, they and their fellow workers will live to work again.

WHAT IS BEING DONE

I shall present this problem to indicate its vital interest to your group, to state what is being done by the electric utility companies, and to seek your active programming of a campaign in the construction industry to eliminate such accidents.

Many of the electric utility companies throughout the nation, in cooperation with state and local governmental agencies, are conducting such accident prevention programs as a public service. These campaigns have included the following:

1. Newspaper advertising.
2. Radio and television programs.
3. Sound films.
4. Pamphlets.
5. Direct mailing to contractors, union members, farmers.
6. Personal appearances before contractor groups, union meetings, farmer groups, public service groups, etc.

The construction industry, by joining in this campaign, can bring about substantial accomplishments.

Both contractors and workers have the overriding motivation of the saving of human life in the prevention of these accidents. In addition, contractors and owners have vital financial reasons for eliminating such accidents. Insurance companies, damage

claims, work stoppage, contract losses, cost of training new skilled employees, etc., are but a few of such reasons. The workers are vitally interested because they are the ones who will be killed or injured, and because their families and their job opportunities also suffer.

Electricity in our modern civilization is a wonderful and indispensable servant. However, like many other modern conveniences, such as the automobile or airplane, it must be used or treated with proper respect. Carelessness can transform a wonderful servant into a horrible master!

Overhead power lines have long been used as the only feasible way of bringing electricity to the majority of our citizens. Almost all construction jobs find the use of electricity essential today. Your electric utility companies construct overhead electric lines to high standards of safety. This method of distributing electricity has been used since its discovery and will continue to be used for a long time in our present civilization with reliability and safety. It is the failure to "look up" and keep a safe distance from such overhead lines that brings about accidents.

WHAT CAN BE DONE

If the "Look Up and Live" message is carried far enough, loud enough, and often enough to those persons having potential exposure in their work, we can eliminate or reduce to an irreducible minimum this type of accident.

There is a need for concentrated action, properly coordinated, between contractor associations, labor unions, state and local authorities, electric utility companies, and the National Safety Council. This action should provide the thorough and repeated dissemination of information to all members of the construction industry, emphasizing the theme of "Look Up and Live." It stresses how proper care in the movement of objects when in the vicinity of overhead electric power lines will save the life of a fellow worker and prevent horrible suffering for those who might be maimed, but not killed outright.

Many of your local power companies will be glad to assist in preparing written information, developing programs, and preparing special material which you can deliver to your members and associates.

WAYS TO AVOID ACCIDENTS

Many suggestions for avoiding such accidents have been advanced, such as blocking crane wheels or tracks, blocking turning or lifting mechanisms, so that booms may not be moved beyond a safe point, building physical barriers, proximity alarm systems to warn when a boom is brought too close to power lines, contacting local power company in advance so that line can be de-energized, raised, re-routed, or other precautions taken. The exact solution will differ, depending upon circumstances.

In California the law requires maintaining a minimum distance of at least six feet from overhead electric power lines at all times. State safety inspectors require mechanical blocking or locking of equipment to preclude the possibility of contact.

The first rule to be followed is to look up frequently to discover whether overhead electric power lines are in the vicinity. Once this is determined, the other steps should be taken. However, it must be noted that visual observation of an overhead wire from the ground can be misleading. The angle of sight, light conditions, atmospheric conditions, background conditions and other factors may make determination of exact distances difficult.

Perhaps one of the most graphic illustrations of the need for continual observation and awareness can be quickly given by a brief summary of the tragic facts of a case which happened in our territory a few years ago. A salesman was demonstrating a boom equipped truck designed for trimming trees. He intentionally brought it to an area in the immediate vicinity of a 12,000 volt overhead electric power line to demonstrate its mobility.

FAILED TO OBSERVE

After several conversations concerning the proximity of the wires and how the equipment would avoid them, the salesman proceeded to demonstrate the equipment and in doing so, misjudged the distance and moved the bucket in which he was standing directly into the 12,000 volt line. Both he and the bucket were engulfed in a tremendous flame and eventually the bucket disintegrated, dropping what was left of the salesman to the ground.

Needless to say, he was horribly burned and was dead upon his arrival at the hos-

pital. This indicates that mere awareness is not enough. Further precautions must be taken. The equipment should have been located and blocked so that the farthest extension of the boom could not have brought it closer than six feet from the power line.

A discussion of the problem in advance with the local power company is recommended if careful appraisal of the job indicates no method of performing the work without coming in close proximity to the power lines (any distance closer than six feet).

DISTANCE ELECTRICITY JUMPS

Statements about electricity arcing and jumping through the air while booms are several feet away from power lines have been made. Such statements are incorrect and misleading. They do a disservice to proper understanding of this subject. The distance which electricity will arc or jump in the air gap or space under given conditions is a scientific fact. Air acts as an insulator or non-conductor of electricity.

The American Institute of Electrical Engineers, in cooperation with the American Standards Association, has published Standard No. 4 (American Standard for Measurement of Voltage in Dielectric Tests, September 11, 1953), which sets forth arcing distances. Table IA on Page 19 of this Standard shows that the arcing distances of electricity is normally considerably less than one inch at voltages as high as 40,000 volts. For example, the table shows that at 12,000 volts the arcing or jumping distance is only 0.5 CM or 0.197 inches (approximately ⅛ of an inch).

Most distribution voltages range from 2,300 to 12,000 volts. Higher voltages are used for transmission, but such lines are fewer in number. Even the very highest transmission voltages now in use in the United States will not arc or jump several feet through air, as has been claimed.

Perhaps some of the confusion has arisen from the fact that once a contact is made, an arc will be caused to stretch out when the contacting object is drawn away from the power line, and there may be a spectacular display of "fireworks" before the arc thus induced is actually broken. This cannot happen until direct contact is made or the boom has been brought so close to the line that it is within the arcing distances shown in Standard No. 4, which as I have indicated, for the normal power line distribution voltages is less than one inch.

A short television safety cartoon was prepared by the Pacific Gas and Electric Company of California as a public service. This cartoon warns of the need to "LOOK UP" and keep away from power lines.

FILMS AND PAMPHLETS

Two pamphlets have been prepared for distribution. The first is entitled, *Look Up—Power Lines Are Overhead*, which was published by our company. The second is entitled, *Keep Away from Power Lines* (Bulletin 140, April 1955) published by the Division of Industrial Safety, State of California.

The construction industry and its workers have an obligation to reduce these accidents. Knowledge and information to bring this about are available. We solicit your action to bring this message to the attention of every person engaged in construction activities. Our message is simply this: Whoever you are—wherever you work—if you have any equipment that reaches into the air—REMEMBER: Power lines are overhead—look up.▲

REMARKS OF GENERAL CHAIRMAN

by WILLIAM G. HAWKINS
director of insurance and safety, Winston Bros. co., Minneapolis, Minn.

It is with sincere humility and considerable pride that I accept the privilege and honor to serve as your general chairman this coming year.

In accepting this gavel from our outgoing general chairman, Robert L. Jenkins, I want to say that Bob has established, during his two years administration, a pattern of accomplishment that is going to be difficult to equal. We may be, indeed, thankful that he has agreed to continue to serve as an active member of our executive committee.

We may be justly proud of our executive committee, of its heritage and accomplishments since its founding in 1919, where today it has earned a reputation of being one of the most outstanding in the National Safety Council. But neither reminescence nor laurels-resting have ever been a part of our makeup. We must be concerned only with the tasks that lay ahead.

When we consider that we are the national safety committee for the biggest industry in this country today, the importance of our responsibilities become apparent. To be truly representative of the vast construction industry, we must furnish the leadership, coordination, and services that will provide the safety movement with a united front for all divisions and segments of the industry. Today, through direct and association memberships we are offering accident prevention services to more than 25,000 construction firms, employing several millions of construction workers throughout the United States, Canada and every corner of the globe.

The success of our leadership is largely dependent upon the effectiveness of our services and our ability to obtain participation from the contractors as active cooperators—all doing their share as individuals.

In planning and developing our committee activities, careful thought will be given to two goals, namely:

1. Developing effective materials and programs that will assist in setting up and carrying out a safety program, particularly at the job level, for our present participants and cooperators.
2. Developing activities that will "sell" our service, thereby, not only assuring broader and more effective use of our materials by our present participants, but also to reach out to the thousands of contractor associations and individuals who neither have a safety program today, nor are participating in our united national effort.

It is fully realized that it is going to take a heap of teamwork on the part of each member of our executive committee, but I have every confidence in each committee chairman and every individual member —truly representative of the construction industry and the best in the business of accident prevention.

Our Construction Section executive committee is now comprised of five divisions to cover Heavy, Highway, Building, Home Building and Specialty Construction safety problems. We have doubled the size of our committee, and are accepting the challenge of leadership with the ambitous determination to win.

Every member of our committee has complete faith and confidence in our fellow Constructors of America, for once a contractor is convinced of the importance of any task needed to be done, no matter how impossible it may seem, he will find a way. So it is with accident prevention.▲

PUBLIC EMPLOYEE SECTION

DRIVER TRAINING AND/OR REFRESHER COURSES

(A Panel Discussion)

DRIVER TRAINING

by FORREST S. ADAMS
safety coordinator, county of San Diego, San Diego, Calif.

In the spring of 1949 Arthur B. Groos, county training officer and secretary of the Central Safety Control committee, "viewed with alarm" the increasing number of vehicle accidents involving county vehicles driven by county employees.

Plans were made and in September, 1950, the County Board of Supervisors approved driver training for employees driving county vehicles, to be put into operation October 1, 1950. Sergeant J. T. Biddle of the San Diego Police Department was appointed as instructor and the San Diego Police Traffic Education Department cooperated by supplying materials, films, charts and testing equipment. The San Diego City Schools System assumed the cost of the instructor's salary.

The program was to consist of six hours of instruction in rules of the road, the vehicle code, defensive driving techniques, courtesy, vehicle maintenance and psychophysical tests.

The six hours of the program were divided into sections to suit the needs of the various departments participating; i.e., three, two-hour periods, two, three-hour periods and/or one six hour period.

The content of the course was based upon the ideas of Professor Amos Neyhart of Pennsylvania State College, a program developed by the County of Los Angeles, and other material appropriate to the local situation. Sergeant Biddle had gained national recognition for his work in driver education and is currently head of driver training for the United States Post Office Department.

During the year following the inception of the program 1,121 out of 2,800 employees completed the course and were awarded Safe Driver Certificates.

An almost immediate decrease was noted in county vehicle accidents. A six months survey indicated a 32 per cent reduction in accidents and a 65 per cent reduction in costs of accidents. These reductions occurred in spite of an increase of nine percent in the number of cars in operation and a six per cent increase in mileage driven.

The course was continued on a periodical basis up to the time of the appointment of a County Safety Coordinator in 1954. Since that time the course has been conducted on a monthly basis with new employees participating.

A continued decrease in vehicle accidents and their attendant costs has been noted each year since the course was started.

Obviously both mileage and the number of cars in operation have almost doubled since 1950, and of course the exposure to an ever increasing number of cars on the road points up the fact that the trained county driver is better equipped to do, and is doing, an excellent job of safe driving.

As compared to the numerous complaints by the community regarding the irresponsible attitude of county drivers prior to 1950, and the few complaints now voiced, it is quite obvious that the Safe Driver Program has paid off very handsomely.

The planned purpose of the county driver training program develops good drivers from the average run of the mill driver. Attitude is stressed, together with an awareness that good public relations with the tax paying public is enhanced by the golden rule of driving; i.e., courtesy, common sense and caution. Driver training does pay dividends.

SELLING THE DRIVER ON THE NEED FOR DRIVER TRAINING

by ALFRED M. NOYES
manager, safety div., Chief Administrative Office, county of Los Angeles, Calif.

Before the individual driver can be influenced to accept a driver training program, top management must be sold on the idea and give the program its full endorsement. This will be achieved if top management is fully informed of the extent of the problem and the method by which it is proposed to improve driver performance.

THE PROBLEM

A brief résumé of the history of driver training programs in the county of Los Angeles will show you the problems we faced, how we faced them, and what we are doing currently to develop and maintain safe driving procedures among all employees of the county.

The county of Los Angeles has more than 3,000 vehicles ranging from passenger cars to sheriff's interceptors, station wagons, buses, ambulances, bookmobiles, pickup trucks, fire fighting equipment, road building and maintenance equipment, and heavy trucks including trailer units and one special 300 horse power unit. In addition to this county-owned equipment, some 4,000 employees are authorized to drive their own vehicles on county business as "permittees." This poses a special problem because we do not exercise control over the physical maintenance of permittee vehicles.

This paper will be limited to land based motor vehicles, and will not include our small air force in the sheriff's Aero Detail of two light planes and three helicopters; nor the small navy of motor launches in the Flood Control District and the Parks and Recreation Department.

The terrain covered in our motor vehicle operation exceeds 4,000 square miles and includes travel in the heavy metropolitan areas interlaced with an extensive freeway system, level areas, foothills, mountains, valleys and deserts.

In recent years the total mileage covered annually by county-owned equipment has been approximately 25 million miles, and permittee vehicles have covered an additional 19 million miles annually, for an average annual total of approximately 44 million miles. Twelve of the 59 county departments and districts total more than one million miles of driving per year and three of these departments—county engineer, road department and sheriff, each covers more than three million miles per year.

With all of these drivers, all these vehicles, all this terrain, and all of these miles piled up each year, we have also been piling up too many vehicles and injuring too many drivers. Both frequency and severity of vehicle accidents were too high to be ignored and too many vehicles were out of service due to shop repairs. A number of these were major repairs and too many involved total losses.

THE ATTACK

On October 5, 1934, the county of Los Angeles' Board of Supervisors recognized the problem by officially establishing the County Safety committee, which, among other responsibilities, was instructed to investigate automotive accidents involving county equipment and personnel "to promote safety and develop a program of accident prevention and assign penalties as prescribed by the Board of Supervisors," as a means of reducing serious personal injuries and costly property damage.

For a number of years attempts were made to augment driver selection with some kind of a driver training program administered by the Civil Service Commission. However these efforts failed to arouse any real enthusiasm among the drivers and department heads did not provide the necessary support for the driver training efforts.

Several years ago the entire program was reviewed and advice was sought from such groups as the automobile clubs, insurance companies in the commercial vehicle field,

and the Greater Los Angeles Safety Council, regarding an effective driver training program for county personnel. The Safety Council proved to be the most productive resource due to its many contacts.

From this survey and the advice received, we developed a driver training program to be directed to all county drivers. Before it was launched, the chief administration officer was approached for his blessing, without which we knew the program could not make an effective start. The idea was adopted and the new driver training program was inaugurated as one of the first projects when the Safety division was established in the chief administrative office.

SAFETY AMENDMENTS

Since the start of this new program approximately 4,000 county drivers have taken the special one-day training course. Official support for this revised Safe Driving Program has been gained through several significant amendments to the County Administrative Code, notably:

Section 125.2 Supervision of Safety. . . . He(the chief administrative officer) shall take all measures which he deems necessary or effective to reduce or eliminate all industrial and vehicular accidents and the costs thereof.

Section 125.3 Investigation. The chief administrative officer shall investigate and ascertain the cost of all industrial and vehicular accidents . . .

Section 125.4 Safety Instruction. The chief administrative officer . . . shall conduct or provide for the conducting of courses and other instruction in . . . motor vehicle operator education and motor vehicle operator training.

Section 125.5 Motor Vehicle Operator Education. The aims and purposes . . . shall include . . . knowledge of the Vehicle Code . . . and a true appreciation of the causes, seriousness, and consequences of traffic accidents.

Section 125.6 Motor Vehicle Operator Training. The aims and purposes . . . include the development of the knowledge, attitudes, habits and skills necessary for the safe operation of motor vehicles.

As with any new effort, the effects of this training were not felt immediately, nor were they evident throughout all county departments. However, one department in which the majority of the authorized drivers have taken the new driver training course showed a 25 per cent decrease in vehicular accidents during the year following the completion of the driver training. An analysis of their vehicle accident reports shows a progressive decrease in preventable accidents during the last three quarters of the 1956-1957 fiscal year.

In addition, several other departments have informed the Safety division that in recent months their departmental automotive subcommittees have not been convened because there were no automotive accidents for them to review. For the first time in years, these subcommittees can now focus their attention on vehicle accident prevention programs rather than a review of accidents.

In this revised program, we started with the following objectives: reduction of automotive accidents; reduction of operating costs; reduction in maintenance costs; promotion of good public relations; developing safe, courteous, skillful driving habits; improving habits, skills, and attitudes; promoting defensive driving practices.

DRIVING TRAINING PROGRAM

The driver training course now operated by the County of Los Angeles is really neither a beginner's course nor entirely a refresher course. We attribute our success in gaining driver acceptance for this training to the fact that they are immediately informed that they are not being treated as beginners, but that we are starting with the premise that they are good drivers and that we are bringing them together in order to give them an opportunity to review their knowledge and skills and their attitudes, and compare their problems with those of drivers in other departments.

Realistically we let them know that we hope to strengthen their defensive driving habits by reviewing accidents in which other county drivers have been involved. We use psychology liberally in our driver training program, and we find that by emphasizing good driving habits and good driver performance we invariably have a more responsive class.

We purposely do not point the finger of guilt at any of the drivers attending the class for we feel that there is nothing to be gained in letting the entire group know that some of those attending the class have been directed by their supervisor to participate because of recent accidents in which they were involved.

In advance of the day's session, drivers who will attend are issued a brief résumé of the principal items we plan to cover, a timetable of the program, and a definite invitation to present their problems to the class and be prepared to join in the discussion for the general good of all drivers who will attend.

CLASSROOM CONFERENCE

In this one-day, 8-hour, driver training course, the morning session is taken up entirely in the classroom by the session which is conducted entirely as a conference. Each driver is made a part of the conference and brought into the discussion by posing the obvious question: What do you think is responsible for most accidents on the road?

Through skillful previous planning we manage to bring out in these conferences through discussion of the answers to the basic question, important parts of the Vehicle Code, local ordinances, driver skills, public relations, physical laws affecting vehicle operation and county policy regarding vehicles. In addition, we develop the importance of maintenance and care of motor vehicles and the correct procedure in reporting accidents. We wind up with a demonstration of driving skills with emphasis on reaction time and stopping distance.

CLASSES ARE MIXED

About two-thirds of the day's session is conducted in the classroom and the last item discussed is the basis for the demonstrations which will be conducted in the field. The class then adjourns to the paved Flood Control channel (which is dry most of the year) where each driver is given a forceful demonstration of his own limitations in maneuvering and stopping a vehicle. We conduct several reaction and stopping distance tests at normal speeds of 20-30 m.p.h.

At the wind-up we provide one dramatic demonstration of panic stops which might occur on the freeway at 50-60 m.p.h. These demonstrations invariably have impressed even the most unimpressionable drivers. Most of them remember that prior to the demonstration they were convinced that they were better drivers than the test revealed.

We are in the process of extending the demonstration to include driving skills such as parking, backing and maneuvering through offset roadways.

In general, each day's class is a mixed class, not limited to operators of county-owned vehicles, so that we may have truck drivers, social workers who drive as permittees and life guards, and among this group there may be drivers with a 10 or 20 year no-accident record and others who have been involved in accidents within recent weeks. We make liberal use of visual aids, but we try not to go overboard.

In addition, we start the session in the morning with a multiple choice quiz which covers most of the driving skills and significant sections of the Vehicle Code which we feel are important to most county drivers. These quizzes are for informational use only; each driver corrects his own paper and the real purpose is to let him know where his weaknesses lie so that he can correct them.

These classes have been conducted in a special classroom in the headquarters of the Safety division. However, in certain cases, we take the class to the facility, notably the Road Department, Fire and Sheriff. In the latter two cases, we conduct a special one-day course for recruits. In the recruit training we emphasize the legal limitations of operating emergency vehicles on emergency runs and we put all recruits through a skill course. A special quiz on emergency driving operations is used in recruit training.

In all of our classes we distribute resource material such as: California Vehicle Code Summary, Chauffeur's Supplement, and Summary of the Financial Responsibility Law.

CAN BE REFRESHER

While the course generally is not operated as a refresher course, we do make it available for re-training purposes when the Main Automotive Safety committee, or one of the departmental subcommittees, recommends further training for drivers who have had a number of accidents within a relatively short period. This training is often supplemented with a test drive in traffic by a qualified driver coach, usually an automotive safety engineer of the safety division.

From the critiques and evaluations following these classes, in which the driver is not required to identify himself, we have picked up a number of good suggestions for improving the course. We have been encouraged by such comments as the one expressed by a county engineer who stated he had been exposed to all kinds of driver education and training courses in the past 25 years, both in civilian and military life, but he had never received as much tangible benefit as in the driver training program we are now conducting in the county of Los Angeles.

We plan to link the driver training program with control of driving practices through a County driver licensing program. All newly hired employees, whose work would involve any driving, would be required to attend the driver training class and to demonstrate the necessary skills on the type of equipment to be handled by them, before receiving this county driver's license.

USE OF VISUAL TESTS IN DRIVER TRAINING

by BAYNARD A. SWITZER
chief safety engineer, Calif. div. of highways, Sacramento, Calif.

In the Division of Highways we do not have an organized driver training program.

In our state an examination is required for anyone to obtain a driver's license and no one is permitted to drive a motor vehicle unless he has such a license. The only requirement that the Division of Highways has regarding qualifications for driving is that the employee possess a valid driver's license.

We have little trouble with our employees not having adequate knowledge regarding the mechanical operations of driving a motor vehicle. Our problems have been largely in the field of attitudes and our program is geared toward the development of defensive driving techniques.

REACTION TIME TESTED

In an effort toward an indirect approach in driver training and attitudes, and also other accident prevention, the division in 1951 purchased two Keystone vision screening machines. One of these machines is used by a traveling assistant safety engineer in checking the vision of employees in Northern California and another one does the same in Southern California. Employees have their eyes checked on a volunteer basis and are advised to consult their own doctors when tests indicate poor visual performance.

When an employee has his eyes checked, he also receives a test for reaction time. In order to emphasize the importance of reaction time in driving, the examiner measures out the distance that a car travels at 20, 25 and 30 mph and indicates to each employee the distance the car would travel in his reaction time at those particular speeds.

The employee is given a card on which his reaction time is marked. This card also gives the stopping distances at various speeds divided into reaction plus braking distances.

DEFECTIVE VISION CASES

The eye test has several objectives. We know, for example, that our drivers with only one eye usually have better accident records than those with supposedly better vision. The employee with the one eye knows of his limitations and compensates for his disability. Therefore, we believe that employees who are familiar with visual limitations will compensate for them and have a better accident record.

We have found in our testing of employees' vision that approximately 17 per cent could have their vision impaired and do not know that they need glasses.

When we started our program, we found that approximately 48 per cent of our employees with or without glasses had defective vision. We found 7 per cent did not have satisfactory depth perception and 1 per cent was partly or wholly color blind.

The employees are anxious to have the vision test and retain the cards which are given them.

We have found few employees who are really conscious of the distance that a car travels in reaction time and we emphasize this part of the test. In some cases, we use the flash gun method of measuring distance traveled and in other cases we use an electrical device which is attached to the examiner's car.

We make no limitations on the employees who take the vision test. They may be operating or staff personnel. We have found that district staff members are just as anxious for the test as highway equipment operators and we have run into some rather odd situations.

Recently, tests were being conducted at the district headquarters in one northern district and a young lady took the vision test. It was found that her vision was quite defective. Upon the advise of the examiner, she visited her doctor, and some months later when the examiner was again in that area, she searched him out to thank him for his previous test. She explained that up until that time she had always thought moving pictures were foggy and indistinct and that it was natural to be unable to read sign boards or messages at a distance. Her entire life has been changed by proper glasses and she has an entirely different outlook on life than she had before.

In connection with the eye program, we have arranged with the Optometric Association and with the Registered Dispensing Opticians of our state for employees, who are properly identified, to obtain commercial discounts and standardized costs for prescription ground safety glasses. This program in which the eye specialists have cooperated has worked satisfactorily. It does not, however, in any way approach the programs which are put on by larger companies in private industry such as the Telephone company which not only give vision tests but also pay for the cost of the first pair of safety glasses.

This particular program is well accepted by employees who are appreciative of the fact that they are obtaining a special service for their personal benefits. We have found it necessary for our examiners to be careful in their discussions with the employees on their approach of the eye test. Our examiners are not in any way eye specialists and it is carefully explained to the employees that we are giving them information determined by a mechanical analysis of the eye and if the machine indicates defective vision they should consult an eye specialist.

REMARKS OF WARREN D. WILT

safety engineer, city of Detroit, Detroit, Mich.

Detroit requires pre-employment physical examination. The city plans to hold training to teach men their equipment—both inside and out—and how to operate same. It is the responsibility of the supervisor to screen his employees insofar as possible—with a probationary period before full employment—to ascertain whether many are safe and capable.

HOW TO TREAT THE PROBLEM

We plan to conduct an eight hour training course for all city drivers and construction men. It is important not to depend on rules and regulations — we train a man so he knows only the right way—use positive approach.

Men should be taught maintenance of equipment and vehicles, with the safety engineer to help out in case of trouble—in filling out reports—or in determining the cause of accident.

We use films—don't want to scare employees but show them damage and results of accidents. The program includes a written test to see that each class learned what the instructor was teaching. This tests the instructor's ability as well as student's knowledge. We also have tests—like a sort of obstacle course—putting into action what the student has learned. A new driver should drive with an old driver as passenger—checking errors and correcting same—taking up errors with new man—roadeo style test. The results: maintenance costs have been reduced which proves need for schools for employees to improve Safety. Statistics don't show results we want—talk about preventable accidents is not enough—what will we do?

Seeing habits are important. Drivers should train their eyes for expert driving—mechanical failure is not a factor—control is not a factor—people are not seeing what they look at. Fixed focus is not good. We insist on eye examinations. We do not want drivers to be experts—they should be professionals.▲

JOB TRAINING AND PLACEMENT

(A Panel Discussion)

REMARKS OF GEORGE F. KUHNS,

Discussion Leader

safety supervisor, Illinois div. of highways, Springfield, Ill.

I have revised the topic slightly and call it "Employee Selection, Placement, and Training." Any training and placement program should include a sound method of employee selection, since the hiring of workers without regard to mental, physical and health limitations would put too great a restriction on the job of placement and training.

The Illinois division of highways, like many agencies, is faced with the selection, placement and training of appointees, members of various units, civil service personnel, and exempt persons, such as engineers and other professional people.

Because of its diverse activities, the division has representatives of numerous trades and professions in its employment; therefore, it would be virtually impossible to discuss the selection, placement and training of employees in all job classifications. Since the highway section man represents one of the job classifications with a large number of employees, and his exposure to hazards appears to be great, I feel that he and his equivalent in your organization should be considered the front line man of "offense" in the war against accidents. I will try to limit my comments to his classification.

HIGHWAY MAN'S DUTIES

The highway section man, under supervision, directs a regularly assigned helper and one or more laborers, as the work volume may demand, in the ordinary maintenance and upkeep of an assigned section of the State highway system. This work may include a variety of highway surface types and drainage structures.

The following are examples of the work performed by a highway section man:

1. Inspects highways for hazardous conditions, such as ice, snow, dirt, fallen trees, water, or other obstructions on pavement, and removes the same.
2. Repairs and replaces broken pavement; repairs shoulders; mows weeds; keeps ditches open; maintains drainage structures; and polices right-of-way.
3. Operates truck, grader, mowing machine, snow plow, concrete mixer, and keeps the equipment in good repair and working condition.
4. Paints and repairs guard fences; repairs and replaces route marking and traffic signs; erects and removes snow fences.
5. Performs semi-skilled work as principal worker in maintaining highway in good condition.
6. Makes reports on work accomplished and distribution of time.
7. Performs other duties as required or assigned.

The department of personnel has set up certain desirable requirements of applicants, for the position of highway section man, even though he is subject to appointment.

Education—Requires knowledge, skill and mental development equivalent to completion of eight years elementary school.

Experience—Requires two years experience in highway maintenance or construction work, such as might be acquired as a highway section helper, including some equipment operation; working knowledge of highway construction and maintenance materials and operations.

Significant Responsibilities — Requires ability to make simple specified reports; skill in the operation and repair of highway maintenance equipment; mechanical aptitude.

Significant Mental Requirements — Requires ability to understand and to carry

out effectively written or oral instructions; ability to observe hazardous or improper road conditions and to take appropriate action.

In addition to the above requirements the applicant must have a physical examination by a licensed physician. The applicant is responsible for the examination fee and may have a physician of his choice make the examination.

PHYSICAL CONDITION CONSIDERED

When a district maintenance engineer has an opening for a highway section man the personnel office will send an applicant for interview. The district maintenance engineer is furnished a copy of the completed physical examination form and a completed employment application form. The district maintenance engineer may accept the applicant and assign him to a maintenance section, or he may recommend against employment because of past performance, lack of experience, or because of a mental, physical or health limitation. If there should be some question as to the physical fitness of an applicant or an employee, the division may request that he submit to an examination by a physician selected and paid by the division.

When an applicant is accepted for employment, he is given a detailed course of indoctrination by the district maintenance engineer. In addition to an explanation of the policies and procedures of the division, the district maintenance engineer informs the new employee of his responsibilities and duties as a highway section man in regard to his work and employee safety. The new employee is given a copy of the division's "Safety Code" at the time of his indoctrination.

SUPERVISION RESPONSIBILITY

The work of the highway section man is supervised by a maintenance supervisor, who is accountable to a maintenance field engineer. The supervisor, or field engineer will visit each maintenance section at least once each week and hold group meetings with their men once a month at the supervisor's or the field engineer's headquarters. The district maintenance engineer will hold occasional meetings at field headquarters with all employees in that area.

The maintenance meetings are held shortly before the highway section man will be involved in some seasonal work, such as snow removal and ice control operations, vegetation control, crack pouring, or other major maintenance operations. Although the district maintenance engineer and his field engineers make job safety an integral part of their work instructions, separate safety talks have been included in the field meetings.

When a new piece of equipment is purchased by the division and assigned to a district, the district maintenance engineer will have a representative of the equipment supplier meet with the field engineers and supervisors to instruct them in the operation of the new equipment. The supervisors and field engineers will then instruct their highway section men.

I do not wish to appear as one offering excuses or apologies for our relatively poor rates; on the contrary, I would like to make a few observations which I feel would aid in reducing the number and severity of work injuries and accidents generally.

MERIT SYSTEM PROMOTES TRAINING

I am confident that our respective maintenance organizations would have more suitable and younger applicants from which to choose for the various maintenance jobs, if the employees could be assured of continuous service based on merit. Also, if we could expect to have maintenance men in service for 15 to 20 years or more instead of only four to eight years, a greater expenditure of time and money in the training of those men could be justified.

At the present time several highway departments have maintenance men in their 70's and can expect to have many more within the next three years. The duties of maintenance men within highway departments require that they do arduous physical labor and, at times, operate snow removal equipment for long periods of time.

There are few men in this age bracket who are in such good physical condition that they can long survive this type of work. If a maximum age of 55 were set for applicants, this would give assurance that seldom would men over 63 be called upon to operate snow removal equipment or engage in other strenuous activities.

If the number of men supervised by each field engineer were reduced, the field engineer could exercise closer supervision over his men and thereby learn more about their work habits as well as the work they do.

There are many more suggested changes that could be made which would no doubt assist in improving our accident record if put into effect; however, no ideas we now have or that we may pick up here at the Congress will be of value if they are not properly evaluated, adjusted to our own organization and then put into operation.

It is hoped that some of the ideas projected by this panel today will find their way into your safety programs and thus become a vital force in reducing the number of injuries suffered by public employees across the nation.

REMARKS OF LORIN J. ELDER

supervisor safety div., Pennsylvania State University, University Park, Pa.

You should have no drivers past 50 years of age. When that age is reached—give them lighter duties—don't release them but make use of their years of experience and know-how.

Causes of accidents frequently can be traced back to home life. Therefore, check accident records back for five years—show them to employees—this makes them think. Keep check on records from that time on. If employee seems to work carefully but continues to have accidents, remove him from that job and give him another job he can do.

Try to investigate every accident in some form of report so they realize there is a particular hazard. Even in an accident that is "slight"—when you go out to investigate it—the things you find!

Accidents are caused by manufacturing faults—unminded conditions—carelessness. If manufacturers don't install safety devices on their products—don't use them.

The safety division of Pennsylvania State University tests various machines. When the manufacturer refuses to put safety devices on their machines, saying it would run the cost up beyond competitive prices, the safety division either refuses to accept them for testing—or requires their immediate removal—if they have been installed.

REMARKS OF JOHN J. HOBAN*

safety coordinator, City of Seattle, Wash.

Seattle is no different than your city as far as the new employee is concerned for he comes to you after he has demonstrated his ability and competence by passing a civil service examination. The next step is to teach him the job you expect him to do. For this training you place him under the supervision of your foreman or supervisory person. The key to the successful training and placement of the new employee, is therefore the capable supervisor or foreman.

A supervisor may be a capable person in knowing his work, yet not be able to teach what he knows. You have seen supervisors who are unable to get their message over to the new man. And the new employee is, to say the least, bewildered and confused. The supervisor sometimes assumes the new employee knows all the answers. In the discussion of job training and placement it is fatal to assume anything about the new employee.

With the new employee you must spoon feed him until he knows the job and we know that he knows the job and what is expected of him as a safe competent workman. He is thus thoroughly indoctrinated in all operating procedures but more basically in the integration of accident prevention and all aspects of our city safety program. This is what we are trying to do in Seattle with our new employees.

PROPER PLACEMENT

We know that the proper placement of the new employee is equally as important as recruiting that employee. Assigning the new man to a position where he can work at his highest level of efficiency in city service, is a basic consideration of Seattle's placement program. The other factors considered in Seattle's program of Placement and Training are:

a. Minimal physical standards for the many hundred job classifications.
b. Job surveys. A technique applicable to the placement of all employees, male or female, young or old, able bodied or handicapped.
c. Job analysis for physical fitness requirements so you will know:
   1. The job is completely and accurately identified.
   2. The tasks of the job are completely and accurately described.
   3. All physical and environmental demands the job makes on the employee for successful performance, must be shown.

An excellent publication on this subject *Analysis for Physical Fitness Requirements*, U. S. Civil Service Handbook. No. M-605 U. S. Printing Office 20c.

In Seattle we do not have a formal training program for the new employee. He is indoctrinated by the supervisor and foreman, after his initial interview with the personnel officer, who outlines the overall operations and functions of the department. He is given a handbook of Civil Service rules and department rule book, entitled *Your Job with Seattle City Light.*

His instruction is sometimes given by a fellow employee who "breaks in" the new employee to his job. At the monthly safety meetings, through the bulletins issued by the department, tail gate meetings or departmental conferences, his training is continued and advanced.

Award presentations, either for safety effort or service attained, all tend to stimulate the employee's interest in his job. The employee publication carries the story of how and why the employee can do a better job for the department. These media stimulate and arouse his continued interest. He may serve as a safety committeeman, and thus become acquainted with the hazards of the job in the department. Many a mediocre attitude toward on-the-job safety has become an aroused and inspired attitude, dedicated to accident prevention, when exposed to a safety committee membership.

To summarize, therefore, what the Seattle city departments are doing in job training and placement, I might conclude:

1. The employee is introduced to the job by the personnel officer and safety official.
2. The individual instruction of the employee by the foreman or supervisor or his assistant.
3. Supplementary aids are given by conferences, bulletins, posters, movies, employee meetings and publications, incentives and all types of morale building activities.

There is a great deal more we can and must do in Seattle and every city to meet the challenge of industry in recruiting and making more attractive municipal employment in the years ahead.▲

*John Hoban was unable to present this manuscript at the Congress because an illness prevented his coming to Chicago.

REMARKS OF J. F. DE VIVIER

personnel dir., Colorado dept. of highways, Denver, Colo.

Does training come before placement—or vice versa? It comes both places. In job recruitment and placement, keep politics out. Select the best qualified personnel—a lot of training can be done for you by selecting trained employees for the position open.

Rules are for when brains run out—unless an individual has brains to apply rules—rules will not solve accident problems.

There will still be a lack of necessary trained personnel after screening. Then you must provide a training program under supervision—to watch and coach.

One-the-job training: train employees beyond their present duties to higher level jobs. Supervision must come from management to train beyond routine to higher level.

When an employee reaches an older age—don't start him down the hill—take advantage of his knowledge and pass it to younger men. Supervision should be responsible for training in an organized manner—supervisors should be trained in training.

Safety should be put on an over-all training program. Use a variety of equipment for training.▲

PARKS MAINTENANCE SAFETY — TREE TRIMMING — BRUSH HANDLING AND RELATED SUBJECTS

(A Panel Discussion)

IMMUNIZATION EXPERIMENT—1956 RESULTS

by J. F. HUZVAR

Pennsylvania State highway dept., Harrisburg, Pa.

During the spring and summer of 1956 an effort was made by the Bureau of safety to determine the efficacy of homeopathic medicine in desensitizing Highway department workers to poison ivy.

Preference in treatment was given to those employees who had reported ivy poisoning in 1955. Eighty-two of these volunteered to take a product named Imun-Ivy. Two one cc doses were taken orally by each person at a 24-hour interval. Of the 82, 72 reported that they did not get ivy poison during the 1956 season.

At the same time, with the surplus Imun-Ivy, an additional 158 men (who were known to be susceptible to ivy poisoning) were given similar doses. Of these, 138 were apparently rendered immune. The ratio remained the same and showed an effectiveness of 88 per cent in each case.

The work habits of these men remained essentially the same during the years 1955 and 1956.

In District #5 where Oral-Ivy was used instead of Imun-Ivy, even more startling results were obtained, but unfortunately the sample was not large. In this case, the medicine was given to 29 men, of whom only one reported ivy poison, showing an effectiveness of 96 per cent.

As a result of this campaign we cut down our lost time from poison ivy from 31 cases to 12 and the actual lost time from 178 days to 88.

RESULTS—1955 EXPERIMENT

District	*Took Imun-Ivy*	*No Poison Ivy*	*Poison Ivy*
1	5	3	2
3	9	9	0
4	12	12	0
9	13	7	6
10	11	10	1
11	16	15	1
12	16	16	0
TOTALS	82	72	10

88 PER CENT EFFECTIVE

DISTRICTS 2—6 & 8—no immunization—just treatment

Dist. 2	46 worked	13 had poison rash of some sort	4 lost time
Dist. 6	51 worked	17 had poison rash of some sort	4 lost time
Dist. 8	67 worked	21 had poison rash of some sort	9 lost time
TOTALS	164	51	17

51 cases in 3 districts

The cost per man was approximately $1.00. The immunization period was approximately nine months. It was recommended that in those sections of country where poison vines grow year around—immunization product be administered about every six months. This taken on strictly voluntary basis—but when others saw effectiveness— all requested same.

Showers are provided in each shed and men are required to take a shower at end of each day. Some disregard the requirement with consequent cases of poison ivy. Bland soap is used.

Firm rule that no poisonvines be burned if it can be avoided. If you must burn the vine, stay out of the smoke because poison oils from vines are carried by the smoke and will affect persons susceptible to it.

THOSE EMPLOYEES WITH KNOWN ALLERGIES

1956

District	*Took Imun-Ivy*	*No Poison Ivy*	*Poison Ivy*
1	44	38	6
3	40	38	2
4	40	36	4
6	11	7	4
8	18	14	4
9	16	9	7
10	39	37	2
11	16	15	1
12	16	16	0
TOTALS	240	210	30

88 PER CENT EFFECTIVE

NO IMMUNIZATION

District 2—46 worked—15 had poison rash —5 lost time.▲

REMARKS OF JOSEPH F. WICKLESS

supervisor of safety, city of Baltimore, Baltimore, Md.

This phase of parks maintenance is performed by the forestry division of the Baltimore bureau of parks. The personnel consists of chauffeurs, climbers, foremen and laborers.

High tree trimming is done by experienced climbers only. These men are selected on their experience and then given additional training by foremen. They must be physically fit.

The climbers handle their own individual one-half inch manilla rope safety line which must be inspected each time it is coiled and before re-use. Climbers use belts with an extra seat strap with a rope safety tie line. They also use rope lines and sliding knots, and are always tied to the tree with a safety line. Limbs are lowered with one inch lines except in isolated cases. Removal of logs, stumps, etc. is done with a winch and cable.

Climbers are started up the tree with a ladder since steel climbers are only used on exceptionally large trees and those to be felled. Ground men are always available and are trained for working beneath overhead work.

Brush in most cases is fed into the chipper. All brush is pruned before being fed into the chipper to avoid binding and possible kick back. The operator must wear goggles when feeding chipper. The chipper is equipped with a power cut off within easy reach of the operator.

When brush is hauled on trucks it is passed from one man to another who wear gloves and then to the top man on the truck who loads systematically. Brush is hauled to a dump area and burned. Goggles are worn when pulling brush.

All overhang of brush on sides of trucks is pruned before hauling. Flags are attached to overhang in rear. Hauling to dump requires two men: the chauffeur and a back-up man.

Logs are always cut up into lengths convenient to handle and logs large in diameter are loaded mechanically.

All tools and equipment are subject to frequent inspection. Adzes are not used. All cutting tools are kept sharp and can be exchanged anytime if any defect is noticed. Ladders are inspected frequently and before each use. Time is allowed for tool

sharpening. All cutting tools are carried in sheathes or guards by climbers.

Work locations are set up with proper arrangement of warning signs (men working in trees), flags, cones and barricades where needed as related to traffic.

A hi-ranger has been purchased and is in constant service. All exposed metal equipment and tools are insulated against 20,000 volts of electricity. Three men usually operate the ranger, a foreman, tree climber and ground man.

The ranger can be controlled from the basket by the climber or from the ground and is equipped with a reserve hydraulic equipment for emergency use. It is never operated with less than two men.

A chipper is attached to the rear of the ranger into which brush is fed and chips loaded into a provided bin on the ranger chassis. The chipper blades are inset to a distance impossible to reach under ordinary conditions.

For night emergency work, fusee flares are used along with barricades and warning signs with flashers. Flood lights and spotlights of 1,000 watt are used for illumination. The rear of trucks is well lighted and painted yellow with black stripes.

Spraying operations are performed after posting of area and respirators are used.

Reporting all accidents is demanded and victims interviewed to determine causes. Unusual cases are interviewed by the superintendent to determine safety infractions and action.

The forestry division, bureau of parks, city of Baltimore is administered by the city forester, the superintendent, Charles A. Young. This division is responsible for the care of more than 250,000 street side trees and those on more than 5,000 acres of parks.

BRUSH—HANDLING

Lifting
Secure footing
Wear eye protection
Look out for overhead work
Removing trees—grubbing operation
  Care in position while using axe
  Not too close to fellow worker
  Don't lay tools around carelessly

PARK MAINTENANCE

Inspect Mowers—motor—when to shut off
  Keep feet away
  Look out for foreign objects
  Be alert to fellow mower
  Be careful when filling gas tank
  Be careful of traffic when in center plot

Steep Slopes
  Operator wears cleats
  Mower held in place by rope
  Attached to another person—on slope
  Prevents sliding

Care of Hand Tools
  Place rake in safe position when not in use

Care in tool house
  Use care in parking vehicle near center plot.
  Use cones for barricade

SAFETY IN TREE TRIMMING

a. Safety belts—Rope or life line
b. Make and care of equipment
c. Ladders
   Safety factors
   1. Construction
   2. Shoes
   3. Extension type
   4. Use of ladders
   5 Examine tree—determine ladder needed
   6. Where to place ladder
   7. Clothing

Tools for tree trimming

Saws—Pruners—Knives
  a. tools sharp and in good condition
  b. care of tools—location for keeping
  c. Clean—strong
  d. Wood handles

POWER LINES—KEEP AWAY
CHAIN SAW
CHIPPER

Tree Trimming

1. Safety Belts and lines
2. Ladders—shoes on them
3. Clothing—high shoes—gloves (leather)
4. Tools—saw, pruner, knife, pole saw

5. Power line—Hi voltage
6. Power saw—chipper, hand saw, all saws

Don't lean against or grab dead limb or tree

Park Care

1. Power motor
2. Keep toes and feet away
3. Alert to traffic if on parkway
4. Never park vehicle without barricading or warning
5. Use cleat shoes on incline
6. If scythe is used—keep far away—beware of hard objects.

▲

REMARKS OF JOHN H. WILLIAMS

director of safety, Chicago Park District, Chicago

CONSTRUCTION SUB-SECTION SAFETY

TREES

Digging:

Dig trees so that balls are only slightly tapered on sides and flat on bottom, so they will not tip over easily when setting around work area. Be sure ball is deep enough, according to size of top, so that tree will lay on its side and not automatically fly up. Block ball if deemed necessary.

Avoid injury from thorns. Be alert at all times when working with thorny trees.

Machine operator and others in near vicinity should be constantly on the alert when tree digger is in use to avoid being hit by branches as tree tips.

Wear goggles when breaking frozen ground.

Hold frost wedges with holder not hands. Grind off mushroomed heads on wedges or send to blacksmith shop for repair to avoid breaking off pieces that might fly through air.

Be sure sledge head is not loose on handle.

Moving and hauling:

Check chains and ropes for safe condition and attach so they won't slip.

Watch hands when hooking onto chain with winch cable. One man only in charge give signals to winch operator, except in emergency anyone call yell, STOP.

Always keep clear when handling heavy material, chain or rope may break or slip. One man handle, others stand clear.

Tie branches in whenever handling, loading, unloading and hauling.

On trucks, block tree balls well and also tie in place.

Use red flags on extended ends.

Unloading heavy trees, roll down skid while snubbing, even medium weight. Use mechanical devices, hydraulic tail gates, etc. whenever possible.

Control top also at all times.

Don't haul men and trees together, except when absolutely necessary. Watch going under viaducts.

Tree holes:

Determine whether or not there are any underground utilities in area before starting to dig. Use special care around underground electric cables. Notify electrical department of your activities.

Be certain of ability of soil to not cave if digging hole near standing balled tree. Can dig closer, in heavy clay or frozen soil, than in sandy or loose soil. Prop ball with strong timbers to protect men working in holes under or near standing tree.

Planting:

Use mechanical equipment if possible.

Grip ropes properly. Never "take a wrap" around hands. Keep ropes clear of feet. Keep clear of whipping branches.

Trimming:

Wear soft soled shoes to avoid slipping. Shoes should have firm arches to avoid discomfort or injury from prolonged standing on ladder rungs or branches.

Wear goggles when any possible eye hazard exists. Wear safety belts or use safety ropes always when in trees. Tie self in when working high in "flat-headed" trees.

Be sure of safe condition of climbing rope and that it is looped over a strong crotch

and around trunk to catch on next limb down if limb breaks. Examine rope carefully and frequently. Should be treated rope. Can tell bad rope because it swells oversize and softens up.

Use taut-line (skinner's knot) and double bowline for swing line in tree.

Use barricades or flagman to keep people out from under trees while they are being trimmed.

All tools used in tree should always be safely secured. Ground man should service trimmer with tools but stand clear for safety.

When using power saw in tree, both man and saw should be roped in, separately, and in such a way that if either should fall, they would swing apart not together.

Ladders, either of wood or of aluminum with non-slip rounds:

Base 1/4 of length out from bottom of tree.

Should have safety shoes on legs of ladder.

Be sure top is anchored in well to not move when climbed.

Remove ladder after trimmer has gone above it to avoid damage to ladder from falling branches.

Never trim heavy limbs or top a tree while on a ladder, falling limbs can break ladder, or knock trimmer off.

Watch for bare wires in trees. Insulate wires or call utility for co-operation in clearing branches from wire. Keep out of trees with wires through them in damp weather.

Don't trim at all in any weather that endangers the men except in extreme emergency: too cold to have good grip on trees or tools, extreme heat can cause fainting, dangerously high winds, enough precipitation to interfere with work.

Removal:

Properly diagnose exact condition of tree before climbing. Do all necessary guying to protect men and property. With forked tree, divided near base, treat as separate trees for fear of each part falling separately.

Lower heavy branches or sections of trunk with ropes in proper size sections. Cut into sections small enough to be loaded easily by no more than two men. Men should always be wearing gloves. Use mechanical loader when available.

Shrubs:

Wear gloves, goggles and safety shoes when indicated. Wear suitable clothing including head covering.

For frost bite in winter, for allergies and poisoning in summer and traumatic injuries anytime.

Keep fingers out of shear blades when trimming. In fine work don't hold with fingers of one hand while operating shears with other. Let trimmings fall free.

Use proper manpower in handling heavy material or use mechanical equipment if available or necessary.

Soil:

Always use right tool for job in handling soil.

Wear goggles if soil is dry and there is wind. Loading trucks, work on windward side.

Put on gloves before hands blister instead of after.

Don't leave soil working tools lie around, teeth or blade up. Lay face down with teeth or blade pushed into soil, or stand tools up against building with back out.

Tools and Equipment:

Keeping all tools clean and sharp is good housekeeping.

Watch for slivers on handles of all tools. Store properly on racks completely off floor if feasible.

Axes: Don't use as sledge. Dull axes are dangerous, they slip off work instead of entering. Handles should be strong and whole, not slivered partly away. Be sure head is tight on handle. Use right weight for work being done. Sharpen correctly. Don't let axe blade cheeks get too fat. Don't use beyond temper on clean cut work. Can save and use for chopping roots in soil.

Stand clear of axeman and of flying chips. Axeman and others in immediate vicinity

should wear goggles. Carry with blade turned away from head.

Chisels: Carry in scabbard or kit, not in pocket. Don't stand or work under man using chisel. He may drop it. Wear goggles.

Mallets: Have wrist strap on end of handle to avoid dropping.

Paint: Wear goggles to protect eyes.

Power Equipment: Shut off motors to:

Adjust

Repair

Gas and service

Clear stoppages

Rotary Tillers: Run in lowest gear that will do work properly for more safety. Keep tiller in soil whenever it is rotating. Disengage rotor when out of soil to turn or cross walks, etc. Keep apron on back and floating on soil for protection of operators.

Tractors: Check parts that might cause injury if defective. Hose on hydraulic system. Don't over-tax machine or use on unsafe inclines risking tipping. Prop bucket up securely when working under it. Turn off motor and put in neutral gear when not in use.

Trucks: Don't jam small trucks full of mixtures of men and tools. Don't mount or dismount while in motion. Never ride in truck except while sitting down. Keep all parts of body completely inside at all times. Never hang legs out over tail gate.

Saws: Keep sharp and clean for safest use. Keep handles tight and never use with cracked handle. Hook on belt to leave hands free for climbing in tree. Never drop to ground, lower with rope. Don't use back of saw for axe. Load and unload carefully to avoid injury to personnel if riding in same body of truck. Better to have separate trucks for men and for tools.

Power Saws: Recognize the possibility of extreme dangers involved. Never get careless. Don't store where wood floor will get soaked with fuel mixture.

Pole Saws: If hung in tree when not in use be certain it will stay where hung. Never drop from tree, lower with rope.

Shears: Don't overtax shears or [illegible]erator.

Use lopping shears for stock not easily cut with hand shears.

Make diagonal cut, cuts easier. Use saw for stock not easily cut with loppers. Carry locked and in sheath when not in use.

Pole Pruners: Should be insulated to work around wires in trees. Watch knuckles when using handle operated type. Rope on handle type preferable, with knots in rope for easy grip. No stoop on low branches either, can reach up rope instead of down to handle.

Winch: Check cable frequently for defects, weak spots, worn, etc. Stand clear when there is strain on cable. Wrap straight on drum by guiding with bar but not with hands.

Never handle without leather gloves and never let moving cable pass through hands. Use "solder-in hooks" on cable, not clamps that leave a frayed end.

Fertilisers:

Use respirators and goggles under dusty conditions. Use two men in handling any quantity of 100# bags especially for loading or stacking. Lift with leg muscles not back muscles.

Spraying:

Use goggles or masks or respirators with materials calling for same, or when face is exposed to danger due to wind, overhead spraying, etc.

Wear proper clothing to protect from absorption of, or contact with spray materials: Slickers, rain hats, boots, rubber gloves.

Be careful of slippery platform on tower trucks, or gangways alongside tanks. Use soft soles for safe footing.

Wash or bathe as necessary, before eating and to prevent absorption.

Don't use personnel known to be allergic to spray materials or specific plants.

Avoid horseplay around equipment or conditions that could cause injury.

Forbid strongman exhibitionism with heavy equipment or materials.

Insist on proper clothing that protects from sunburn, frostbite or exposure to scratches, abrasions or punctures from plant parts, ropes and equipment.

MAINTENANCE SUB-SECTION, SAFETY

ICE MAKING

Must wear creepers.

Wear on ice only, not to and from on concrete or climbing on and off trucks. Dulls points, and unsafe to wear other than on ice.

Shoe type best, hinged with calks. Should have adjustable leather straps with pin and hole buckles. Instep type hard on arches, no help to heel or sole.

Handling hose:

Always shut off fire hose to move it, using a minimum of three men. Should use shoulder straps like firemen do.

Carry over shoulder, walk forward, no less than two men (especially at night). Can pull hose around on ice with hook. Assistant should stay close to nozzle man and facing him to give ready and complete co-operation.

Wheeling hose, wear creepers. Have wheel barrows in good operating condition. Axel greased and tire inflated. Use hose reel when possible, safer than wheel barrows.

Frost Bite:

Proper housing and warming facilities. Arrange for access to inside of buildings at hours necessary.

Insist on proper clothing, especially with young fellows who don't realize danger from exposure.

Lighting at Ponds:

Should be lighted area to aid workmen and for safety of public.

Arrange with buildings for lights, if controls are inside.

Suggest parks be less indulgent of demands by public to avoid having men work without proper facilities.

SANDING, SALTING, SNOW REMOVAL:

Trucks:

Boxing rings on trucks to protect men from falling off. Mechanical section should see to it that all trucks to be used for this work are so equipped. If Standards to be used have clamps on bottom they would fit all trucks.

Equip all trucks with blinkers that might ever work on boulevards, both one-half and one and one-half ton trucks. Red lanterns on back of truck, better yet, "plug in" lights on extreme ends of spreader.

Always have a supply of red lanterns or portable battery type flashers on hand. Could mount them permanently on ends spreader.

Use reflector buttons also.

Don't board or dismount from moving trucks.

Mounting and dismounting spreader. Keep fingers clear of between spreader and truck. Weld handle on tail gate for opening to insert blocks. Don't try to remove tools, etc., by hand, while motor is running on spreader, always shut it off first. Should have wind protection on tractors for plowing. Tractors are not suitable equipment for work, trucks are much more desirable.

Snow shovels and pushers hitting cracks in sidewalk can cause hernias. Keep handle out of line with belly. Hold to side.

Sand Boxes:

Set back two feet from curb to protect boxes, cars and person using material from box. Spread some in front of box first if slippery. Should have "no parking" painted right on boxes, so they are always available.

LEAF DISPOSAL:

Wear respirator and goggles when operating any leaf mulcher.

Rotary type mulcher.

Be sure guards are in place, keep hands and feet out from under.

When burning leaves, always extinguish fires before leaving them unattended.

Fire might spread and do damage.

Children might play with fire.

Athletic Fields:

Keep lime out of eyes, wear goggles or mask, when marking fields.

Keep toes out from under rollers. Danger in loading rollers and other equipment on trailer to move, may tip off edge of ramp.

Service yards should have hydraulic lifts to load with or trailers with hydraulically raised and lowered deck.

Full plate to hook on rather than narrow hooks on end of skid planks to prevent tipping of plank. Diving mat on skids for traction for machine and operator. Snub equipment to front of trailer.

Watch slime on bottom and sides of wading pools, clean daily. Warn new men of slipperiness under foot. If bad scatter sand first. Don't pick up broken glass by hand without gloves. Use extension rods on water valves that can be operated through hand hole in cover making it unnecessary to handle basin covers.

Don't combine working on athletic facilities with playing by patrons, if any danger exists. Stop play if emergency calls for it, otherwise try to schedule work to not conflict with use of facility.

GOLF COURSES:

Golf balls: Wear helmets (boiled hats).

Wear helmets (boiled hats).

Distinctive colored shirt or safety belts, color of shirts could match hats. Could see shirt at greater distance. A number of men together with one kind of shirt would be recognized as workmen not golfers.

Two men watering, for weight of hose and protection, especially at night.

Screen for emergency repair work on course, for plumbers, etc., can also spot trucks for protection.

Personnel from other departments working on golf course should always contact golf course maintenance man for his co-operation before working.

Motorized equipment should be painted yellow or other bright color.

Mow golf greens early and get out of way or move flag to temporary green while working on regular green.

Respirators for spraying insecticides and fungicides, or gas masks.

Wash hands after using insecticides and especially before smoking or eating.

Grass, Mowing:

Men or tractors should always wear helmets, when mowing on golf course or ball fields and have a screen or cab on tractor.

Use safety club in reel of mowers to remove obstruction, don't use fingers. Shut of motors. When clearing reels, disengage reel.

Don't ever leave mower while its running, there is danger to others, especially children.

Operators should be required to sign safety rules card before operating power mower and other motorized equipment. Duplicate cards should be signed, one to go to safety section and one kept in local office. This impresses the employee with seriousness of rules.

Police lawn area in advance of first mowing in spring to prevent objects on grass being propelled by mower injuring operator or by-standers, or damaging mower. Keep eyes open all the time for obstructions.

Shut off motor while gassing up and servicing. Don't smoke while handling gas. Keep gas in safety containers only. Use care in carrying shears, hooks, whips. Make scabbards out of one and one-half inch hose to cover sharp edges.

Suggest back rest or wear belt for back strain from riding Toros Triplex or other Sulkies.

Catch Basins:

Stand close to curb to clean if possible. Barricades, warning flags, use flashers while working at night and flag man during day, safety belts and shoes, and wear gloves.

Keep handle out of street when cleaning. If trees are in the way barricade off wide enough to tip handles into street.

Use special tool for opening covers.

Bridle Paths:

Should be sprayed with light oil to lay dust.

Goggles and respirators while cleaning if dusty, or sprinkle down area.

Barricades to control equestrians while working on path, far enough away to stop safely.

Stand still, don't excite horses when they are passing.

Lagoon Cleaning:

At least two men at a time in boats, with life preservers.

Scows preferable for sea weed instead of row boats.

Watch for allergies of men, give protection.

Litter and Garbage Cleanup:

Use goggles when working around shrub beds.

Use two men below to a basket when heavy when handing up to trucks.

Wear gloves.

Use lighter gauge garbage cans in field houses and boiler rooms.

Don't fill ash cans with water.

Avoid use of those too heavy to carry out. Use demountable winches on back corner of trucks where there is no stationary one, to hoist out of deep basements.

Examine condition of stationary hoist and report any defect.

Hand rails on cabs and expanded metal on running boards for safety getting on and off trucks used for close pickups.

Beach Maintenance:

Use gloves on broken glass.

Goggles and respirators for men on sand-sifter.

Short handle rakes for screen cleaners to keep out of drum.

Take care when carrying heavy baskets on sand to not slip.

Use bale hooks, one man on each side of basket.

Buildings:

Ramps going into basement tool rooms, etc., get slippery, watch and correct.

Remove snow and ice.

Roughen concrete with acid or use chicken ladders, if steep.

Snow Fence:

Wear gloves, avoid slivers.

Bend ends of fastening wires in.

Pickup cut wires in container when dismantling to avoid foot injuries and damage to lawn mowers.

Two men to boost rolls up, one on truck to receive.

Use post puller to prevent back strain, don't try to pull by hand.

Boulevard Maintenance:

Work against oncoming traffic. Work on slack side when possible.

Wear safety belts.

Red flags on wheel barrows.

Wear goggles when dust or other eye hazards are present.

Keep off of boulevards during rush hours. Use knockdown barricades for safe transporting and to collapse if hit.

Blocks and flags 50 feet to 75 feet from piles of debris, to protect men loading material off boulevard, unless motorists' vision is obstructed by curves, underpasses, etc.

Then set as far back as necessary, 200 feet or more, and also use flag man if situation warrants. If piles stay for night put lantern or pot on each pile.

All trucks with crews should be equipped with mercurochrome and 1" adhesive compresses in first aid kits.

Avoid horseplay and strong man exhibitionism.

Insist on employees' wearing clothing that protects from the elements and from hazards of the particular operation. Protect head and body from exposure to sun and to cold. Don't permit working stripped to waist, in shorts, or barefoot. Wear safety shoes on work hazards to feet.

All new employees should be made aware of our safety and medical program before starting to work.

FLORAL SUB-SECTION, SAFETY

GOOD HOUSEKEEPING:

Keep all premises orderly at all times. All materials, tools and equipment should be properly stored in racks, on shelves, in bins, or in cabinets. Keep all tools hanging off the floor if possible.

Mechanical equipment stored in such a way that it does not have to be climbed over to get to other facilities. Power operated equipment should not be stored on wooden floors unless wood is protected from drippings of oil and gasoline because of fire hazard.

Make every effort to procure sufficient proper storage area for equipment.

Greenhouse and Conservatory walks:

Special care should be taken to never leave objects in walks or projecting out over walks at anytime but especially at night, when the already poor visibility is even worse. Stretch hose out straight and keep to side of walk or under bench.

Never permit anything to interfere with proper access to heat control valves and ventilator control machinery. Chain valve on mains are safer than hook and wheel.

Algae should not be allowed to accumulate on walks as it becomes very slippery. Temporarily sand can be thrown on walks but algae should be destroyed with algaecides and completely removed. "Captan" gives good control. New walks should have brushed finish and old walks worn smooth should be roughened with 20 per cent muriatic acid.

Small trucks used for summer servicing of outside work should be cleaned up daily and not allowed to become cluttered with tools, flats, plant parts, flower pots, and so forth.

Broken glass being one of our most hazardous problems, special care should be taken to clean it up and dispose of it promptly and properly. Special effort should be made to keep broken glass out of potting soils or any materials that are likely to be mixed into potting soils.

Auxiliary supports, etc.:

Wires, pipes, brackets, shelves, etc., used seasonally, should, if possible, be at least six feet above walks, while in use. Flag wires if hazardous. They should be removed entirely when out of use, if feasible or stored in such a way as to not be a hazard. May have to give additional support to shelf brackets.

Administrative:

Insisit on prompt first aid for minor injuries and on first aid reports being made out. First aid courses should be given to office workers especially. Their hands are generally cleaner and office is centrally located.

Representatives of department should attend safety conferences and demonstrations, in and out of park district.

Gardens and servicing trucks should be equipped with first aid kits.

Lifting:

Instruct new employees and remind old employees of proper methods of lifting by hand. Lift with strong leg muscles not weak and vulnerable back muscles. Watch for proper footing to avoid slipping, causing hernias or bad falls. Use adequate number of men for lifting heavier things according to weight.

For heavier things use machinery whenever obtainable even if work has to be delayed, in case of very hazardous operations. Obtain cooperation of other departments, if necessary, to use motorized equipment. Fork lifts, electrical tower trucks, cranes, front-end loaders, low trailers, tail gate lift trucks.

Use other aids or methods such as: skids, rollers, pry bars, tub-lifters, or other devices with which to get a safer hand hold.

Store materials in such a way as to minimize lifting. Stack heavier material lower.

Trucks:

Never get in or out of trucks while they are in motion.

While riding in trucks keep all parts of body inside at all times.

Never ride standing up, always sitting down.

Climb in and out of truck bodies with extreme care. With trucks used constantly for hauling personnel, have steps installed to facilitate climbing in and out safely.

Use red flags or lanterns on parts of load extending beyond body of truck.

Snub all machinery or other materials that might shift around dangerously, especially if body of truck is occupied by men also.

Report any defects concerning trucks to Mechanical Section immediately.

Bamboo stakes:

Cut square across with shears, preferably blade and anvil type, not with knife. Square cut is not dangerously sharp like sloping one.

When re-using used stakes cut off end that has been in the soil, to avoid danger of it snapping off.

Inspect stakes for infestations of borers and discard if infested for fear of braking and slivering in users hand.

For inserting heavy stakes, make hole with steel bar first and then drive in with hammer if workable.

Give immediate first aid treatment for injuries caused by bamboo stakes as the experience in the incident of infection from such injuries has been high. Take employee to doctor if wound is puncture wound or any complications seem possible.

Exercise caution in the handling of staked plants to not injure handler or others near with stakes, especially watch for eye injuries.

Allergies: Watch for sensitivity among employees to specific plants and materials and protect them from same or avoid trouble by not assigning susceptible personnel.

Operations:

When edging lawns or trimming hedge mechanically wear face masks that cover all of face.

Using insecticides and fungicides.

Read carefully the instructions on the the container of all insecticides. There are often special instructions concerning safety to the grower.

Cover as much of your body as possible while handling toxic materials. This may mean a slicker, rain hat, shirt or jacket buttoned up tight, sleeves rolled down, boots and rubber gloves.

Use goggles and respirator or gas mask with materials calling for same or when face is exposed due to wind, overhead spraying, etc.

Do not eat or smoke while handling these materials.

Bathe thoroughly when through, launder all clothing worn, do not wear it over and over for spraying. Warn laundry of what clothing was used for.

Be especially careful in weighing out and handling the concentrated dusts and powder. If 15 per cent Parathion is poured carelessly onto a scale, a cloud of dust will soon surround the user. This dust is many more times concentrated than the spray and is correspondingly more dangerous. It is much better to figure out volume measures for the materials you use and wear a respirator when handling them any way.

Burn old containers but be careful of inhaling the smoke.

Types of masks and respirators for greenhouse use.

Full face gas masks with canister. The canister is of course, the little can of chemicals which take the "sting" out of the poisons. Various types of canisters containing different chemicals are used depending on the insecticides being applied.

Vapor or gas respirators. A sort of abbreviated gas mask. It contains a cartridge of decontaminating chemicals plus filters much like the regular mask, but on a smaller scale.

Dust respirator. Unlike the gas respirator described above, this dust respirator is essentially a dust filter mainly for "nuisance dusts." In greenhouse spray or dust work, this refers mostly to such fungicides as Zineb, Ferbam, etc. This dust respirator does not contain a chemical cartridge to decontaminate gasses, and must be used with poisonous sprays or aerosols.

Use warning signs on greenhouse doors when gassing and use any other precautions necessary to prevent anyone entering while gas is present.

Potting:

Watch for glass, wire and other foreign objects in potting soil that might cause hand injuries.

Don't use cracked pots, might finish breaking while in use and injure user.

Use safe potting stakes on large plants, watch for slivers.

Give proper protection from plants with thorns or plants of a toxic nature.

Use gloves if necessary.

Keep debris from potting operation out from under foot to prevent slipping on, or tripping over same.

Handling wooden containers and equipment:

Use gloves, preferably leather or leather palmed to avoid splinters.

Flats, wooden tubs, planks, and tool handles.

Be careful not to drop on feet.

Prop lids of tool boxes open securely, while reaching in to avoid injury if lid should close.

Wheeling:

Don't overload, either by weight or bulk. Watch for strain on wheeler and possibility of dangerous tipping. Never load so that wheeler can't see where he is going.

Keep tires well inflated to relieve strain and for safer handling.

Don't allow wheels or body to become wobbly.

Guard against injuries to hands when wheeling down walks between benches. Equip handles with guards and/or wear gloves.

Hand trucking:

Don't overload, either by weight or bulk, or by total work expected by a crew in a given period of time. Men are not machines and become fatigued. Use sufficient manpower for any given load. Don't risk a heavy load getting away from crew. Keep trucks in good maintenance and repair at all times.

Watch for handle of trucks dropping on feet. Handles should be modified so they can't drop on feet.

Planting heavy materials:

Use mechanical equipment whenever possible.

Grip ropes properly, never take a wrap around hands.

Keep ropes clear of feet.

Control tops of plants at all times, keep clear of whipping branches.

Use precautions to prevent caving in of holes, and stand clear to avoid being injured.

Supporting top-heavy plant material to keep it from toppling:

Wear gloves and goggles where indicated. Exercise care when climbing high in conservatories to secure supports. Use proper safety equipment or call on experienced personnel from other departments if necessary for safety.

Applying and removing shade on greenhouses and cleaning glass with chemicals:

Use only personnel who are willing and able to stand height and precariousness of job.

Clean gutters first if needed, of broken glass, leaves, mud, water.

Use chicken ladders of proper length to make work as safe as possible.

Wear goggles and protective clothing.

Wear rubber boots, aprons, and gloves when handling glass cleaning chemicals. If any should happen to get in eyes or on skin, flush immediately and very thoroughly with water. Keep running hose at hand in gutter at all times while working.

Mix chemicals with cold water only as hot water will cause dangerous vapors to arise.

Fertilizers:

Use respirators and goggles under dusty conditions.

Give protection to hands when handling manures, especially horse manure.

Have personnel immunized against tetanus by periodic protective shots.

Power equipment:

Whenever possible use recoil or kick starters on gas powered equipment rather than dangerous rope starter.

Train special men to handle and don't permit untrained personnel to operate.

Never "gun" any machines except when actually performing operation.

Never gas up while machine is running. Don't smoke while handling gas.

Shut off motor to adjust, repair, clear stoppages, or any other operation that might be hazardous while motor is running.

Always wear goggles when operating soil shredders.

Don't operate equipment not in good working order.

Use proper ramps and with care when loading and unloading on to or off of

trucks or trailers. Ramps or bottoms of tilt trailers should have expanded metal or diving board matting on them for traction for machine and operator.

Tools and equipment:

Turn tines and blades down and even push into soil when necessary to lay tools down on ground.

If leaning against other object turn back of tool out.

Knives: Should be clean and sharp

Keep closed when not in use, especially while carrying.

Use thumb guards whenever feasible.

Shears: Keep closed or in scabbard when not in use.

Keep non-operating hand out of way.

Let trimming fall clear instead of holding, to prevent cutting hand.

Never overtax shears or man operating same. Use kind of shears with proper capacity for work being done or saw or axe if work is too heavy for shears.

Grass hooks: Carry in scabbard when not in use.

Hang up properly or store in such a way that they cannot fall causing injury

Never use makeshift tools. Use proper tools for work indicated.

Carry tools properly with sharp ends down or in view of carrier.

Ladders: Inspect ladders frequently for safety.

Be sure spreaders are locked when using step-ladders.

Straight ladders should be equipped with safety feet and base should be set out approximately one-quarter of length of ladders from support.

Keep aluminum ladders away from electric wires.

Prescribe protective clothing for outside work to avoid frost-bite or sunburn as the case may be.

Hazards to public in conservatories:

Watch for hanging pieces of glass and remove same and have repaired. In case of high winds, violent storms and always with hail storms, barricade off dangerous sections or evacuate as rapidly as possible and deny admission.

Give proper instructions on the spot for each operation not previously performed by individual personnel with special emphasis on possible hazards and avoidance of injury.

All new employees should be made aware of our safety and medical programs before starting to work.

There are so many new and different kinds of chemicals coming into use as insecticides and fungicides, that it is wise to have on hand some pertinent advice to overcome the dangers to personnel who have been exposed to them. The following advice from The Illinois State Florists Association Bulletin Number 160, is valuable to have around for the use of those applying the materials, their bosses, and even any members of the medical profession that might be called on to come to the aid of a victim of exposure.

ADMINISTER FIRST AID

See to it that your employees report to you at once if they feel ill, if poison has been swallowed, or if poisoning by any other means has occurred.

Either call for a doctor immediately, or get the patient to a doctor or hospital without delay. Take this advice yourself. Some first aid should be given while waiting for the doctor, or if the poisoned person cannot be gotten to a doctor immediately.

GENERAL FIRST-AID RECOMMENDATIONS

1. When poison is spilled on skin, flush off right now with lots of soap and water.
2. When poison has gotten into eyes, rinse eyes repeatedly with lukewarm water.
3. When poison has been inhaled, move patient to fresh air, and administer artificial respiration if necessary.
4. When poison has been swallowed, empty stomach as soon as possible:
   a. Should patient be vomiting, make him drink large amounts of water.
   b. If not, put finger or tongue depressor into patient's throat to induce vomiting, or
   c. Give an emetic to induce vomiting, such as one of the following:
      (1) 1 to 2 T. (tablespoons) salt in glass of warm water, or
      (2) Ground household mustard (1 t. (teaspoon) in glass of warm water).
   d. If doctor has not arrived, give salt water emetic until vomit fluid is clear. Then administer Universal Antidote: 2 parts pulverized charcoal (burned toast will do), 1 part milk of magnesia, 1 part strong tea. Give ½ oz. in half glass of warm water.
5. If poison is corrosive acid or caustic alkali, do NOT use an emetic! Solutions to use in these cases are:
   a. For neutralizing acids—
      (1) Milk of magnesia, diluted until it flows easily, or
      (2) Two per cent bicarbonate of soda, or
      (3) Soap solution.
   b. For neutralizing alkalis—
      (1) Vinegar in water (1 to 10) or
      (2) Orange or lemon juice (½ to 1 cup, straight or diluted).
6. Keep patient lying down, warm and quiet.
7. Never give an unconscious person anything by mouth.

HELP THE DOCTOR

In case of accidental poisoning, try to find out exactly what material was being used. Your doctor may be unfamiliar with this poison, or the proper antidotes for it. Therefore, give him all the information you can—and it might be a good idea to show him this article. Also take along the label from the can, which usually gives suggested antidotes and treatment. See that the name and address of the manufacturer are included, since he may be contacted by phone for further information on antidotes, if necessary.

Administer first aid before the doctor arrives. But, in some cases this requires a specific antidote (see below). Be prepared by having some of the more important antidotes on hand at all times—you may not be able to get them in time if you wait for an accident to happen. For example, you should have atropine sulfate tablets in case of poisoning with one of the organic phosphates, such as Parathion or TEPP.

Some Specific Antidotes and Treatments

Aramite—Also known as 88R (alkylaryl sulfite), Niagaramite, and Ortho-Mite.

First Aid: Remove from skin with soap and water. If accidentally swallowed, empty stomach using salt water emetic.

Physician: Aramite is relatively nontoxic (its LD-50 is 3,900 mi. per kilogram), although the manufacturer recommends: (1) Avoid excessive inhalation of dust or spray mist, (2) Do not get into eyes, (3) Use with adequate ventilation. If ingested, probably a good idea to empty and lavage stomach.

Arsenic Compounds—(Such as arsenious oxide; calcium, lead and magnesium arsenate; Paris Green, etc.)

First Aid: Empty stomach, using 1 T. salt in glass of warm water; repeat until vomit fluid is clear. Give milk, raw eggs, lime water, or flour and water. Have patient lie down and keep quiet.

Physician: Empty stomach after giving Universal Antidote:

1. Universal Antidote (for use by physician): Pulverized charcoal (2 parts), magnesium oxide (1 part), tannic acid (1 part): ½ oz. in half glass of warm water.

Lavage solution may be Universal Antidote, one per cent sodium thiosulfate. Five per cent sodium bicarbonate, or warm water. Use BAL as listed for mercury.

Benzene Hexachloride—Known as Bentox, Benzahex, BHC, Chemhex, Cpd. 666, Gamiso, Gammacide, Gammaloid, Gamoxo, Gamtox, GBH, G-tos, HCCH, HCH, Hexachlorocyclohexane, Hexadow, Isotox, Lexone, etc. (Lindane is a gamma isomer of benzene hexachloride of not less than 99 per cent purity.)

First Aid: For external exposure, remove clothing and wash skin thoroughly. If swallowed empty stomach thoroughly. Give hot tea or coffee, and 2 T. Epson Salts in water.

Physician: Treatment essentially same as for DDT—no specific antidote and treatment is symptomatic. Wash contaminated skin thoroughly with soap and water. Clear alimentary tract if taken internally, but never use acid substance for washing stomach. Barbiturates for convulsions, and stimulants for depression. Choice of drugs is pentobarbital, with penobarbital a good second choice. Should be given in large doses and pushed to limit of therapeutic effectiveness. Not desirable to depress patient to point of hypnosis. However, persons poi-

soned by stimulants may tolerate large doses of barbiturates without undue depression and with great benefit. Intravenous calcium gluconate reported to have some effectiveness as antidote and may be used in conjunction with the barbiturates.

Chlordane—Known as Chlordan, Cpd. 1068, Octoachlor, Octa-Klor, Velsicol 1068, etc.

First Aid: If on skin, wash off thoroughly with soap and water. If taken internally, empty stomach and lavage with warm water, or salt water (1 T. in glass of warm water).

Physician: Treatment essentially same as for benzene hexachloride. Remove poison from skin or alimentary tract. Avoid oil laxatives. Use barbiturates for convulsions and stimulants for depression. Nervous symptoms best combatted with pentobarbital or phenobarbital.

Cyanides—(Including acrylonitril, calcium cyanide, hydrocyamic acid, potassium cyanide, prussic acid, and sodium cyanide).

First Aid: Get patient to fresh air, remove contaminated clothing, and keep warm and quiet. Administer artificial respiration if breathing has stopped. If cyanide swallowed, give 1 T. salt in glass of warm water, and repeat until vomit fluid is clear. (Give only *if patient is conscious.*)

Physician: Break pearls of amyl nitrite, one at a time, in handkerchief over victim's nose. Repeat five times at about 15-second intervals, leaving over the nose about 15 seconds for each pearl. Give (through same needle and vein) 10 cc. of 30 per cent (0.3 gm.) sodium nitrate followed by 25 per cent sodium thiosulfate (12.5 gm.). If swallowed, give five per cent sodium thiosulfate or 0.2 per cent potassium permanganate lavage, and simultaneously use the injection treatment. Give five per cent carbon dioxide in oxygen, or oxygen and artificial respiration if necessary.

DDT—Known as chlorophenothane, Detex, Dicophane, Gesarol, Neocid, and many other names.

First Aid: Same as for Chlordane.

Physician: Treatment similar to that for Chlordane and Benzene Hexachloride. Depending on condition of patient, attention should first be given to sedation, or to removal of poison which may have been taken internally. Gastric lavage and saline laxatives may be used. Avoid oil laxatives; they tend to promote absorption of DDT and of many organic solvents. Five drugs of choice, arranged roughly in order of their effectiveness are: phenobarbital, penetobarbital, paraldehyde, urethane, and calcium gluconate. Phenobarbital, which has been used in doses up to 0.7 grams per day in epilepsy, and pentobarbital (0.25 to 0.5 grams) are the barbiturates known to control convulsions of central origin. Epinephrine is contraindicated.

Dieldrin—Known as Cpd. 497, and Octalox.

First Aid: (Same as for Chlordane).

Physician: Treatment similar to that for Aldrin and Chlordane. Every effort should be made to remove from skin by thorough washing with soap and water, or from alimentary tract by use of lavage and/or saline laxatives. Oil laxatives should be avoided. Administer phenobarbital as an antidote, adjusting dosage to symptoms.

Dithiono—Known as Dithione, Sulfo-TEP, and tetraethyle dithio-pyrophosphate.

Treatment: (See Organic Phosphates).

HETP—Known as Hexaethyl Tetraphosphate, Hexotine, Pladon, etc.

Treatment: (See Organic Phosphates).

Malathion—Known as Cpd. 4049, malathon, etc.

Treatment: (See Organic Phosphates).

Nicotine—Known as Black Leaf 40, etc.

First Aid: If gotten on skin, remove clothing and wash skin thoroughly. If swallowed, empty stomach using mustard emetic. Give strong tea or coffee, or spirits of ammonia aromatic (1 t. in water). Also have patient drink water freely. Keep patient warm, and lying down. If necessary, use artificial respiration.

Physician: If taken internally, give Universal Antidote and lavage stomach with 240 cc. 1/1000 potassium permanganate, leaving 60 cc. in stomach. Give stimulation with adrenaline, or 0.5 grams of caffeine sodium benzoate I.M. and oxygen inhalations and artificial respiration if indicated. Increased fluids should assist in elimination of the poison. Manufacturer recommends 1/30 gr. strychnine by hypo every hour until four doses are taken.

OMPA—(Octamethyl pyrophosphoramide).

Treatment: (See Organic Phosphates).

Organic Phosphates—(Including Demeton, Dithiono, EPN, HETP, Malathion, OMPA, Parathion, Sulfo-TEP, Systox, TEPP, Vapotone, and others).

First Aid: Remove contaminated clothing, and wash skin with soap and warm water or soda bicarbonate solution. If swallowed, empty stomach with emetic. Use 1 T. salt in glass of warm water to induce vomiting; repeat to cleanse stomach thoroughly. Give two 1/100 grain atropine sulfate tablets. Artificial respiration if necessary. Call for a doctor immediately—these are deadly poisons!

Physician: If a patient has not yet shown symptoms or they have been allayed by first dose of atropine, he must be completely and quickly decontaminated. Wearing rubber gloves, remove clothing and, with due regard for his condition at the moment, bathe him thoroughly with soap and water. Using washing soda, or any relatively mild alkali; organic phosphates hydrolized by alkalis.

If any suspicion that material has been ingested, induce vomiting; give some neutral material such as milk or water and induce vomiting again. Nausea often occurs from this poisoning but if vomiting is not profuse, gastric lavage may be used.

Keep patient fully atrophinized if symptoms appear. Give one to two mg. (1/60 to 1/30 grain) of atropine sulfate every hour up to 10 to 20mg. in a day, particularly for the control of respiratory symptoms. The I.V. route is most rapid. Atropine relieves many of the distressing symptoms, reduces heart block, and dries secretions of the respiratory tract.

Never give morphine, theophylline, or theophylline-ethlyenediamine (Aminiphylline).

If pulmonary secretions have accumulated before atropine has become effective, patient must be turned upside down or in some other positions of postural drainage in order to drain out mucus. Use suction and a catheter if necessary. If stomach is distended, empty with a Levine tube.

Atrophine does not protect against muscular weakness. Mechanism of death appears to be respiratory failure. Use of an oxygen tent or even use of oxygen under slight positive pressure is advisable and should be started early. Watch the patient constantly, for the need for artificial respiration may appear suddenly. Equipment for artificial respiration should be placed by the patient's bed in readiness as soon as he is hospitalized. Cyanosis should be prevented by the most suitable means, since it aggravates the other signs of poisoning. Complete recovery may occur even after many hours of artificial respiration have been necessary.

Acute emergency lasts 24-48 hours, and the patient must be watched continuously during that time. Favorable response to one or more doses of atropine does not guarantee against sudden and fatal relapse. Medication must be continued during the entire emergency.

Following exposure heavy enough to produce symptoms, further organic phosphorus insecticide exposure of any sort should be avoided. The patient remains susceptible to relatively small exposures of these materials until regeneration of cholinesterase is nearly complete.▲

DIGGING OUT AFTER MOTHER NATURE GOES ON A RAMPAGE

(A Symposium)

HURRICANES—THOSE WILD WOMEN OF THE ATLANTIC

by JOHN L. GUILMARTIN
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The first hurricane that we ever had in connecticut, occurred 19 years ago, in September, 1938. That was before we knew hurricanes by their names or that they were supposed to be ladies.

From the standpoint of damage caused by high winds, the '38 hurricane was the worst one we ever had. It came after two or three days of steady rain, which softened up the ground, and with the foliage still full and heavy on the trees, they were literally a "pushover" for the winds that blew more than 100 mph. The wind started to blow in the late afternoon and without the slightest bit of advance warning. Our maintenance crews were scattered out on various jobs on what was just another rainy day.

When the storm struck, many of them found themselves without the proper tools or equipment, stranded along with thousands of motorists in a maze of fallen trees, utility poles and wires. Communications were knocked out all over the state and it was impossible to organize a uniform clean-up procedure. Consequently, maintenance crews were more or less on their own and tackled the job the best way they knew how.

MAKE-SHIFT CLEAN-UP

In the particular section where I worked at the time, those in charge proceeded to hire every man and growing boy they could find, and put them to work with axes and saws to cut a path through the jungle which used to be our state highways. From the standpoint of safety, the result of such a procedure was just what you might expect it to be. We didn't have any safety program in those days, nor did we have the type of accident reporting and record keeping that we have today.

Therefore, it is impossible to say just what our accident experience was, following that storm, but, if what I personally saw and heard was any criterion of what occurred throughout the department, I am sure that our accident rate was certainly not one to be proud of.

We have had a few more hurricanes since 1938, and we have learned a bit more about the job of cleaning them up. We have a good warning system now, thanks to the U. S. Weather Bureau, the Army, Navy, and a few others, and we know several days in advance when a storm is expected. This gives us plenty of time to prepare for it, and from the standpoint of preventing accidents, we can issue timely bulletins and instructions on how to avoid being injured on this type of work.

When it is reasonably certain that a storm is going to hit us, the first thing we do is to get our maintenance crews into their respective garages. Whether they are out working at the time, or if they are off duty, they are contacted, and instructed to report to their garages, well in advance of the expected arrival of the storm.

In one storm we had a few years ago, some economy-minded official of the department decided to wait and see what was going to happen before calling in the men. When the storm did hit us, many of them were unable to get to work. Therefore, it is now the policy to call them in if any possibility we are going to get enough of the storm to cause damage.

After the crews have reported to work, they are required to "stay put" in the garages until after the storm has passed. We do not allow our men to go out on the roads where they will be exposed to the high hazard of falling trees, poles, and other objects that fly about during the height of a hurricane.

DANGEROUS FIRST HOURS

Following the storm, the clean-up work is begun, and the first few hours are probably the most dangerous. With the pressure on to get the roads open as soon as possible, there is a tendency for the men to hurry, and in doing so, to get careless. Also at this time, there is the danger of coming into contact with live wires. Usually, when utility poles and wires are knocked down, the power companies will shut off the main switches in the affected areas to avoid fires and prevent injuries.

Our men are instructed to stay clear of any wires and to regard all of them as being "live" until they are definitely assured that the power has been cut. In the event that someone does come in contact with a live wire, we have trained first aiders in every crew, who know how to remove a wire from the victim, or the victim from a wire, as the case may be.

At the beginning of the clean-up operation, the main objective is to open the roads as quickly as possible, at least to one way traffic. To accomplish this, we use our dump trucks, hooking onto trees and limbs, with chains and cables, and dragging them off the highway, leaving a minimum of hand work. This method, rather than using saws and axes, gets the roads open a lot faster, and by the same token, reduces the possibility of personal injuries. Caution must be exercised by drivers in this back and forth operation, and proper guidance must be obtained while moving about in the work area, particularly while backing.

NIGHT WORK INVOLVED

This initial clean-up usually involves at least one night of operations, and for this we have a number of portable generators and lights. We make the best possible use of truck headlights to light up the work area, and although the traffic hazard is not high under these conditions, our trucks are equipped with flashing lights to warn motorists of their presence on the highway.

After the roads are opened enough so that traffic can get through, sometimes with detours, the job of widening out can be done a little more leisurely, without the pressure of an emergency situation, and usually in daylight, when more efficient and safer work can be done. The usual procedure is to cut the trees back beyond the shoulder line and pile the wood and brush on the roadside, where it can be later picked up. Wherever available, power saws are used to cut the wood into convenient lengths.

This equipment is operated by members of the tree crews who are familiar with its use. We don't allow the chain saws up in the trees, and never over waist high unless the operator has a firm footing on a platform or ladder, and the saw is properly slung. Only skilled tree workers are used to do any climbing to remove hangers or to do any other necessary trimming. All of the men are cautioned to exercise extreme care with sharp tools.

Axes, hammers and similar tools must have secure heads and be in good condition, and when swinging them, employees should obtain a firm footing and be sure of sufficient clearance of obstructions and other workers. Because of the high incidence of eye injuries on brush handling, the men are furnished goggles, and for handling limbs, debris, ropes, chains and cables, they are required to wear gloves.

OTHER EQUIPMENT USED

For removing the wood from the roadsides, we use winch trucks, with tripod attachments to load the heavy logs; the lighter ones are loaded by hand. Brush chippers are used to dispose of brush and smaller limbs. When necessary, trained flagmen control traffic to protect our men, equipment, and the public.

Many times, hurricanes are accompanied by floods. In fact, the most devastating storm in the history of our state in August, 1955, started out as a hurricane. But when it reached Connecticut, it wasn't even a good breeze. It dropped the heaviest rain in 36 hours that we had ever had before, resulting in floods that caused tremendous property damage and took the lives of 90 persons, including two state highway employees.

All in all, our accident experience on disaster clean-up work is not bad. As a

matter of fact, the records show that our accident rate following storms is as good and sometimes better than it has been in similar periods when we had no storms. I don't know exactly what that proves, but we can at least hope, if nothing else, that our year-round efforts to reduce accidents on the hundreds of other activities in which our men can be injured, may be the reason we have not had too much trouble with our hurricane clean-up operations. ▲

HURRICANES AND GOVERNMENT

by JACKSON G. FLOWERS
director of safety education, Dade County, Miami, Fla.

October 17, 1957 saw the seventh anniversary of the last hurricane passage through the South Florida area. One might feel, and it is the general consensus of opinion, that Florida has been fortunate to escape the destruction of hurricanes for seven years in a row. However, our weathermen state that after a review of the hurricane statistics which go back to 1875, a normal period between storms is between six and seven years.

While we are most happy to be relieved of the destruction and possible injury and death, year after year, there is, however, created a feeling of false security on the part of our populace. The recent hurricane which visited Louisiana, stands as living and dying proof of the effects of overconfidence and lack of vigilance as related to the power hurricanes pack.

PARK DEPT. PREPARATIONS

From the standpoint of our public employees, some 5,000 county employees, it is necessary for us to have detailed hurricane preparation plans available for immediate use. In view of the wide variety of services performed by the County, it is also necessary for us to review continually our hurricane plans, making changes to compensate for added public service responsibilities. The county family is responsible for the maintenance of some 2,800 miles of roads, the collection of garbage at 50,000 homes and 5,000 business establishments, the operation and maintenance of the second busiest airport in the United States, the control and maintenance of two major causeways, the operation and supervision of seven major parks, as well as the operation of two police departments and fire department.

In the "Land of Sunshine," South Florida is renowned for its many outdoor activities —so let's tee off with the Parks Department and its plans for handling its vast county's facilities as related to hurricanes. Their plan consist of two parts: a Blue Alert and Red Alert. When it is determined through close liaison with the weather bureau that in all probability South Florida will feel the sting of a hurricane, the Blue Alert goes into force, which calls key employees into action to accomplish preparation which can be quickly undone.

1. Secure garbage cans.
2. Turn over park tables.
3. Secure loose material and equipment.
4. Shutters are taken out of storage and placed near the buildings.
5. Remove and store all types of signs.

With the announcement that a storm is eminent, the Red Alert goes into effect, and all Parks employees are pressed into service, at which time, final preparations are made:

1. Put up shutters.
2. Remove all equipment from job areas.
3. Communication posts are established at the various park offices where all activities are co-ordinated with the parks director.
4. The plan calls for pre-arranged crews to report to various parks to lend assistance to the accomplishment of the various preparations.
5. One big factor in the preparations is the possibility of high tides and blowing sand. Therefore, electrical equipment such as compressors are disconnected and stored in a high place. Selected supplies are also stored in a high place.
6. Through pre-arrangement, the use of motor vehicles is kept at a minimum and are controlled from one central motor pool.
7. An interesting point is the establishment of a hurricane chest at each park. These chests consist of various types of tools for putting up shutters, two by four's, wire, rope and hammers. These chests are inspected prior to the beginning of the hurricane season, and their contents are utilized only for hurricane purposes.
8. Dade county operates a zoo at Crandon Park which has the usual kind of animals, including a giraffe, and the buildings which house them have been constructed to hurricane-proof specifications. The cages are built four feet above ground, based on tide and flood criteria. The giraffe with its periscoping neck, also lives on a platform two feet above ground level. Many of the animals are transferred to a specially built barn prior to the onset of the storm.

All of our hurricane plans by departments are predicated on two factors:

- Sufficient time to accomplish the work and allow the employees to be dismissed in sufficient time to secure their own personal homes and property.
- To allow the maximum safety factor to the employee through prior planning and sufficient time to accomplish the work which reduces the possibility of personal injury.

After the storm, all personnel report for work to start the job of clean-up and restoration of the facilities as quickly as possible. As an example of this type of work, in 1950 there were over 1,000 palms blown down in Crandon Park, which is our largest park. The painters have a busy time of it after the storm as the blowing sand often times has the effect of sandpapering a building down to the stucco.

Taking another department, the Dade County engineers' plan includes the completion of any roadwork underway, and the securing of all materials and equipment.

The Water Control division plays a vital part in clearing canals to insure proper drainage of heavy rains dropped by the hurricane. Included in their function is an interesting factor that they remove specially constructed dams prior to the hurricane, which are normally left in place to keep the salt water out of our canals.

CLEAR CANALS TO DRAIN LAND

The Water Control department which was established in 1953, has made a thorough study of the entire county and set flood criteria stage levels.

Standby crews are strategically located throughout the County for the purpose of placing lights and barricades where road obstructions have occurred as a result of the storm.

After the passage of the hurricane, the Engineering department is faced with the principal problem of repair of road damage which primarily comes about as a result of standing water. This repair is necessary on those roads which were constructed prior to two years ago. All roads which have been constructed since 1955 must meet certain specifications which will cause them to withstand water damage and patching is not a problem.

From the employee standpoint, road patching crews are faced with many hazards which are found in our heavily travelled roadnets. From a safety standpoint, we have made every effort to give these crews a maximum of protection by painting the trucks yellow with black stripes on them, numerous flashing red and amber lights, as well as red flags mounted on the trucks. Our experience has shown that the rainy months, August, September and October require extra patching crews which naturally increases the employee exposure.

AIRPORT IS READY, TOO

Turning to the Miami International Airport which is controlled by the county, we find that their plan includes securing all loose material and placing shutters on all buildings. In addition, fire extinguishers are checked and tested; owners of all planes are advised through the Operations department of the forthcoming storm, and they are encouraged to evacuate all flyable aircraft.

The Maintenance Department of the airport has a truck standing by loaded with road barricades and emergency supplies, as well as lanterns.

Auxiliary power and hand pumps are placed into position for possible use if power failure occurs. All fire and crash equipment is distributed to various locations on the airport. All radio controlled units of the Port Authority are assigned to various locations to assure immediate communication in the event of an emergency. Immediately following the storm, crews are dispatched to clear away any debris that might be on the runways.

Turning to the Waste Department, their preparations include disbursal of 256 trucks with all gas tanks filled, and immediately following the storm, they are pressed into service to collect all garbage which could become a health menace if not collected immediately.

The County Road Patrol and County Police secure their headquarters and place auxiliary units into position to insure adequate communications to the radio-patrol cars in the event of power failure. Road Patrol units which are responsible for the protection of the unincorporated areas, are placed in pre-designated garages within their zones to ride out the storm, and at the same time, are available for emergency calls. The County Fire Units secure their stations and recall all off-duty firemen.

Experience in South Florida has proved over the years that with adequate advance planning and preparations on the part of the various units of government, as well as the general populace, death and injury can be virtually eliminated. In spite of our tremendous growth in the past seven years, property damage can also be held to a minimum as the result of strict compliance with rigid building codes.

Only indifference and lack of preparation can set the stage for disaster.

SAND STORMS

by CHARLES P. DUNWIDDIE

safety program director, New Mexico State Highway Commission, Santa Fe, N. M.

Having lived in New Mexico for 43 years I have seen thousands of sand storms. The Highway department gets the blame for everything that happens, including sand storms. Let me give you a few typical daily headlines and comments, from the Newspaper angle. "Winds, flood borne sand clogs important highways." "Sand whipped by winds and borne by flood waters slowed or halted New Mexico's holiday traffic in two parts of the state Thursday night. Motorists were halted by blinding sheets of sand (I like the descriptive words, 'blinding sheets') in the nine mile stretch of US-70-54 between Alamogordo and Tularosa.

"One flood left two feet of sand on a US-83 bridge across an arroyo six miles south of Belen. State police were discouraging south-bound traffic from Albuquerque. State police put up four roadblocks to halt the traffic between Alamogordo and Tularosa. Winds were estimated up to 60 mph. NO VISIBILITY. Visibility at the intersection of NM-83 and US-70-54 north of Alamogordo was non-existent. The same situation existed at the US-70-54 junction in the town of Tularosa."

Here is another. "Bus and car crash during dust storm south of Tularosa. Twenty-three passengers aboard a Santa Fe bound Greyhound bus escaped injury last night when it collided with a car two miles south of here on US-70-54 in a dust storm. The mishap occurred just as the bus was pulling back into its lane after passing another car. The vehicles collided head-on, but were moving slowly, police said."

SAND STORM FACTS

These are exemplary and only point out a few facts worthy of early comment. First, that sand storms can be either dry or wet. Sand can be and is deposited on the roadways by either wind or water.

Second, that preliminary to the clean-up or digging out program, which is a continuous maintenance problem, is the terrific job of trying to control traffic in the danger areas during the storm and immediately after. Motorists are most obstinate and will not take care of themselves.

Third, that a huge portion of the state has a top-soil that is easily picked up and moved with the wind. This top-soil can be unbelievably deep.

Fourth, that the sand storms present a tremendous problem in engineering.

Let's consider the first point. Sand storms occur in all varieties in New Mexico. We don't call them tornadoes, nor hurricanes.

The Air Force and its weather people at Kirtland Air Force Base at Albuquerque gave me some wonderful information. I am now on speaking terms with air-currents, low pressure areas, high-pressure areas and storm-belts. I have seen winds plotted on maps. I know that when cold air meets warm air in collision, something is going to happen.

New Mexico has a lot of more or less flat country. The flat areas, after centuries of erosion, are mostly sand areas. They are typical desert areas. Little rain leaves the areas dry. Sparse vegetation can't hold the sand. So it is easily moved by hard winds. Winds pick up the surface and carry it miles high. Or, just as easily rolls it along the ground.

An example of the movement of sand and dust is seen frequently in the capitol, Santa Fe. The city is bounded on three sides by mountains. The elevation is 7,000 feet. Mountains to the east and north range to 14,000 feet, to the west 11,000 feet, to the south the land levels off and slowly loses elevation. Prevailing winds come from the southwest.

With the mountains as a back stop the air above Santa Fe can be so completely saturated with sand and dust, thousands of feet high, that the sun is completely obliterated. Or, it can be as easily rolled along the surface, coming uphill and leaving ground visibility at zero. The sand and dust deposited in the area during these storms have been traced to various points as far away as several hundred miles.

Mountains throughout the state more or less determine the prevailing winds in the flatter areas. So the movement of sand and those points where wind carries it onto or across our highways is, of course well known and the movement can be anticipated to some extent. Actually in some areas the winds are seasonal.

These winds and other atmospheric conditions are also responsible for rain and hail storms. New Mexico is a land of unexpected rains, in the form of cloud-bursts. These never occur in the same place twice. They drop tremendous amounts of water over a small area in a matter of minutes and the resultant run-off of water that cannot be controlled is often disastrous to our roads.

The heavy run-off and the loose top soil that can easily be carried leaves heavy deposits of sand on the roads. It makes for a very dangerous situation when it involves heavy moving traffic. Water courses can be traced, of course. Structures can be designed to carry anticipated water fall. But cloud-bursts can not be anticipated. It can be readily seen that it sets up a hazardous situation for motorists.

I have been leading up to the second point. This is the practically impossible job of controlling the flow of traffic during the danger periods. Consider the factors. Interstate bus lines have to maintain schedules, if possible. Drivers of these lines are inclined to take chances, in spite of their safety training. The movement of heavy freight along the highways must be maintained at as fast a rate as possible. Tourists and common citizens are all inclined to be in a big hurry, whether they are going two miles or 2,000. So, the problem, during these storms is to slow down or stop them.

Signs don't mean a thing. Why try to tell the drivers that there is a sand storm ahead when the sand is probably blowing so hard that he couldn't read it, even if he was inclined to read signs and take cognizance of the warning. Drivers hate to be slowed down, and lose time. I've seen them creep along at two mph, straining their eyes to see the radiator ornament, much less the road ahead. And when a guy going in the opposite direction is doing the same thing, somebody's gonna get hurt. On the other hand to pull off and stop on the shoulder may also be extremely hazardous. In certain areas police controlled road blocks are the only answer.

The third point that I mentioned is important in this discussion. The soil, or various soils, and sand and gravel, go to make a top soil product, that, when dried out and subjected to heavy surface winds will be quite easily picked up and moved. Much of our good farming land is just such soil. A crop planted on one side of the road today may be blown to the other side tomorrow.

LOSS OF TOP SOIL

In the sandy desert parts of the state vegetation, natural vegetation, does little to hold the soil, and keep it from shifting. We have several famous examples of shifting sand.

The principal one is known as the white sands. It is a national monument, located in Dona Ana and Otero Counties in south central New Mexico. It is quite extensive, covering an area of 176,000 acres. That's about 275 square miles. Here is found an albino desert of gleaming, dazzling pure gypsum. Vast reaches of ever shifting and changing opalescent dunes form a paradise for photographers.

A National Play Day occurs here every April. Many persons enjoy skiing on the dunes.

The dunes can be quite dangerous to the tenderfoot. The sand is so white that there is danger of sun-blindness. Persons with a poor sense of direction can easily be come confused and lost. As the years go by the sands turn up an occasional skeleton, as the surfaces of the dunes shift. These are not always human. The Sands are supervised by the Park Service and daily tours are made during the year. A black-top, two lane road has been built into a portion of the dunes and it requires continual maintenence to keep it clear of blow sand drifts.

Another example of moving sand, and this is a yellow sand, is found in Socorro County.. It is found on US-85 and is a headache for our department. It is difficult to explain the movement of this sand and the problems involved.

Most engineers can realize the problems involved in the building of our highways over such terrain. My fourth point covers all of the difficulties from preliminary location surveys, through all the stages of planning and design, the actual construction, the opening to moving traffic and finally the tremendous job of proper and fast maintenance. Actually, future maintenance must play an important part in the design stage itself.

New Mexico has never been a wealthy state. Funds for road construction have always been limited. Many miles of our roads are in flat country where watercourses are shallow and wide, yet serve huge drainage areas. Bridges, and long ones at that, were not feasable, nor from the factor of cost, were they possible. Paved dips were used for many years. Many of them still exist and will for years to come.

Many of these are the points where upcountry cloud-bursts send water across the highways. At such times they become the danger points that require road blocking. Maintenance crews must be available at all times, in all areas to take over. Their work of course is to try to maintain a movement of traffic, halt it when necessary and clean up the mess afterwards. In the parts of the state where these dips are prevelant, equipment is available for any type of required operation.

The cleanup job often involves gathering up the sand and silt deposited by water and hauling it away. This wouldn't, of course, have to be far. In this type of country it is an expensive bit of maintenance to keep the ditches clean and serviceable. Shoulders are hard to maintain. When rain soaked they are dangerous. To make it more difficult, drivers will not believe a sign that reads "soft shoulders." They always try it anyway.

LESSONS LEARNED BY GIVING SERVICE DURING AND AFTER THE RECENT FLOOD

by MELVIN G. LYELL

safety engineer, Virginia dept. of highways, Richmond, Va.

Flash floods are not uncommon to the area along the Cumberland Mountain Range separating the States of Virginia and Kentucky. Such floods occur with a certain frequency in this region. Their intensity has been confined to some particular small area, so damages were not widespread, and the repairs were made quickly with the regular personnel, equipment and materials.

On January 29, 1957, after several weeks of rainfall, a heavy concentrated downpour fell over a large area of southwest Virginia, eastern Kentucky, and southern West Virginia. Small streams and large rivers overflowed. The flood reached five to seven feet higher than any previous flood.

The cost to Virginia highway department for repairing and replacing its facilities was $2,141,000. This includes funds from emergency federal aid and Civil Defense. These aid funds are very restrictive and very difficult to fit into an emergency program.

To show the extent of the damage, here are a few statistics:

—396 miles of roads damaged, from complete washouts to shoulder washouts

—74 vehicle bridges—16 feet to 142 feet long—damaged to the extent that practically new structures were required

—28 bridges required repairs.

—24 swinging footbridges completely destroyed and required replacements

Recovery, partial or complete, from such a disaster depends on personnel, equipment and materials. Command should be centralized but not to the point that leadership is not properly delegated to the local superintendents and foremen.

The period of greatest confusion is during and immediately following the disaster, and during this period proper leadership begins to show its effectiveness. During a state of emergency the public looks for guidance and leadership in its highway organization.

The public depends on the local engineers to bring food, clothing, medical, and other aid into the stricken area. And rightfully so, because the engineer is the field commander for his area, and he must provide the leadership to clear the highways for travel.

Calm and confident leadership which processes the work efficiently, has an exalting affect on the morale of the civilian population and the recovery organization.

When a disaster like Virginia's January flood occurs, the local organization is neither large enough nor equipped well enough to handle the situation alone. Damage must be determined quickly and requirements for recovery evaluated in proportion to the need. This calls for good planning on the part of leadership. Reinforcements must come from an area outside the disaster.

Personnel reinforcements bring the added problem of housing and feeding. To alleviate this problem our equipment division set up a temporary camp in an area which presented our biggest problem. This camp had kitchen trailers and sleeping trailers.

Personnel were sent into the disaster area without knowing weather conditions and they are not properly clothed. Although the deluge had passed and the streams had subsided to some degree when reinforcements began arriving, rain continued without interruption for another 18 days and many found themselves without the proper clothing. Boots and raincoats were needed —the employee's welfare is an important part in the effectiveness of his work.

As in the case of personnel, the equipment requested was based on actual need and was placed at the proper point upon arrival. This saved time and operations started with maximum efficiency. Bulldozers, motor graders, and power shovels were the prime movers. This equipment was used on major

washouts, slides, and erection of Army H-10 steel bridges. Trucks, fronted loaders, and backhoes were used for removing small slides, hauling materials, repairing or replacing small bridges and installing pipe lines.

All available hired equipment was used to supplement state owned equipment. Some of this equipment was available from the vicinity of major roadblocks on main arteries, which were given first priority.

Metal pipe culverts were used extensively to replace small bridges. It was simply a matter of placing a pipe or pipes, dozing in a fill composed of gravel from the creek and moving to the next trouble spot.

Army H-10 bridges were sent from other districts through the state and were erected where major bridges were destroyed. In all instances temporary structures were installed so as not to interfere with the installation of the permanent structure.

An entire organization can be used to maximum efficiency in a disaster of this kind. For instance, personnel secured permission, easements or purchasing rights for repairs, detours and local materials. Sign crews relieve local forces of putting up detour signs, barricades and warning signs. Survey parties secure measurements and staking abutments and piers for large bridges.

Recovery is accomplished in two steps. First, re-establishing traffic quickly by every known temporary measure and second, replacement in kind.

The first step, or initial recovery, is most important and generally accomplished without formality or for permanency. Beginning immediately after the flood waters began to recede, this stage is both costly and temporary, therefore efforts must be made not to waste personnel, equipment, materials, or funds.

This first stage, with one-way traffic in many places was completed in about a week except for major bridges. After this we gradually restored the roadways to normal widths. Step two soon got under way, requiring time, funds and patience.

Now all replacements have been completed except the construction of a few major bridges, reconstruction of certain road sections, and the construction of a few protective devices such as walls and riprap.

An outstanding accomplishment was that none of our employees was seriously injured and no time was lost as a result of accidents. The foreman and superintendent said they worked under hazardous conditions but prevented a serious injury by:

1. The daily, five-minute safety meeting kept employees safety conscious.
2. While working under hazardous conditions, everyone was accident conscious and remained alert.

In contrast, serious accidents sometimes occur on bright, sunny days when employees tend to be lax and apparently do not fully realize just how quickly an accident could be serious and sometimes fatal.▲

REMARKS OF J. C. McDONALD, JR.

safety supervisor, Mississippi State highway dept., Jackson, Miss.

Organization is the thing needed most during any disaster. Get a good man—don't let too many outsiders into disaster area. They know nothing of the operations and are likely to panic causing additional trouble and problems.

Work with portable radios—keep in constant contact. Get trained personnel on the scene immediately. There is the problem of care for your men. Organizations such as Red Cross and the like will take care of the victims but you must plan for housing and feeding your men while they are operating in the disaster area.

Good signing is essential for the protection of your men and any outsiders who might come into the area. For safety put signs at least a mile out from work area. Depend on your district men as much as possible.

Get safety into operation—and get your area men to do the job. In case of need a safety engineer is good but your men on the scene from that district know best the problems which will arise.

SELL YOURSELF

Don't try to catch your men in errors—set the proper example and build their confidence and respect for you. You must sell yourself to your men—then they will count on you. You can't get anywhere with "police action."

You must stay on the job always—with safety. You can sell more safety with laughs. Safety is a serious matter but gets across easier with your men when you can make your points with a laugh because you can hold their interest with jokes.▲

SNOW AND ICE CONTROL

by GEORGE C. MURPHY

safety supervisor, Maine Highway Commission, Augusta, Maine

There are many hazards to both the public and public employees in most snow and ice removal problems.

We have many hazards that could be lessened by mechanical means and money. But strangely, few of these hazards produce injuries. Probably our most hazardous operation is sanding. Conditions calling for this operation are usually at their worst. The highways are slippery; it is probably storming, and it seems that it is nearly always dark.

We have men perched on a truck body elevated to the angle of a ski slope. During any state wide storm we have 500 to 600 men working under these conditions. This would appear to be a perfect climate for injury-producing accidents. But injuries are rare and more than half of these are caused by the dangerous driving habits of the public.

But after the sanding is done, when the dangerous part of the operation is completed, this is the time that injury producing accidents are likely to occur.

Dangerous conditions produce few accidents. Unsafe acts of people produce many. Adequate supervision will take care of some of the unsafe acts. But the greatest number of the unsafe act injuries are produced by the people who do not have their minds on the jobs at hand. They are far away with their multitude of problems and worries.

How are we going to deal with these people? To me they represent the real problem in accident prevention.▲

Health and Safety Programs for Governmental Employees

(A Symposium)

THE PROFESSIONAL VIEWPOINT ON A CITY PROGRAM

by DR. FRANK H. HERRINGTON

chief physician, Employee Health Services, City of Columbus, Columbus, Ohio

A health and safety program planned for a municipality must of necessity differ greatly from one for a contained industrial set-up. "Contained" means that the physical plant of an industry is limited to a certain area, and fixed in location and size. A program may be designed to serve this unit to the maximum of efficiency.

Problems of health and safety can be dealt with satisfactorily due to the stability of the working units in this contained industry. On the other hand, we face divergent and constantly changing elements. Our health and safety measures must be geared to small mobile units which perform many different tasks; for example, street cleaning, road repair, and electricity, not to mention the various units of the police and fire divisions. Out of approximately 3,500 employees serving the city of Columbus, at least 50 per cent are constantly mobile and most difficult to reach. These mobile units are made up of small groups, therefore we must depend on supervisors to carry out our rules and suggestions regarding safety measures.

MUNICIPALITY SAFETY PROGRAM

The main purpose of our program is to institute measures necessary to protect the employee, insure his maximum efficiency on the job, and prevent him from injuries by reducing the various hazards to which he is exposed. We encodrage prompt reporting of all injuries and see that they receive the necessary care.

We in our division provide emergency care only. Any continuing care is the responsibility of the employee's family physician or competent specialist. If an employee has no family physician, we refer him to a specialist on our consulting staff. We do not wish to be accused of practicing socialized medicine and above all, we wish to and have maintained a friendly and cooperative liaison with the local medical society.

The main duties of our program consist of routine pre-employment physical examinations including a complete history, physical, urinalysis, serology, chest x-ray, visual acuity as measured by the orthorater, audiometric test, EKG and BMR when indicated. After this examination the applicant is rated as employable or unemployable. The result and rating are sent to personnel and to civil service. There has been only one case in which an applicant certified by us as unemployable has been hired and this case was later satisfactorily taken care of when the employee had a hernia repaired.

RETURN TO WORK EXAMINATIONS

To reduce the number of days lost due to illness, and to satisfy us that an employee absent from his job because of illness or injury has fully recovered and may return to work, we have a civil service rule. This says than an employee absent from his job for more than two consecutive days must be certified by the medical department before he may return to his regular duties.

Depending on our evaluation of him at the time of this examination, he may be certified to regular duty or we may allow him to return to so-called light duty with certain restrictions.

Routine annual physicals are offered to all city employees who wish an evaluation of their physical condition. The results of our findings, with the consent of the employee, are available to the family physician. These examinations are not mandatory for all city employees but are set up primarily for the police and fire departments.

During the past 18 months we have completed more than 1,000 annual examinations and are presently starting over again. This will be an annual affair, since we believe this is necessary to maintain these essential employees in the best of health.

These routine pre-employment and annual physicals have already turned up cases of malignancy, diabetes and hypertension, which had produced no symptoms and were therefore unknown to the employee.

As stated earlier, we provide emergency treatment of illness and injury *only* and for this purpose we have a well equipped emergency room.

The salary differential between private industry and public service does not provide us with the best material—lack of adequate personnel staff prevents proper screening of applicants.

One of our biggest problems is motivating the employee toward his job. Outside stress and strain plus improper motivation toward his job make for an inefficient and accident prone worker.

PROBLEMS OF HEALTH PROGRAM

All of us who are closely associated with industrial and environmental medicine feel that we are compelled to deal with more than the physical aspect of an employee's health. The mental and emotional components are a very important factor to maintain workers at top efficiency.

Each type of job has its particular hazards with which we must cope and for which we must find a solution if we are to reduce injury and the subsequent cost of industrial claims.

THE SAFETY ENGINEER'S VIEWPOINT ON ACCOMPLISHMENTS

by JOHN E. PAGNARD

safety coordinator, City of Columbus, Columbus, Ohio

The safety engineer must be equipped with certain tools if he is going to do a job. These tools are often much different than those used by machanics, welders and electricians. The safety engineer must rely on his own imagination and personal qualities that enable him to work with people and sell ideas.

In many cases the safety engineer is asked to perform tasks only the most skilled magician would attempt. But through patience and his belief in serving humanity, the most unbargained for task is successfully completed.

From 1951 to 1956 I have seen and felt the need for an occupational health program for all city employees in Columbus. Before our present medical policy, the only available medical services were for employees in the department of public safety, chiefly to the fire and police departments.

After a number of conferences with various city officials, a request was submitted in August of 1955 to the Department of Preventive Medicine of Ohio State University, for assistance in surveying the need and advisability of an occupational health program for the 3,500 employees of the City.

From a study of the municipal organization, physical requirements, and specific job hazards, a detailed proposal for establishing an employee occupational health program was prepared by Dr. James P. Hughes, Associate Professor, College of Medicine, Ohio State University, and submitted to the Mayor and city council.

FIRST LOCAL LAW FOR EMPLOYEE HEALTH

From this proposal, emergency legislation was prepared and presented to city council. An emergency ordinance was passed unanimously by the City Council and approved by the Mayor on December 17, 1955, thus creating by local law, the first occupational health program for employees on a local

level. Before passing this ordinance, the city law department was unable to find a similar existing ordinance in any other major city.

On January 1, 1956, the Columbus Employee Health Services opened its doors. As facilities increased, a nursing staff was recruited and trained and services were quickly made available. Six months later the medical program was supported enthusiastically by the city administration and employees alike.

Dr. Frank H. Herrington was appointed *full time Chief Physician and Director of* the Columbus Employee Occupational Health Program. By now the medical staff had increased to three part time physicians, three nurses and a secretarial staff.

Why so much emphasis made on this one item: "Occupational Health" or "Industrial Medicine?" From the humanitarian viewpoint, no service is as important to any group as that which safeguards the health and well-being of every employee. Secondly the economic aspect is tremendous when savings are important and a must with management. Successful management today, be it industry or government, will insist on economy. The waste of man power due to *injury or illness, is a tremendous drain on* the American prosperity of today.

The State Industrial or Workmen's Compensation premium rate for Columbus has increased steadily from 1950 through 1955. Employment has been at a high peak and payrolls also have increased considerably. The City of Columbus paid in Workmen's Compensation premiums during this five year period, more than one-half million dollars. No city in this country can pay such an industrial premium and prosper, because this is a waste of tax payer's dollars and a reduction in good, efficient, public service.

COMPENSATION PREMIUMS CUT

After one year of operation, the Employee Health Services program cut the Workmen's Compensation premium more than $75,000.00. The basic rate for Columbus dropped from $2.39 per $100.00 of payroll to $2.23. Our modification or penalty rate, dropped from a plus 73 per cent to 63 per cent. The risk rate dropped from $4.13 per $1,000.00 of payroll to $3.63.

Along with this record of direct cost of Workmen's Compensation the partial cost of sick leave for city employees in one year was more than one and one-half per cent of the total payroll. This figure is much less than previous years.

Another factor is the effect of the medical policy in regard to the number of Workmen's Compensation claims filed with the State Industrial Commission. During the first six months of the Employee Health Service program, the total number of Workmen's Compensation claims filed was reduced by 12 per cent.

Also, the total number of injury claims for payment of Workmen's Compensation was reduced 29 per cent. The number of industrial claims filed, payment of medical fees only, was reduced by five per cent. This was for the first six months only and is good evidence of expected benefits as far as top management is concerned.

It is not easy to persuade a budget director or finance committee of City Council to appropriate $40,000.00 or $50,000.00 for a proposed program. This is especially true for an accident prevention program because of the lack of tangible evidence to prove your argument. Prior to revamping our entire safety program so as to include the proposed medical program, the yearly budget alloted the Department of Industrial Relations was $14,000.00

SAVE TAXPAYERS' MONEY

The approved budget for the first year of our complete medical and safety program was $63,000.00. The budget for the year 1958 will be approximately $68,000.00. Final approval of our budget request is yet to come, and as in every governmental agency, we expect reduction of the initial request. I will say the city officials have been most cooperative and understanding when additional monies are needed.

The aim of our program is to prevent injury, have physically capable people performing public service and relieve the tax payers of excessive cost in payment of Workmen's Compensation and medical fees. From a monetary point of view we anticipate a savings to the city of over $200,000.00 a year in industrial premiums.

Another advantage and service is the certification to duty. Except for uniform personnel of the fire and police departments, it was my responsibility in the past to approve persons returning to duty, when a statement from the family physician was presented. This practice was unfair to not only the employer, but to the employee as well.

A layman should not have this responsibility—he is neither qualified nor licensed to judge the physical fitness of a person. Many times I felt that the employee should not return to regular duties because of the strenuous activities involved. But with a statement from the family physician, there was no alternative. The employee will—in some cases—tell his physician that his job is "not strenuous" or whatever excuse is needed to get back to work.

Financial hardship in the home and medical fees will effect the physician's decision to permit the employee to return to duty. This situation does not exist within the framework of our organization since the inception of our Employee Health Services program. No employee returns to duty now, unless certified by our medical staff.

Periodic inspection of work areas are a part of our safety program. Before our new policies, these inspections were carried out by myself and a foreman or supervisor. The chief physician and myself now make these inspections accompanied by supervisory personnel within the department or area inspected, and the success of correcting hazards found is most surprising.

There is no argument or question from any supervisor or superintendent or division head when the medical expert makes a recommendation for correction. A safetyman is fortunate indeed who has a medical section, especially a physician to advise and assist in the problems pertaining to the well-being of all employees.

The success of accomplishing that which is good for all peoples depends on the initiative, perseverance and determination you yourself inject in this or any other program.

There have been no political pressures or interference whatsoever in carrying out our health and safety policies and procedures. This is definitely not a problem with our Employee Health and Safety program.

There is no room for politics in safety but there is a lot of room for safety in politics.

WHAT RED CROSS FIRST AID TRAINING HAS DONE FOR OUR ACCIDENT CONTROL PROGRAM

by TARVIA JONES

engineer-director of safety, North Carolina State Highway & Public Works Commission, Graham, N. C.

We started our state-wide American Red Cross and First Aid courses on October 5, 1956 and we believe this is the best forward step we have ever taken in the SAFETY field.

Is there any thing more noble than teaching people to save life? Everyone should have the know-how of safety and all of the numerous things about life and living safely.

Did you know there is a bandage for every part of the human body? Who should know what, where and when to use such bandages more than the public employee?

We have been informed that we are the only state in the Union that has ever attempted such an all inclusive prevention and first aid program on a state-wide basis for every employee. We haven't had time as yet to evaluate our frequencies or severities as a result of our all-out red cross training but we have seen and heard enough to know it will pay dividends in more ways than one—like when we had a tree fall on a man and break his leg.

A first aider cared for him until they could reach a doctor who took an x-ray of the fracture to learn the nature and type

and ordered the injured person to a hospital 144 miles away. Our first aider said, "Aren't you going to re-splint and bandage?" The doctor replied, "That's as good a job as I could do, take him on."

Another man in our instructors' class stated, "Had I known two weeks ago what I know now I could have saved the life of one of my neighboe's children and the reason that's so important to me is because I have three children of my own."

All of our men have been elated over the privilege of having this course made available to them. It helps them—as well as their wives and children.

Everyone knows the American Red Cross is on the job in times of stress and disaster. Many of you know what it means to have some one with the know-how when a hurricane strikes or a tidal wave sweeps over the country side, perhaps some of you remember my article—"Wild Girls of the Atlantic"—which showed it pays to train all of our men in this most vital art. Life may be saved and shock prevented.

I am happy to report that in North Carolina we have approximately 400 qualified red cross instructors in our highway department and more than 4,000 qualified first aiders among our employees. We hope to continue our instruction until every highway employee is the proud holder of at least an American Red Cross Standard First Aid card. This will be the day when the real pay-off comes.

We unreservedly and whole heartedly recommend to every public employee group—the American Red Cross Prevention and First Aid course.

WHAT WE EXPECT FROM OPERATORS OF HIGHWAY VEHICLES

by MELVIN G. LYELL

safety engineer, Virginia dept. of highways, Richmond, Va.

This is part of a booklet written to acquaint drivers and operators of our vehicles and equipment with what the Highway Department expects of them in the way of driver performance to maintain a good safety record, and promote courtesy and good will toward the traveling public.

It also outlines our system of driver safety awards, and the system of penalties in the event of an accident which our operator could have prevented.

DEFENSIVE DRIVING

A key factor in this safe driving program is to require a high standard of performance. We know that if we are satisfied with mediocre standards we will get nothing better.

High standards create an additional incentive and become a challenge to each driver. The skilled drivers have a chance to prove their ability. They spur the other drivers to improve their performance.

A defensive driver is a driver who not only avoids causing accidents but also prevents pedestrians and other drivers from causing accidents involving him. He uses his skill and experience to insure that others are not able, through their own faulty actions, to involve him in an accident. He is a superior driver who obeys all traffic regulations. He realizes that many other drivers do not have the same degree of skill or knowledge that he has. He recognizes the need for extra safety measures to protect himself from the unpredictable actions of others—drivers and pedestrians. The defensive driver:

—readily concedes the right-of-way to others when encountering them at narrow bridges, intersections, converging traffic lanes, rotary intersections, and traffic circles.

—makes all allowances for: poor weather conditions, reduced visibility and slippery roads, narrow untreated, gravel roads.

—learns to anticipate accidents and takes precautions that will prevent them.

Drivers are generally classified into three groups, namely:

Amateur Drivers—who are so poor that they actually cause collisions by the way they drive.

Semi-pro Drivers—who drive well enough not to cause collisions by the way they drive, but not well enough to avoid being hit by amateur drivers.

Professional Drivers—who are so good that they not only do not cause collisions by their driving methods but who, in addition, are smart enough to outguess the amateur driver and not be hit by him. In other words, he is the defensive driver.

A safe driving award for one or more years without an accident should be awarded to the defensive driver. Then every other driver would try to achieve those standards. If the award were given to the amateur or semi-professional driver, then he would not recognize our skilled operator, the defensive driver.

STANDARD OF PERFORMANCE

How then can our standard of performance be described?

A perfect safety performance is operating a motor vehicle without having an accident at all. That is too much to expect. Our operators may become involved in accidents over which they have no control. Obviously it would be unfair to charge an operator or penalize him for this type of accident.

In most cases it takes two to make an accident. One driver usually violates some traffic law, the other some principle of defensive driving relating to safe speed, right-of-way, or alertness.

Either could have prevented the collision and therefore both contributed.

Here then is the clue to what we expect of a reasonably safe driving performance from our operators. We do not want to charge them and penalize them for all accidents in which they are involved, but we do expect them to prevent accidents.

Therefore, our standard is this—for an operator to have the ability to drive without having a preventable accident. Every possible precaution should be exercised to prevent the accident.

Of course the word "possible" is subject to various interpretations. If it is applied strictly, operators will think us unreasonable. However, if it is applied too loosely, driving errors will be overlooked and the same types of accidents will re-occur.

PUBLIC RELATIONS

So the problem of classifying accidents as "preventable" or "nonpreventable" and "avoidable" or unavoidable" is most important. We want our operators to feel that they have been treated fairly and impartially. We want to penalize the careless, non-attentive operator and reward the alert, skillful operator. The assessing of a penalty is not for the sole purpose of making the operator pay a fine, but to also point out what he could and should have done to have prevented an accident.

The majority of our accidents are usually preventable. In the assessing of a penalty or determining responsibility, we are not concerned with whether our operator was legally right or wrong. We are concerned with whether or not the accident could have been avoided by defensive driving.

Every possible precaution must be taken to avoid and prevent accidents. Both the traveling public and employees of the department engaged in the performance of work must be safeguarded effectively.

All employees of the department shall act with courtesy at all times, and shall so conduct themselves as befits a representative of the Department of highways. There must be no display of temper. Arguments with the public must be avoided, regardless of provocation. The value and effect of courtesy is inestimable.

Inquires shall be answered as completely as possible in a business-like manner; however controversial subjects and certain policies should not be discussed with parties outside the department.

In case of highway accidents being witnessed, regardless of whether or not state equipment is involved, employees of the department shall offer assistance.

It must be remembered that defense in case of any accident involving state employees or equipment, requires that the em-

ployee or employees do and have acted entirely within the law, and that occupational and personal conduct should be above reproach.

In offering services, the employee must be certain that his actions will not place him, or the state, under liability for damages.

No employee will make any statement as to responsibility for any accident at the scene of the accident in which he is involved. Such statements will be made only on the accident report submitted to the Highway Department, and or as outlined in the paragraph of "What Not to Do" on the last page.

GUIDE TO ACCIDENT PREVENTABILITY

Responsibility—Responsibility to prevent accidents is not based on who was primarily responsible or at fault. Responsibility to prevent accidents goes beyond careful observance of traffic rules and regulations. Drivers must drive in a manner to prevent accidents, regardless of the other fellow's faulty driving or non-observance of traffic laws.

Important: Unless thorough investigation shows extenuating circumstances quite beyond the control of the driver, the following types of accidents will be regarded as preventable. This list has been prepared as a guide to help you determine whether or not an accident should be charged as "preventable" on a driver's record and the driver assessed with a penalty.

Accidents at Intersections

a. Driving Straight Through Intersection—Collisions with vehicles coming from either the left or the right, regardless of the presence or absence of stop signs or traffic lights, or whether the light was green or changing.

b. Driving Straight Through Intersection—Collision with approaching vehicle making left turn in front of our driver.

c. Starting Through Intersection When Light Changes—Collision with cross traffic which has not cleared the intersections.

d. Making Right or Left Turns—Collision with approaching or cross traffic. Turning left-when other driver is approaching from the rear and attempting to pass on the left at intersection. Collision with adjacent traffic even when the other vehicle is illegally passing at the intersection. Also collision with a vehicle leaving curb as our driver makes a right turn.

Grade Crossing Collisions—Collisions with trains at grade crossings, regardless of where the accident occurred. Trains always have the right-of-way.

Backing Accidents—The care with which a vehicle is backed depends entirely on the driver's ability to make certain the way is clear. The driver is not relieved of his responsibility to act safely when someone guides him. The flagman does not have control of the vehicle and can neither start it nor stop it.

Collisions with Vehicle Ahead—Having the vehicle ahead stop suddenly is a common highway hazard. Collisions with such vehicles are considered preventable because professional drivers should always follow at a safe distance and have their vehicle under control.

Our Vehicle Struck in Rear—Will be considered preventable when:

a. Our driver was passing traffic when close to an intersection, then stopped suddenly at the intersection for a red light, stop sign, pedestrian or other vehicle.

b. Our vehicle was improperly parked.

c. Our vehicle rolled back in preparation for starting ahead.

d. Our driver made sudden stop to park, to load, or unload merchandise or passengers, for a grade crossing, or for similar reasons.

Accidents resulting from other drivers entering the main road from driveway, alley or side street—It is our driver's responsibility to enter traffic safely from such locations. These accidents may be prevented by proceeding with caution and being alert when approaching these intersections.

Weaving right or left—Failure to keep in line in multiple lane traffic. Some accidents may seem unavoidable if it appears that the other vehicle tried to pass through a space too narrow, when actually the space was made too narrow by the weaving of our driver.

Forcing off of road—Usually due to the leading driver forcing the other driver to the left of the center line—into viaduct

columns, parked vehicles, adjacent traffic, or off the roadway. Drivers should not get into a position where they may be forced into trouble, nor should they swerve so as to force others into trouble.

Accidents in pulling away from the curb—It is the responsibility of our driver to enter the flow of traffic safely.

Collisions with vehicles from opposite directions—Includes both head-on and sideswipe collisions when our driver was not on proper side of roadway.

Pedestrian accidents—All types of pedestrian accidents, including collisions with children and with persons coming from between parked cars. This can be avoided by always expecting or anticipating that some one will step from an obscure place.

Non-collision and collision with fixed objects—Includes overturning in roadway, running off roadway, and collision with culvert, traffic signal, parked vehicle, or other object.

Accidents due to poor visibility—Darkness, fog, rain, snow, sleet and glare. The burden of responsibility is placed on the driver to operate his vehicle within the limits of his ability to see ahead, stop and maneuver safely.

Accidents due to faulty brakes—It is the driver's responsibility to report faulty brakes. It is also the driver's responsibility to drive within the limits of the mechanical condition of the vehicle. This classification includes accidents caused by trucks rolling away from parked position, due to failure to block the vehicle, to set hand brake, air lead, etc., properly. (Includes failure to scotch vehicle parked on steep grade.)

Mechanical failure—When the investigation of a "mechanical failure" accident shows that the mechanical failure which caused the accident was due to rough and abusive handling on the part of the driver, the resulting accident should be charged against the driver. We should not permit nor require our driver to operate mechanically defective equipment.

Skidding Accidents—In which our vehicle skids.

WHAT TO DO IN CASE OF ACCIDENT

1. Set out flares or flags if vehicle cannot be removed from pavement.

2. Render first-aid to the injured if you are qualified.

   a. Telephone for a doctor. (Have someone else do this while you stay with the injured.)

   b. Telephone for an ambulance if needed. Notify the state police, asking them for assistance.

   c. Describe the location and tell briefly what they may expect to find.

3. Direct someone or yourself to act as flagman to handle traffic.

4. See that all precautions are taken against fire or further destruction and injury, by prohibiting unsafe practices.

5. Fill out Driver's Report of Equipment Accident, form S-9.

6. Report the accident to your immediate supervisor as soon as possible.

What Not to Do

1. Do not accept responsibility or blame for the accident either at the scene or later. Remember that such admissions may be used against you in court.

2. Do not discuss the accident with anyone except the police, your superiors or our insurance company representative.

3. Do not give a signed statement or a court reporter's statement to any person other than representatives of the Highway Department or our insurance company.

LEGISLATION AS IT AFFECTS PUBLIC EMPLOYEE SAFETY PROGRAMS

by H. P. "PAT" GOODIN
safety director, city of Minneapolis, Minn.

According to the United States Department of Labor, Maryland is the only state that has adopted legislation specifically aimed at the public employee safety problems.

Francis Otto said that this was the main reason that we do not have a report from his committee. It only proves that all public employee programs that have been successful have only been so because we have had outstanding men that have adapted the regular laws of the states to accomplishing the wonderful job that has been done in this field. This is I believe one of the reasons that we do not have more Public Employee programs than we have. There seems to be a reluctance on the part of some public administrators to assume their liability regarding protecting their employees. It appears that most laws covering workers and working conditions leave public employees as second class citizens.

We have a law on our books in Minnesota, 182.05 Minnesota Statutes, which reads "Manufacture and sale of unguarded machinery prohibited. When practicable the points of danger in any machine shall be securely guarded by the maker, and the manufacture or sale of any machine or mechanism not so guarded is hereby prohibited."

We had a request from the Industrial Commission, which has the responsibility of administrating this law that the law be changed to cover machines or mechanisms leased to producers in the state. There are many machines that are leased and kept maintained by manufacturers outside the state and the wording of the law seemed to exempt them from so guarding.

This amendment to the law almost was lost, the argument being that a farmer loaning his tractor or other farm equipment would be liable if he loaned unprotected machines to his neighbors, this in spite of the fact that the law only applied to industry. We finally got the bill through but we found out that this type of legislation is difficult to explain to those who don't want to be convinced.

In our state we have taken this up with the League of Minnesota Municipalities and we did get a small booklet out covering Public Employee safety and the responsibility of government in realizing that its employees are as necessary as any group of employees in any industry. It is beginning to pay off but there must be considerable more push behind this movement if we are to take care of our public employees.

GOVERNMENT'S RESPONSIBILITY

We must write into our laws language that will bring our public employee under the law by reference rather than by the present method of implication. What success we will have will depend to a great extent on what we as a public employee group do toward taking care of our people.

In 1951 we started a safety program in our city. We used the state laws as if they were written to cover our people and succeeded in getting some recognition from the city council with whom we deal in our city. Of course being a member of the state legislature helped in getting them to listen to what we had to offer. They helped us get authorization to try and cut the costs of lost time as a result of accidents which for the year 1950, was $200,000.00, disregarding other costs which go along with losses of this kind.

We started a safety glass program along the lines set up by industry starting in our equipment department. This was similar to a large maintenance shop in which we had been having an average of, loss of vision in one eye, every year for quite a while back. We had the council authorize the payment of half the cost of corrective glasses or the full cost of planos in safety glasses.

Shortly after we had a few fitted there was an accident in which a piece of steel struck one of the employees in the center of one glass. Had it not been for the fact he wore safety glasses, he would have lost an eye.

I kept this pair of glasses as a horrible example and succeeded in getting most of our employees either plano or fitted safety glasses and they wore them. We went into a period of economy and in 1954 we had a little difficulty getting enough on our budget to cover replacement or issuance of new glasses until it was pointed out that the horrible example I had been using had saved about $3,000.00 to the city. We have been getting our budget since that time and we have enlarged our program by having the council pass our budget allowing additional departments, where hazards exist, come under the program.

USED AS EXAMPLE

This had the effect of being accepted as legislation recognizing the responsibility of the Public subdivision complying with the state law covering employee safety. This has broadened out to include hard hats, and other protective equipment required by industry under the law.

Where do we go from here? This is a question we as Public employee safety men have to answer. I believe that we must reactivate the legislative committee. We must have one of our people who is active in safety activities chair the committee. We should have Otto or someone from the department serve as an advisor to this committee. We must assemble all data possible from Public laws covering Industrial and labor safety with the idea in mind of assembling a set of laws that will serve as a model for Public Employees.

This will take some time. Someone from the Department of Labor in Washington on the committee will have to help get the information from states with safety laws and regulations. Let's get away from the idea that state and other public officials have regarding these laws—that they apply to everyone else except our employees.

Let's get back of a movement to draft legislation for Public Employee Safety that will accomplish what we want, take our people out of the category of second class citizens and give them legislative protection equal to that provided for labor and industry. Let's make this the year that the Public Employee assumes his place as a valuable employee and gets the benefits and privileges granted other employees and the protection of a set of proposed laws we can all be proud of.

Report of Traffic Accidents with City Vehicles for Six Months of 1957

	1951	1952	1953	1954	1955	1956	6 Mo. 1957
Total Accidents	195	153	127	106	133	101	45
Frequency	34.2	273.8	226.5	196.5	182.2	174.0	164
Chargeable Accidents ..	83	69	51	40	50	33	12
Frequency	150.6	125.5	91.2	74.2	68.2	56.8	35.3

Frequency rate is per million man hours which on motor vehicles is about ten million miles.

Total accidents means all accidents involving city vehicles.

Chargeable accidents means those in which our operators were at fault. There may be some contributing negligence on the part of our operators in some of the others which hasn't been determined.

Of the 12 chargeable accidents the first six months of this year:

5 were caused by our operators not having control of their vehicles and running into the rear of either parked or moving vehicles.

4 were caused by our operators backing into other vehicles or stationary objects.

1 was caused by our operator misjudging the operation of his snow plow and striking another vehicle.

1 was caused by our operator turning from the wrong lane and squeezing other vehicle.

1 was caused by defective equipment.

All except one accident were caused by *the operator not having proper control of* his equipment. Here is where defensive driving comes in. You are the representative of the city when you meet the public with your equipment. Maybe some of the non-chargeable accidents could have been avoided if we just gave a little. These are the people who pay the taxes that your wages come out of, so it's up to you to bend over backward a little to see that they get a break. Even though they may have the right of way, you can't give the right of way, you only take it; so be a bit generous and let the other fellow take it. DON'T try to take it on your own.

Backing up is again causing some accidents and you who have helpers use them. *If you haven't be extra sure your rear is* clear before you back. Look back—keep looking—then back.

Only one wrong lane accident, but there were several near misses. Get in the lane you should be in and stay there. Get in the right lane to turn from at least a block before you turn, then signal and turn properly. Keep on the right side of the street and stay on the right side of the motoring public.

The next six months will determine what we can do. Practice safe driving on the job and you will play safe at home. Safe driving is happy driving.

Accident Report for All City Services Except Park for the First Half of 1957, and Comparable Data on Previous Years

	1953		1954		1955		1956		½ 1957	
Eng. Dept.	Fre.	Sev.	Fre.	Sev.	Fre.	Sev.	Fre.	Sev.	Fre.	Sev.
Water	25.24	235	16.32	195	27.18	248	28.21	405	21.46	243
Equip.	28.76	112	23.96	183	22.52	375	34.00	296	36.67	189
Paving	44.26	621	48.42	762	54.42	409	81.03	436	56.68	353
Street	37.24	378	39.98	231	45.12	228	41.04	852	70.00	530
Eng. Ser.	34.14	336	4.72	33	0.00	000	16.47	49	6.66	27
Sanitation	47.71	206	38.24	596	69.68	805	74.08	17796	55.50	255
Sewer	84.86	636	123.45	1053	81.02	729	68.56	345	24.92	281
Traffic	16.84	146	20.00	400	41.58	1032	16.47	49	22.21	239
Bridge	43.47	87	33.32	167	94.00	1042	46.52	40682	55.00	1462
TOTAL	37.18	456	33.60	357	38.58	402	45.21	3878	39.53	384
Board of Education	10.43	111	9.36	123	9.67	994	8.51	62	13.50	67
Pub. Wel.	*13.77*	*89*	*8.94*	*58*	*11.92*	*185*	*8.23*	*47*	*9.13*	*31*
Fire	21.84	242	21.22	3895	17.68	3741	21.19	219	21.21	7295
Police	33.18	624	18.86	183	26.24	658	26.41	658	33.22	284
All other					4.85	16	2.77	34	1.52	22
ALL CITY	20.64	235	17.75	578	18.21	416	17.78	854	21.72	82

Fre. means frequency, accidents per million man hours.
Sev. means severity, days lost per million man hours.
L.T.A. means lost time accidents.

The committee activities in the Water Department seem to be *paying off. The average* frequency from 1951 through 1956 was *27.41*; the first six months of 1957 it was 21.46, and after a bad Spring, not much snow and with slippery conditions. This shows about $10,000 less for lost time as a result of injury as well as the relief of *pain and hardship that goes along with dis*ability to an employee.

The Equipment Department had quite a few L.T.A., but they were of a minor nature. However, they could have been serious. Most of these were in the first quarter. Maybe a Safe Practice Committee here would bring some results, Eh?

As usual paving has been having several L.T.A., and mostly from careless handling. A little instruction and help from you older fellows could do a lot to help. Maybe a safety meeting among foremen might help.

Sanitation has had too many accidents, mostly in collection. Here again a little help from you older fellows would help.

Sewer Department has been doing real well, but there is always room for improvement, so let's keep trying and cut the L.T.A. out altogether.

Bridge Department had a couple of bad ones and a couple of minor ones. In that work any minor accident could have been bad. It looks like there is some improvement. Let's hope the final report will show it.

You fellows using jack hammers and breakers on concrete—better wear your goggles or safety glasses. Many of you have been neglecting to protect your eyes in this kind of work. Cover one eye and try to work and you will see how necessary it is to have both. You foremen must enforce the rule that all men exposed to chipping and breaking shall wear protective equipment. This means safety glasses, hard hats, or whatever is needed.

Let's put more safe thinking in our work. Report all unsafe conditions right now. Call me if I can help at any time. Let's make all our people safety minded at home and on the job. The City needs you—so does your family.▲

STATISTICAL COMMITTEE REPORT

by WARREN D. WILT
safety engineer, city of Detroit, Mich.

The year 1956-57 has seen much progress in Public Employee Accident control work. This opinion is based on the number of governmental agencies sending statistics to my office.

Not many years ago we crusaded to have governmental agencies make records of all employee on-the-job accidents. Many, in fact a large per cent of the agencies contacted had no records or concealed records of employee on-the-job accidents.

It was common practice to include time-lost due to accidental injury in "sick leave" making it difficult to distinguish if the time lost was due to natural sickness or accidental injury. At the time we encouraged keeping accident records, we made suggestions of methods of recording and analysis of these records according to the American Standards *216.1.*

At first many agencies thought this impractical as it would mean major changes in existing procedures and involve considerable cost. Today, many of these same agencies are doing a fine job of accident reporting along the A.S.A. methods. Smaller agencies, as well as the so-called larger ones have seen the value of full time safety personnel.

FREQUENCIES DROPPED

It was common to receive reports of accident frequency of 60, 70 or 80. Today it runs 16, 18 or 20. Several report frequency below 10. This shows real progress.

No attempt has been made by the statistical committee to tabulate and publish a summary of Public Employee Accident figures. The National Safety Council is doing this in its "Accident Rates." Our industry is large enough to be included in the N.S.C. "Accident Facts." The main reason for not being in this publication is that not enough agencies are reporting to be representative of the Public Employment which is necessary for a publication such as "Accident Facts."

The statistical committee has several recommendations to make:

1. All accident statistics submitted to the

committee be properly identified. The only identification on several of the reports received this last year was the return address in the upper left hand corner of the envelope.

2. That annual summaries of the calendar year accident experience be forwarded to the National Safety Council's Statistical division as soon as possible after the close of the year. This report must be made on the N.S.C. report form, on your own summary form. These forms can be secured, free of charge, from the N.S.C. headquarters.
3. All agencies to report their Vehicle Accidents according to the N.S.C. standards. No comparisons can be made if each agency has a standard of their own for reporting.
4. That the National Safety Council be requested to record and report Municipal Government Vehicle accident statistics on a total city basis. The large variety of work, and the difficulty in securing a fine break-down of mileage for each class of operation now being used by the Council, make it impractical to compare like statistics of different municipalities.

ENGINEERING COMMITTEE REPORT

by DWIGHT C. CROFFORD
state safety director, Idaho dept. of highways, Boise, Idaho

The year 1957 has been a year of foundation laying for the Engineering committee. We learn by trying, and sometimes we learn not to try the same thing again.

During 1957, part of the Engineering committee worked up a brochure which it was felt would adequately represent the section in the hands of interested friends. This brochure was forwarded to the chairman of the section and from there to the National Safety Council where it was worked over for five months, and as yet no proofs have come to the committee for recommendations or approval.

Also during the year an effort was made to gather information about the emergency signing used by state, county, municipal and school levels throughout the nation. The response was spotty, there being those who would divert this attempt to gain a semblance of uniformity. However we were able to come up with a few conclusions in the response received. Time did not permit the development of specific recommendations.

After due [illegible] correspondence with representatives of the N.S.C. it was discovered that NSC furnishes little in the way of helps or materials for the section. The section is responsible for the composition and compilation of all approvals given

devices and placement of signs can and should be worked out. In actual interviews with violators in our state, there was confusion due to lack of uniform action between us and our next door neighbors. Recall that we have referred to minimums, leaving the door wide open to those who want additional warnings.

The apparel, equipment and procedures of the flagman are other sources for study and uniformity.

In this realm, we can accomplish some real good for the safety and protection of our charges, the unsung heroes of the highways. If there are any accomplishments made, our section will have to do the work from start to end.

There is much work to be done, and we are the only ones who will do it. We urge you to cooperate with the new Engineering committee in doing something constructive for our people and their welfare.

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where'er we go
Regardless of amounts,
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—*Humble Pipe Line Company, Houston, Texas*

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CURRENT SAFETY TOPICS

Volume 8

GREEN CROSS FOR SAFETY®

ELECTRICAL EQUIPMENT and PUBLIC UTILITIES INDUSTRIES

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE PUBLIC UTILITIES SECTION
THE ELECTRICAL EQUIPMENT SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Electrical Equipment Section and the Public Utilities Section. The conduct of these Congress sessions each year is only one of the many cooperative activities, which the Electrical Equipment Section and the Public Utilities Section carry on in behalf of their members, and for the benefit of accident prevention work in the electrical equipment and public utilities industries generally. These sections give guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of electrical equipment and public utilities companies.

The activities of these sections are under the direction of their executive committees, the members of which are listed at the close of this volume.

ELECTRICAL EQUIPMENT SECTION

IS "HOT" ELECTRICAL WORK NECESSARY?

by W. F. LIPPINCOTT

electrical maintenance engineer, Chambers Works,
E. I. DuPont De Nemours and Co., Inc., Penns Grove, N. J.

At the Chambers Works "hot work" is, "work in which energized parts of wires, bus installations, switches, starters or panels, must or could be contacted by hand, body, tools, or equipment while a potential of 50 volts or more is present."

The definition itself is simple, but the successful, practical application is difficult. Too often, people who work on "hot" circuits over the years fail to recognize when they might get into a hazardous position, for example, in a crowded pull box. To work in a pull box, it is frequently necessary to rearrange a jungle of wires to get to the circuit involved. The definition of "hot work" applies here when *all* circuits in the box must be shut down. Field experience is required by both supervision and employees to determine when the definition should apply.

Electricians often feel that some energized work is unavoidable in their jobs. Eliminating "hot work" takes the "bravado" out of humdrum day-to-day work. The man doing "hot work" feels it sets him apart from the ordinary mechanic. Too often he resists a change in his accepted way of doing maintenance. However, facts prove that "hot work" is dangerous even for the most experienced craftsman.

ELECTRICAL SAFETY RECORD LAGS BEHIND

It is a generally accepted impression that the electric utilities have a good safety performance. However, their accident frequency rate for 1954 through 1956 was 7.69 injuries per million exposure hours, contrasted with the chemical industries' record of 3.57, and Du Pont's safety performance of 0.39.

Naturally, not all electric utility accidents were due to "hot work" but a greater proportion of their work is done without de-energizing circuits, and this undoubtedly contributes to their greater accident frequency. In fact the Edison Electric Institute had 122 fatal accidents in 1955 from the utility group. Electrical shock and burn caused 95 of these deaths.

The Du Pont Co's. safety and fire protection division indicate that in the past 26 years, out of 21 electrical fatalities, 15 were the direct result of "hot work". Thirteen of the 15 fatalities occurred among qualified electricians.

Can we be complacent if 62 per cent of the fatalities from electricity were among men supposedly trained and experienced? How is it possible to justify the continuation of "hot work" knowing that even the most earnest efforts will probably only delay the next injury?

A review of the past 14 years indicates that during the first seven years (1943 through 1949), the Chambers Works had 14.7 per cent of the electrical injuries in the Du Pont Company.

"NO HOT WORK"

An accident on the Chambers Works in 1948 resulted from using full potential to test an exposed, oil-immersed starter. A short circuit caused burns that hospitalized an employee for several months. To eliminate such accidents, management established the policy of "*No Hot Work*" and told the line organization to develop a program for adhering to it. All electrical work and methods were reviewed.

Finally, it was concluded that proper planning could permit all necessary work with circuits de-energized, so that no production loss would result. The "No Hot Work" rule was adopted and the practicability of the program has been confirmed. The corrective action, both by its direct and psycho-

logical implications, has been unprecedented in reducing electrical injuries on the Chambers Works.

Since the "No Hot Work" program began in 1950, no serious injury has been caused by electricity. However, this year a fatality did occur when a mechanic disregarded regulations and violated his foreman's specific instructions by working on an open starter without pulling the switch.

Chambers Works is the largest Du Pont Company plant and employs more than 125 electricians including nine linemen and nine elevator mechanics. The facilities include miles of 11,000, 2,300, 550, and 110-volt outside electric lines, eight primary transformer banks, 35 secondary banks, and 100 lighting transformers. These facilities service 552 buildings, having a total demand of 25,000 kilowatts.

AN OVER-ALL PLAN

Normally, production areas demand continuity of electric service and are reluctant to accept shutdowns. Electrical maintenance groups also avoid outages. To eliminate "hot work" both groups must be convinced that planned shutdowns can be arranged without production schedules. The change from working on energized electric circuits can not be made quickly. There must be an "acceptance" of the new way by all levels of supervision in both operating and maintenance groups and the path must be carefully prepared.

On the Chambers Works, the approach to the goal of "no hot work" can be divided into four categories:

1. Management
2. Program
3. Equipment
4. Education

MANAGEMENT

Plant management must desire safe performance above all else and actively sponsor the basic policy of "No Hot Work". Operating supervision must understand that anything can be shut down; that production can be scheduled to make up for these interruptions. Maintenance departments must be convinced by management not to risk "hot work" and to arrange their plans accordingly.

Further, all activities and services must be co-ordinated to adhere to this basic policy. The engineering department must design facilities to work circuits de-energized without frequent and extensive shutdowns. Plant power divisions must carry out planned shutdowns smoothly.

Management must provide needed electrical equipment and replace hazardous installations. They should prepare a defense against the criticisms of short-range production losses.

PROGRAM

Management must delegate responsibility for the program to direct supervision, and supervision should understand that a "No Hot Work" policy does not mean simply shutting down each time electrical repairs are made. The program involves dovetailing electrical repairs to coincide with planned production outages, and maintenance work should embrace all parts of the circuit involved. Such planning can avoid shut-downs for electrical work alone. Only those who know day to day electrical problems can develop a workable "No Hot Work" program.

Line organization reviewed each part of the electrical activities with the following results:

1. Certain shortcomings in the accepted voltage tester were found. Improvements were made for a positive, safe means of determining the presence of potential. Rules governing when and how this device should be used were outlined. These improvements would have prevented several accidents in the past.

RUBBER GLOVES, FUSES, LOCK-OUTS

2. Methods for the use, care and testing of rubber gloves were developed, which included a monthly glove test in accordance with A.S.T.M. methods. The program is still in effect since rubber gloves must be used for potential testing and fuse pulling. The regular test serves as a psychological aspect of our overall safety program and as a regular reminder to use gloves the few times they are required.

3. Ways to remove and replace fuses were included so the electrician would understand how each type of fuse was to be handled.

4. The nature of an electrician's work on

electrical equipment prohibits normally accepted locking-out procedures. Regulations for "blocking-out" electrical circuits were worked out with the safety department. This system assigns two personal "blocking-out" tags to each electrician. These are used in addition to his lock when he is actively working on the circuit. An "Out-Of-Service" tag is used to designate the condition of the circuit to other electricians.

5. Frequent errors have occurred when 2300-volt disconnects were operated. The most prevalent error was opening them under load. The proper technique for opening 2300-volt disconnects was established and each man doing this work was given training. The procedures were clearly written to avoid misunderstanding.

6. In the past we had experience with fuses exploding. Investigation and field tests found that the ability of the fuse to interrupt a short circuit was being exceeded. The field tests included new devices not used on the Chambers works and they opened the test circuit successfully. These improved types are now used and have proved their value in service.

7. An interim procedure "Electrical Work on Circuits" was formulated. This procedure defined the authority of each supervisor for regulating work on circuits according to the type of work and voltage involved.

8. The final step was to write a simple rule for work on electrical circuits—"No "Hot Work."

These eight items were put into effect as they were developed. Each measure became part of the day-to-day working habits of the electrician and each in his turn conditioned him so that there was minimum resistance to the final logical step of establishing the "No Hot Work" policy.

EQUIPMENT

Expenditures were required to rearrange outside electric lines to reduce the area of shutdowns when circuits were de-energized. These facilities enabled maintaining primary transformer banks without extensive outages. A gradual replacement of hazardous obsolete equipment inside buildings was made and is still in progress.

The man on the job needs certain equipment. Some items are basic, others help "sell" him on the program. Chambers Works electricians are provided potential testers, rubber gloves and blankets, "Blocking-Out tags and locks, ohmmeters, "Out-Of-Service" tags, clamp ammeters, and "Meggers". The equipment needed in other plants may vary according to their special requirements.

EDUCATION

Although the electrical phase has been left until last, it is probably the most important. The man on the job is the key figure in the success of any safety educational program. Since the electrician may resist changes in carrying out his job, he must be "sold" on the program. He was shown the "why," and in general worked in full compliance with the policy. His respect for the hazard was developed and a discussion of what can happen has been the subject of continuous review.

In addition, electrical supervisors responsible for carrying out the program were made to recognize hazards in "hot work". They learned the reason for the policy and helped develop every phase of the procedure. They learned how to plan, and shutdowns were held to a minimum, with all possible work done while the section was de-energized.

Under certain rare circumstances there may be a greater risk to de-energize equipment than to do the work "hot." On these occasions the work is reviewed by members of supervision (as set up in the procedure "Electrical Work on Circuits") so that proper safeguards will be established.

Supervision responsible for production and maintenance established a sound working relationship. Since the operating supervision had to adjust their thinking to the new policy, they were kept fully informed as the program took shape.

IS "HOT" ELECTRICAL WORK NECESSARY?

Chambers Works electricians have emphasized that the "No Hot Work" rule is one of the greatest improvements in work methods they ever experienced. The comprehensive coverage given the subject and the improvements in equipment and replacement of facilities, have brought a feeling of cooperative effort to make it fully effective.

Based on previous experience, the Chambers Works believes that "hot work" carries too high a price. Management has stated

that after seven years of the "No Hot Work" program, there was no notable loss in production and schedules had been maintained. In fact, Chambers Works has had less forced outages now that maintenance work is done during scheduled shutdowns.

As these results are history, we feel safe in answering our subject question. It is practical and profitable to maintain the electrical facilities on a large chemical plant without exposing personnel to energized circuits.▲

THE HAZARDS OF RADIO TRANSMITTERS AND THEIR CORRECTION

by READ H. CARD

methods engineer, Long Lines Dept., American Telephone & Telegraph co., New York city

When we think of the hazards of radio transmitters, our first thought is the danger of electric shock. The transmitter contains many bare conductors, bare terminals, bare parts of all kinds. There are many chances of shock from contact with, or arcing from, those conductors and parts that are energized with d-c or power frequency a-c. There are chances of shock from condenser discharge. There are also chances of burns due to contact with or arcing from conductors or parts that are energized at radio frequencies.

Radio transmitters are dangerous if not adequately safeguarded, because of the high voltages required for plate supply. Low voltage can be dangerous too when there are chances of low resistance contact with conductor and ground, or when one grasps a conductor and cannot release it because of muscular contractions caused by the shock.

One reason radio transmitters are hazardous is because they must be entered for adjustment and testing while power is on.

Some people think that as long as work is done by experienced personnel, aware of the hazards and careful to avoid them, there is no danger. But experience with radio transmitters as well as other electric equipment does not bear this out. Experienced as well as inexperienced men suffer electric shock all too frequently.

A relatively new hazard is radiation from microwave transmitters, such as radar and over-the-horizon (tropospheric-scatter) transmitters. This radiation in harmful quantities may be present at the open end of a waveguide, or in or near the beam of a parabolic reflector antenna.

Serious injury or death can result from exposure to this radiation. The distance from the antenna at which these effects are experienced depends on the transmitter power but, within the beam, it may be measured in thousands of feet.

Other hazards of radio frequency energy include the ignition of flammable liquids and the detonation of explosive materials, especially dynamite caps. Flammable liquids may be ignited by sparks such as at the openings of gasoline tanks. Dynamite caps can explode by energy picked up by leads arranged by chance in such a configuration as to stimulate a dipole with the cap at the center.

As an example, a recent test indicated that a dynamite cap at the center of a half-wave length dipole would explode in a 20 milliwatt per cm² field at 900 mc. The Institute of Makers of Explosives has published safety practices for using explosives in the vicinity of radio transmitters.

Besides electric shock and radiation hazards, there are many mechanical hazards. Prominent among these are burns from hot tubes and cuts from fan blades. Sometimes doors hinged from the top are not adequately protected against falling. In a transmitter designed for safety all such hazards are reduced to a minimum.

THE EFFECTS OF ELECTRIC SHOCK

The effects of electric shock on the human body must be understood to protect against electric shock hazards. The degree of hazard for different values of current and voltage and for different frequencies must be considered in determining the extent of protective measures employed.

Shock reaction varies greatly among individuals and the effects are sometimes complicated or not well known. Consequently, the values and effects discussed here should be regarded only as generally indicative of actual conditions.

At power frequencies we begin to feel currents in the range from about 0.3 to a few milliamperes. Currents just above this threshold of perception offer a degree of hazard, not because of direct effects, but because they might cause a man to draw back quickly and lose one's balance or strike some object.

The second level is the let-go current, the value beyond which one cannot release a conductor he is grasping. At power frequencies, this is around 10 to 20 milliamperes for men, for women, somewhat less.

Most people can stand currents in this range for a short time without serious effects. However, with currents above 25 milliamperes, the victim "freezes" to the circuit and severe muscular reactions make breathing difficult if not impossible. Death from asphyxiation may result if the circuit is not broken in a few minutes.

VENTRICULAR FIBRILLATION

The third level is an important current that can cause ventricular fibrillation. At values around 100 milliamperes to two or three amperes of power frequency current through the chest, the heart loses its rhythmic cadence and begins a quivering, uncontrolled motion that provides no pumping action. The minimum duration of shock causing fibrillation varies from a few seconds at 100 milliamperes to a few hundredths of a second at the higher currents.

The heart rarely recovers spontaneously from fibrillation. The normal beat can be restored by applying counter-shock: deliberate application of sufficient current to stop all heart action while the current is flowing.

This is a practicable procedure in the operating room where fibrillation often results from surgical shock. Much thought and research is being devoted to develop practical means of employing de-fibrillation in locations such as power and radio stations. But such means are not yet available. Therefore, once a radio operator suffers shock from currents in the fibrillation range, he usually cannot be saved.

LOW VOLTAGE IS DANGEROUS

With power frequency currents in excess of about six amperes, paralysis of nerve centers sets in stopping breathing and heart action. If artificial respiration is started promptly and continued until the nerve centers recover sufficiently to take over their normal functions, the victim may be saved, depending on other injuries such as hemorrhages or severe burning.

Volts of 120 at normal power frequencies can be dangerous causing asphyxiation or ventricular fibrillation. Normally the hand to foot resistance of the human body as measured with low voltages may be as low as about 1500 ohms. The corresponding current is 80 milliamperes.

A little moisture on the skin, as from perspiration, and a "no-let-go" grip on a conductor could cause a possible fibrillation fatality. Even with dry skin, if the victim freezes to a 120 volt conductor and no one is present to break the circuit, he could die from asphyxiation. With wet hands and feet, the resistance of the body may be as low as 600 ohms. The current then becomes 200 milliamperes and the chances of fibrillation are correspondingly increased.

Now, how do these effects vary with frequency? First let us consider d-c. For currents in the milliampere range, the tolerable d-c current is about four or five times as great as the corresponding rms a-c current. This applies to perception, let-go and the longer-duration low-value fibrillation currents.

SHOCKS VARY WITH CURRENTS

For shock durations of a fraction of a second, with currents of one ampere or more, the fibrillation threshold approaches the a-c crest value. For burns or internal damage from heat, the effects of d-c would be about the same as those of rms a-c.

Increasing frequency above the power frequency range increases the current one can

tolerate. For frequencies above 10 kc, currents of several amperes produce no muscle or nerve stimulation, only heat. Higher currents may cause severe injury or death from burns.

In dealing with high power microwave transmitters, an understanding of the effects of radiation on the human body is helpful to minimize hazards.

The harmful effects are due to internal heating of the body. There is no evidence of ionizing radiation, such as X-rays or gamma rays, from such exposures.

Damage may be done by localized exposure of the eyes and other parts of the body that are not efficiently temperature regulated by blood flow. Possible harmful effects include cataracts and damage to the gastro-intestinal and genito-urinary tracts.

Tests have indicated the threshold of field strength producing cataracts in the eyes of rabbits is around 100 milliwattts per cm² for an exposure of four hours to 12 cm waves. Similar figures for human eyes are not available but it is believed they have the same magnitude.

DEATH FROM RADIATION

Exposure of the entire body to radiation may result in injury or death from increasing bodily temperature. Ely and Goldman exposed animals to 10 cm (3,000 mc) waves. Their data indicate that, for dogs, the field strength corresponding to an increase in temperature of one degree C is around 20 to 30 milliwatts per cm². A further increase of five or 10 milliwatts resulted in several degrees additional increase in temperature and death to some animals.

Barron et al examined personnel experiencing incidental exposure to radiation from radar transmitters for varying intervals during the day for a six to nine month period. Field strengths ranged from four to 13 milliwatts per cm². Changes in the blood composition were noted but the significance is not known. No other effects were traceable to these exposures.

Many papers on radiation effects have been published. These three possibly establish, in order of magnitude, the upper and lower values between which the thresholds of this hazard may lie.

Considering only the formation of cataracts from localized single exposures, the magnitude of the threshold is 100 milliwatts per cm². But for exposure of the entire body, the danger level may be a small fraction of this figure.

Until further and more definite data on radiation effects are available, prudence dictates allowing liberal safety precautions in guarding against this hazard. It is proper in determining these safety factors to consider first, the lack of information on the pathological effects of the different field strengths and second, the possible inaccuracies in field strength measurements or estimates.

CORRECTION OF HAZARDS

Successful safety engineering of a radio transmitter is best accomplished by incorporating safety from the ground up as the transmitter is designed. To design without safety in mind and then backtrack and attempt to incorporate safety is wasteful in time and materials and may be ineffective.

For example, a transmitter designed for safety is arranged so that all necessary adjustments and voltage tests can be made without entering compartments containing conductors or parts energized at high voltages. Sometimes provision for reducing voltage energization is made for parts tested with power on.

For assembling cabinets, separate units in a high-power transmitter, such as transformers, rectifiers, power amplifiers, and throughout all transmitters in the same station, the same protective arrangements should be followed so far as practicable. Such uniformity engenders safety since operating forces can't confuse which cabinet has which type of protection.

SAFEGUARDS FOR EQUIPMENT

The most effective protection for a transmitter, except for lower power transmitters or low-power stages of large transmitters is a system of interlocks, supplemented by devices that automatically ground high voltage wiring when compartment doors are open.

In a well-supervised transmitter station the key-interlock is one of the most reliable systems of protection. Here's how it works: Before entering a compartment, the compartment door must be unlocked with a key from a lock on the power service switch supplying power to the compartment. Before this key is released from the switch lock, the switch must be opened. If the door is open, the key is seized in the compartment lock and cannot be obtained to close the power switch.

If more than one compartment is opened at the same time, there may be a key transfer box arranged so that inserting the power service switch key in this box releases several compartment keys. The transfer box seizes the power service switch key until all compartment keys are returned to this box. There are many variations of the key-interlock to perform more complicated functions.

A key-interlock can provide reliable protection if no master or spare keys are available and keys within or between systems in the same region are not duplicated.

DOOR-SWITCH INTERLOCK

Here's how the widely used door-switch interlock works: When a protected door to a compartment is opened, a switch in turn de-energizes power circuits controlled by the switch. In some cases all power circuits in the compartment may be de-energized; in other cases only the higher voltage circuits.

Assurance that the power circuits controlled by a door-switch interlock are off when a compartment is entered is qualified because a door switch can be easily violated. Also, this arrangement may be unreliable because it depends on the integrity of an electrical circuit and usually on the release of relays and contactors.

The door-switch interlock is often a secondary protection scheme to supplement a key-interlock system. This is good to protect against failure of the latter.

The door-switch interlock also may be used as the primary system of protection but its weaknesses must be recognized and guarded against. The door switch should open the primary power supply without the intervention of a contactor or circuit breaker unless the door movement is prevented by a locking device energized and actuated only after the contactor or circuit breaker is open.

As a supplementary measure to either the key or door-switch interlock, the automatic grounding system is widely used. An automatic grounding system is a mechanical arrangement to ground high voltage circuits within a compartment when the door is opened. In some instances all three systems, the key-interlock, door-switch interlock and automatic grounding system, are used in the same transmitter.

An interesting and effective mechanical interlock system employed in transmitters operated by the British Post Office was described by Wase and Sellwood. Here a flexible shaft interconnects power switch, grounding switch and door locks.

It is not unusual to find a transmitter with arrangements to turn off higher voltage circuits, but with no protection against lower voltage circuits. Men often lower their guard when working in an interlock protected transmitter. They develop a false sense of security engendered by the idea the power is off. Shock from contact with lower voltage circuits still energized may result unless these circuits are adequately guarded.

The well-designed transmitter has control circuits and fan circuits that are not de-energized by interlocks protected from contact by position, tape or plastic barriers.

OTHER PROTECTIONS

Some of the more important safeguards in addition to those already discussed are:

1. *Compartment sides or panels* not protected by a primary interlock system are often welded or bolted from the inside so they cannot be removed without obtaining access to the compartment through a protected door.

2. *Short-circuiting shunts* should be used to discharge high voltage capacitors, the shunts connected automatically when the compartment doors open. In addition, where feasible, permanently connected leakage resistors should be provided across such capacitors.

3. *Grounding sticks* should be provided at prominent safe locations inside compartment doors to make certain that high voltage parts are de-energized before working in compartments containing such parts.

4. Any protection system should be so designed that it will "fail safe." For instance, the electrical circuit of a door switch interlock should be arranged so that if the devices lose power the system will still be safe.

5. *Door switch circuits* should be simple, avoiding cascading of relays especially. Any relays required should be located or protected so they cannot inadvertently be operated by hand or other means while the compartment door is open.

6. *Wire-glass panels* in the compartment doors or walls enhance safety since they permit observation of meters, tubes and trouble conditions such as overheating and broken wires, without opening the compartments.

LOWER POWER TRANSMITTERS

Lower power transmitter or low power stages of high power transmitters can have optimum safety, with minimum effect on maintenance and service reliability by concentrating on positioning, insulating and guarding energized parts to minimize the chances of inadvertent contact. These measures often give better protection than door-switch interlocks alone, which are likely to be violated and the protection lost.

The use of one-half inch mesh rigid plastic screens to cover the energized parts is suggested. Sheet plastic with holes drilled in it is useful for guarding terminal strips and single equipment units. Such screens prevent inadvertent contact with the fingers yet permit insertion of insulated probes or tools for tests or adjustments. Any bare parts that cannot be protected in this manner should be insulated or provided with separate guards.

Adequate external controls and test points, permanently connected meters, effective warning signs, grounding sticks, and safe types of testing probes should be provided.

These measures should be supplemented by interlocks and grounding switches with certain voltages. Sometimes the main power switch is placed so that it is close by the person working on the exposed side of the transmitter. In other cases it may be placed out of view but arranged to lock in the open position, the key kept by the workman.

Antenna lead-ins, current meters, and other parts that might present a hazard from high frequency burning should be placed or guarded so that they cannot inadvertently be contacted or approached too closely by personnel.

It is also desirable to ground, directly or through static leaks, nearby fencing, guys, and wires that might be raised to hazardous potentials by induction. Also antennas and lead-ins that are out of service should be grounded to prevent burns due to high-frequency induction from nearby live antennas.

Arrangements should be provided for locking out and grounding high voltage antennas and associated equipment when being used.

When the antenna switch is opened the antenna is grounded with an operating stick. A warning sign is then locked in place over the switch blades to prevent closing the switch. The key to the lock is carried by the person performing the work.

Antennas and lead-ins should be placed and constructed according to the requirements of the National Electrical Safety Code or such local regulations as may be in force. In particular, crossing antennas and lead-ins with power lines, streets and railroads should be avoided except as permitted by the code.

To minimize the radiation hazard from the antennas at one over-the-horizon station, each antenna is surrounded by an eight foot fence of wire-mesh topped with barbed wire. The gate to each fence has a key-interlock so the gate must remain closed if the transmitter supplying that antenna is operating.

The fence prevents climbing the feedhorn tower and consequent exposure to the main beam. It also prevents recurring exposure of operating personnel to spill-over radiation in the area surrounding the antenna. Beyond the fence in front of the antennas the field strengths are within the safe range to heights well over a man's head. Swampy wasteland extends in the direction of the beam to such a distance that structures that might extend above the safe zone are not to be expected.

The most effective safety device is a careful, well-trained, safety-minded man. Station personnel must think and practice safety, not on occasion, but constantly. To achieve proper safety attitudes requires continual training, ever-present safety reminders, and management's day-by-day demonstration that it is sincerely interested in safety.

Only the very best in physical safeguards and the very best in safety performance by personnel will eliminate accidents.▲

CONTROL OF HEALTH HAZARDS OF ELECTRICAL INSULATING MATERIALS

by E. G. MEITER

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Electrical insulation is a design factor of great importance and engineering significance. It is absolutely essential to every electrical device and is the keystone to reliability of electrical equipment. Experience has shown that most failures in electrical devices are the result of insulation breakdown, caused by heat, oils, aging or the presence of voids, and by contributing mechanical fatigue of the insulation by scraping, bending or vibrational forces in rotating devices, such as motors and generators.

Resins of material or synthetic origin are the most widely used materials for electrical insulating purposes. The early insulating materials consisted of natural occurring film-forming gums dissolved in suitable solvents. These resins are relatively non-toxic and, therefore, introduced little or no health hazards into the electrical industry.

The material occurring resins, however, had insulation properties which left much to be desired. Consequently, there was a constant search for new and improved insulating materials. About 50 years ago, Dr. L. H. Baekeland announced a phenol-formaldihyde synthetic resin. This was the first synthetic resin used for insulating purposes and is still widely used.

SYNTHETIC RESINS

During the past 20 years, a variety of additional synthetic resins have been developed, which are used for insulating purposes, as well as many other purposes. The more important ones are: vinyl, polyester, polyethylene, fluorethane, silicone and epoxy. These resin materials are now available in a great variety of formulations, depending on the properties desired.

The published information available on the toxicology of plastics ranges from meager to quite complete. Adding to the meager side of the ledger is the fact that the plastics industry is progressive and its research chemists are constantly developing new formulations utilizing many chemicals for which the toxicity is not known.

Since there are several hundred plastic formulations and the health hazard information is incomplete, this paper will cover the health hazards of the electrical industry in fairly general terms. The materials discussed serve mainly as illustrations and it is not intended that only those mentioned require special handling. Likewise, it should be understood that those not mentioned should not necessarily be considered non-toxic.

Judging from published information, the health hazards resulting from the plastics as commonly used for insulating purposes are not of an extreme nature. They can be controlled, in most instances, by the ordinary environmental personal and mechanical protection methods used in industry today.

The principal problems encountered appear to be dermatitis and sensitization dermatitis.

It is the writer's experience that more difficulty is being experienced at present with dermatitis from the use of epoxy resins than any others, consequently, this group of resins will be discussed first.

Among the resins used for electrical applications, the epoxies, a relatively new type of plastic are showing great promise. These resins are being used for the encapulation of electrical components as potting compounds, adhesives, laminating coatings for cloth, and as surface coatings for metals and electrical equipment.

These resins are usually supplied in the form of two reactive components, the resin itself and the "hardener" or curing agent. Mixtures of these two are capable of transformation at room temperature or moderately elevated temperatures into solid infusible substances. In practice the resin is mixed with the hardener immediately before use and then applied to the desired point.

The potential health hazard from epoxy resins is direct skin contact which may cause skin irritation and contact with the vapor may cause irritation of the eyes, nose and throat. The uncured resin can cause skin sensitization in a small number of those individuals who come in contact with it, and dermatitis in others if the exposure is great enough.

The hardeners, which generally are amines, are irritating to the skin and the vapors are irritating to the eyes, nose and throat. They are both primary and sensitizing skin irritants. Everyone coming in contact with them will develop a skin reaction if the exposure is severe enough.

TYPES OF IRRITANT

Because these resins are both primary irritants and sensitizers, it may be desirable to define these terms at this point. A "primary irritant" causes dermatitis by direct action on the skin at the site of contact, if permitted to act in sufficient intensity and quantity for a sufficient time. Examples of skin irritants are strong acids and alkalies.

A "sensitizer," on the other hand, does not cause demonstrable skin changes on first contact but it may affect the skin so that after five to seven days or more further contact will cause dermatitis. Examples are poison ivy, formaldehyde and certain synthetic resins. Primary skin irritants may also sensitize persons exposed to them so that they may develop dermatitis from low concentration which would not have affected them before sensitization.

The matter of skin sensitizations by an epoxy resin is well illustrated by a dermatitis case that recently came to my attention. An employee applying the catalyzed resin broke out with a typical epoxy resin dermatitis. He admitted that he had been careless and contaminated his skin. In short, he had sensitized himself. He was treated by a doctor and returned to work. The superintendent of the plant was well aware of the dermatitis hazard due to epoxy resins and placed the man on another job away from further exposure.

His condition improved daily until he was nearly cured. The employee then became dissatisfied and wanted his old job back. The superintendent, against his own better judgment then gave in and returned the man to his original job. The story is short. He worked just one day and that very night his dermatitis broke out again. It now not only reacted on his hands, but spread, running up his forearms. The moral is obvious. Once one becomes sensitized to the amine catalyst he must stay away from further exposure until completely cured and then double his precautions thereafter.

PREVENTIVE MEASURES

Some bad practices which may cause or aggravate cases of dermatitis are: wiping contaminations from the skin with dirty rags impregnated with solvent and resin; wiping perspiration from the face and neck in hot weather with contaminated hands or rags; failure to wash hands before touching other parts of the body. Therefore, it is important to adopt preventive measures as outlined below.

Supervision

Close supervision is essential to make certain that the employees follow the necessary safety precautions. It is not enough to say we have provided the necessary control facilities, and let it go at that.

The individual worker should be trained by an experienced person to use these resins and hardeners and taught that traces of resin on work tables, floors, chairs, machines, door handles, pencils, clothes and shoes may be the source of skin inflammations.

Avoidance of Skin Contact

Direct skin contact especially should be avoided. The most positive means of preventing skin contact is through the process of mechanization. Mixing the components and pouring the uncured resin can be mechanized to the point where skin contact is minimized. In cases where manual handling is necessary, impervious gloves and/or barrier creams, aprons and sleeves should be worn.

Before work commences, paper or other disposal covering should be placed over all work surfaces to catch resin drippings. These disposal coverings should be placed in suitable containers as soon as the work is completed for the day. Contaminated rags should be handled with gloves.

Tools should also be cleaned. The solvents most effective for epoxy resin removal

are usually flammable, and should be stored in safety cans. It is important to avoid skin contact with these solvents as well as the resin.

Local Exhaust Ventilation

In general ventilation is secondary to the need of preventing direct skin contact of the skin with the resin, hardener or solvent. However, local exhaust ventilation should be provided wherever volatile components are present during weighing, mixing, pouring, and curing operations. The need for ventilation depends somewhat upon the type of hardener used, and its volatility. Some curing operations may not require local exhaust ventilation, provided they are performed in a large work area which has good general ventilation.

Washing Up

Solvents should rarely be used for removing resin stains from the skin. If in certain instances it is absolutely necessary, the solvent should be fresh, and not contaminated with resin. Thorough washing with soap and water at frequent intervals should be stressed. Several hand-cleaning compounds specially designed for epoxy resin removal are now on the market and should be of help in washing up and thereby avoiding the use of solvents.

Medical Treatment

If dermatitis does occur, a doctor's care is advised. The sources of a dermatologist is usually the most effective.

POLYESTER RESINS

The term *polyester* covers a wide range of materials that have one thing in common, the copolymerization agent employed. For electrical insulation monomeric styrene is sometimes used. This is commonly polymerized with organic peroxides.

Normally the polyester portion of this thermo-setting resin is not much of a problem. However, the styrene portion presents both a potential dermatitis and inhalation hazard.

Gloves and aprons of nonsoluble plastic should be worn where splashes or contact with the styrene monomer are likely to occur.

Both the styrene liquid and its vapor when in sufficient concentration are irritating to the eyes and respiratory tract. Prolonged exposure to high vapor concentration is capable of producing systemic effects.

Under certain conditions, therefore, downdraft ventilation is desirable for the taping operations following the impregnation of the coil with this resin. After the coils have been removed from the impregnating chambers local exhaust ventilation to the outside of the building should be installed for removing the styrene until the coils are cool enough to be stored in a cold chamber, which also needs to be ventilated.

Where catalysts, such as, methyl, ethyl ketone peroxide and benzoyl peroxide are used, skin contact must be avoided because those materials are also skin irritants. Due to the fact that these catalysts are active oxidizing agents they must be stored and handled with extreme caution to avoid fires and explosions.

Another word of caution—in no case should accelerators, such as, cobalt, naphthenate be mixed directly with the organic peroxides, since such mixtures may decompose violently.

PHENOL-FORMALDEHYDE RESIN

Although some of the polyester formulations are not considered classical dermatitis producers, we find that a potential hazard exists when employees remove the cured resin from the skin with a solvent such as acetone. As a preventative, it has been found helpful in many cases to provide a water soluble barrier cream for application before starting work. Since the cream is water soluble, the need for the solvent is nil and a potential secondary dermatitis hazard is eliminated.

Phenol and formaldehyde combine in the presence of a catalytic agent to produce phenolic resins. This resin is a non-conductor of electricity and widely used for electrical insulation purposes. It is available in both solid and liquid form.

The constituents of this resin either in liquid or powder form are loosely combined until the resin has been cured by heat into an insoluble state. The parent constituents of the resins phenol and formaldehyde, are capable of producing skin and respiratory irritation.

These resins give off more formaldehyde when heat is applied. In a poorly ventilated

area these fumes may have an irritating effect on the mucous, membrane and eyes.

Formaldehyde often acts as a sensitizer causing dermatitis after repeated exposures to the uncured resin or its vapor. As used in these resins it ordinarily does not cause systemic effects.

PREVENTIVE MEASURES

1. Suitable measuring containers, scoops, etc., should be provided so that the resins are handled without skin contact.
2. Where formaldehyde fumes are strong, suitable hoods and exhaust fans should be installed.
3. Workers who handle uncured resins should wash exposed skin surfaces frequently. The keynote of dermatitis prevention is personal cleanliness. Contaminated clothing should be removed immediately, and cleaned before using again.
4. Workers should be required to report skin rash so that they can be referred to a physician familiar with this type of condition for prompt treatment.

TETRAFLUOROETHYLENE RESIN

Because of the unique combinations of electrical, thermal, and mechanical properties, tetrafluorethylene resin (DuPont trade name Teflon) is used extensively by the electrical industry, particularly in insulation for use at high frequencies and high temperatures.

Teflon does not produce skin irritation. Dust, such as may arise from unheated molding powder is also innocuous. However, when Teflon is heated above 400° F small quantities of toxic compounds are given off. Consequently, adequate ventilation must be provided on operations where such temperatures are maintained. Cigarettes or tobacco should not be carried into areas where they could become contaminated with Teflon, because the polymer decomposes during smoking and the fumes would be inhaled.

Polyethylene Resins

High electrical resistivity and good dielectric characteristics, particularly at high frequencies, have made polyethylene an important material in electrical insulation; as far as I am able to determine these resins are inert physiologically.

Vinyl Resins

One of the initial uses of vinyl chloride resin was for electrical insulation. As a wire insulation it combines excellent electrical properties with fire resistance, abrasion resistance and ease of installation. The unplasticized material is free from any essential toxic hazard.

Silicone Resins

Silicones have good electrical properties which are maintained at elevated temperatures. Silicone rubber meets the requirement for extruded insulation and insulation tape, both supported and unsupported. Silicone resins used in combination with inorganic materials, such as, glass, mica, and asbestos provide operation of electrical equipment at high temperatures. Other uses in the electrical industry include dipping and impregnating varnishes and cloth-coating varnishes.

The silicones as a group have a low order of toxicity. They are essentially non-volatile and are physiologically inert and present no hazards.

Gases as Insulating Materials

The more important gases used for insulation against high voltages are the freons, sulfer-hexafluoride, and the fully fluorenated compounds, such as, octafluoropropane. They are reported to be non-flammable and non-toxic.

PUBLIC UTILITIES SECTION

REDUCING MOTOR VEHICLE ACCIDENTS IN PUBLIC UTILITIES THROUGH DRIVER CONTROL

by D. A. WEAVER

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At a National Safety Congress it is natural to expect new ideas and approaches. Yet the fundamental principles of increasing management control of driver performance have been taught for years. You all practice them. None of us operate without some measure of management control exerted over the actions of our drivers. We are concerned then, in this topic, not with new but with old ideas: we are concerned with re-evaluation and more sharply defined efforts along old and proven paths.

I shall isolate five basic fundamentals which make up management control of driver performance. I shall be concerned not with asking you to do something different, but rather with asking you to do the same things better. Have we in this past year improved our application of these basic ideas? Unless each year sees improvement in our use of these basic controls, we are not working at the driver aspect of our safety program.

Admittedly, our use of these five controls is imperfect. Driver control means that we deal with human factors—the greatest cause of all types of accidents, vehicle accidents and otherwise. We deal with factors as variable and unpredictable as human nature itself.

CONTROL DRIVER SELECTION

Despite this fact, the basic controls of these human factors are definite and tangible even though imperfect. Let's not be confused with the imperfections, but rather let's grasp that driver control does consist of definite and tangible pathways. Let us make each year yield a measurable improvement in the use of those pathways.

We all have some way of choosing drivers. Papers, speeches, and printed materials have been thrown at us on this subject. Rather than new knowledge, ask yourself a question: "Have I improved my techniques of choosing drivers in this past year?" Unless you have worked at sharply defined improvements, a specific and tangible tool of accident prevention has been ignored.

Has intelligent use been made of biographical data on the applicant? Are your physical exams based on standards and the use of physicians who know your need? Do your procedures permit the handiest man to operate your power equipment rather than those specifically authorized? Is driving competence evaluated in your service people who drive incidental to another job?

The topic of driver selection has distinctive features in Public Utility companies. In the first place, most public utilities have a low turnover rate, a helpful factor in any safety effort—if it is utilized. Second, you hire for a variety of jobs in which operating a vehicle is incidental to other work.

COMBINE DRIVING SKILL TO JOB

Your task is to incorporate driving competence into the job descriptions, job requirements, hiring procedures, and promotion practices of your company. And you have a third feature in a variety of power equipment—cranes, trenchers, trimmers, excavators, diggers, bull dozers and cats. Choosing operators for this equipment is a training task not a selection task.

In my contacts with public utilities, the opinion was unanimous that these jobs did not require extraordinary mental, or personality, or physical traits. Rather, you needed a man with proper driver qualifications and then give him experience and training on the specialized equipment he is to operate.

Choosing operators of specialized equipment is thus more a function of training.

So we have glanced at a pathway, a control, the control we call driver selection. My point is not new knowledge. My point is that we should recognize selection as a tangible and definite control, and our safety efforts each year should include sharply defined efforts to use that control more effectively. Unless we consciously assign ourself this task, we are ignoring one facet of our accident prevention program.

DRIVER TRAINING

We can glance at a second control of driver performance—training. This idea is old and deeply imbedded in our mind. Of all the tools of accident prevention, training is the least used and last undertaken. This is a pity for training can often yield dramatic reductions in accident frequency. I point to the U. S. Post Office department. Here is an operation of thousands of vehicles operating all over the nation.

Civil service procedures precluded any revolution in personnel or procedures. In a huge bureaucracy, fundamental safety controls could only be applied slowly. But training could be applied immediately. Their training program was not high powered; training was done by those persons most readily available, few with any background experience. But that training cut accidents in half and slashed accident repair costs by three-quarters.

Training holds a standard of performance before your driver's eyes, a standard which he is challenged to reach. Any man does better if he clearly knows what is expected of him. Training gives knowledge; it improves skills; it changes attitudes—but more important our people respond to an awareness that management is putting time and effort on safety instead of just finding new ways to scream, "My Goodness, be careful."

CUT OUT BACKING UP

Why don't we train more? Is it time, money, lack of competent supervisors, lack of skill? Yes, it is all of these, but the primary failure is intellectual. In the huge mass of things that can be taught, we fail to identify in our mind those one, two, or a dozen things that can actually be done in the present circumstances.

When was the last time you sharply defined an item of training and put the burden of training on your supervisors? You can't tell your supervisors to train all their men to drive, but you can tell them to teach their men to position their vehicles so that they never back up except when absolutely unavoidable. Perhaps as much as three-quarters of all backing is unnecessary. Cut down unnecessary backing and you cut out a lot of backing accidents.

If we ask for a training budget, or time on the clock for training, most of us will get little support for training from management. But we don't have to ask for money, at least not as a first step. We can start doing a better job of training without first getting approval of a budget. My favorite example is the brief and potent bit of training that can be done with a brake detonator. You can do a job of teaching and demonstrating in 20 minutes with 20 men, though it deserves more time. All safety men know of this device and know how quickly and interestingly it teaches facts of braking distance, speed control, and following distance. I've never met a safety man who wasn't impressed with the teaching quickly conveyed by a detonator, but I so seldom meet a safety man who took the time to use it on his drivers.

Yes, we can do a better job of training even in present circumstances—both training the new man and continued in-service training. The primary failure is intellectual—that we fail to define short and specific training projects to convey a specific training item—that we fail to seek a method, a medium, an opportunity to present it.

IMPROVE RECORDS

A third control is our record system. Each year conscious efforts should be made to get better data and get better guidance from it. Personnel records and accident records identify sore spots and give insight into cause and cure. In addition, those of us who can keep the same driver on the same piece of equipment can make tremendous use of vehicle records. In this case, the vehicle record can be pinpointed in driver responsibility and reveal wherein a specific driver needs certain specific training.

Records can be very simple or quite elaborate but each year should see conscious effort to use them better. We all have some means of keeping personnel facts and we all have some means of keeping accident information, and some of us have vehicle records that can be used in the driver control program. Perhaps we can improve the accuracy of our records?

GATHER, STUDY DATA

Do bangs and dents appear on vehicles—and even minor accidents—and no one knows who did it? In a large operation perhaps the problem is to gather the data, or to assemble it for summary and analysis. Or perhaps we can improve by studying our records and not permitting the collection of facts to become an end in itself. For example, a hasty glance at records in one large company revealed a driver with seventeen accidents in one year.

Records even in large operations are frequently misused, in that the facts of each accident are considered apart from the whole picture. Any one accident should produce a review of all aspects of our control program. Records can thus give us the means of constant re-evaluation of all the controls, methods, and procedures of our accident prevention program.

So far we have spoken of three old familiar ideas—selection, training, and records. These fundamentals are specific and tangible, even though imperfect. New ideas develop slowly and are applied even more slowly. Our work in safety consists in truth of constant improvement in these old and basic ideas.

MOTIVATION IDEAS

A fourth control is our use of motivation techniques. These are the teams, contests, posters, awards, bulletins, letters, prizes and numerous other gimmicks and techniques that have proven so effective. Do your motivation techniques need renewed imagination? Are they effectively administered? Is their cost consistent with the results you gain? Are they conducted with leadership with a true response of challenge, competition, better effort, and higher morale?

Are they regarded by your drivers as rewards of merit or rewards of luck? Are you stuck with an ineffective "give away" program that you have neither improved or abolished? Are your motivation techniques a mere collection of gimmicks, tricks of the trade, or have you reviewed in your mind a more sound philosophy of human nature and human motivation which is more deserving of desirable response from our drivers?

Motivation techniques are the oldest tool of accident prevention, but the need for conscious effort at improved use remains a constant challenge.

The fifth control is the whole area of improved management and supervision. This means all those things that enable us to do the other four things I have been speaking of. It is based on the cliche of our business that safety is an expression of good management. It is otherwise expressed that safety is not added on to company operations but is an integral part of company operation, or that safety is a by-product of correct operation, or bluntly, that you can't have safety in a sloppy operation.

IMPROVE MANAGEMENT

Anything that improves safety improves management and, vice versa, anything that improves management improves safety. That's why every study shows that effective safety efforts prove to be merely a part of efficient, "cost-conscious management. Improved management and supervision open an unending vista—job descriptions, safety analysis, job requirements, human relations, company organization, industrial relations policy—these and numerous other aspects of management are part of safety.

We find that safety, especially control of human factors, requires an alert eye on almost every aspect of the business. We must have an alert eye for policies or practices that are actually unfair, or are regarded by the men as unfair. We must spot supervisory practices that cause conflict or poor human relations.

UNLIMITED SAFETY FACTORS

Company policies and procedures relating to labor affairs, to discipline, wage administration programs, vacations, promotions—an almost unlimited list of factors which can lower efficiency anywhere in the organization come under consideration by the safety director.

Thus we see that control of driver performance is made up of basic and old ideas, that new applications and constant improvement must be the aim of the man dedicated

to safety. These fundamentals are things almost as tangible as checking and repairing a leaky valve or a set of brakes.

We at Purdue, in cooperation with the National Committee for Motor Fleet Supervisor Training, offer a five day short course based on these five fundamentals. The course is available at approximately 30 universities around the country. Improved driver control results from conscious effort to improve your methods and procedures in using these tools.

345 KV. HOT LINE MAINTENANCE

by W. P. CARTER
superintendent of transmission, Appalachian Electric Power co., Bluefield, W. Va.

In this country we have had to meet the obligation of ever increasing power demands by resorting to higher transmission voltages. Associated with the higher voltages is a greater demand to keep the transmission lines continuously energized if we hope to maintain a high standard of service. Since it is obviously necessary to perform work on these high-voltage lines from time to time because of damage that may be incurred by windstorm, lightning and other hazards, it is necessary as a part of maintenance work that these lines should not be de-energized to perform such maintenance work.

While hot line maintenance is not new, the problems associated with it are not so well standardized that we can apply the practices that are common at lower voltages to the higher transmission voltages. This involves not only electrical hazards but mechanical as well. Each time we adopt a voltage higher than that which has previously been maintained by hot line practices, we must proceed with caution, since mistakes or lack of recognition of the hazards may have fatal consequences.

CONSIDERED LIMITATIONS

In 1947 during construction and field testing of experimental lines, we, together with our associated companies, began considering the limitations of working the contemplated 345,000 volt lines and stations with wood-stick insulated tools. There are still many who feel that work of this nature is too hazardous for routine maintenance.

But we believe that we have not only developed methods feasible for routine work but that this work is probably less hazardous than is sometimes practiced at considerably lower voltages. Of course, extreme care is mandatory but by recognizing the hazards and with adequate equipment, hot line maintenance work at 345,000 volts is as commonplace with us as is the use of rubber gloves for distribution voltages.

Tools and equipment used for somewhat lower transmission voltages were not adaptable for working transmission line conductors of 1.75 inch diameter, weighing approximately 2.1 pounds per foot and requiring the added lengths to provide enough insulation to assure absolute safety to workmen when working on 345,000 volt lines. Longer and stronger sticks were necessary.

STICKS PROVIDE INSULATION

Twelve feet is now the minimum length for these tool sticks and workmen keep their hands within four feet from the end, allowing eight feet of stick between themselves and the metal tool. Sticks of this length become unwieldy and require skill to manipulate them; all the while the workmen must remain at a safe distance from the conductors while standing on steel frame structures 100 feet or more above the ground.

When replacing insulators, sticks are used both to provide insulation and to carry the load of whatever they are applied to. For this purpose lift and jack sticks have to be longer and of greater mechanical strength. Two lift sticks are used for holding the conductors on tangent towers and one jack stick on dead-ends to take the line tension. Lift sticks are designed for a breaking load of 6,500 lbs. each and the jack sticks for 16,500 lbs. each.

The electrical hazards are not difficult to surmount as long as these hazards are recognized. Obviously it is necessary for workmen to remain a safe distance away from the energized lines. We know that these voltages will flash over distances in air equivalent to about one inch for each 10,000 volts; thus the voltage will flash over a distance of nearly three feet between conductors.

POSSIBLE HAZARD OF LIGHTNING

Since the nominal voltage to ground is about 200 Kv., it will flash over about 20 inches to ground. To these distances must be added a safety factor because of switching surges and lightning which are much higher than the normal operating voltage.

We do not attempt hot line maintenance work in inclement weather; but if a sudden electrical storm catches you on the job protection may be required from fairly high voltages. If lightning strikes a line even though it may be some distance away from the work area, and causes a circuit breaker to operate, it is possible to get two to three times the normal line voltage, which could be a million volts phase to phase or about 600,000 volts to ground.

Hot sticks are normally rated 75,000 volts per foot as a top safe limit so that if a switching surge should occur having a voltage of more than 2½ times normal, the hot sticks would be stressed to the maximum limit of their rating. Switching surges rarely reach this magnitude, but we must be prepared for the worst.

An added precaution against the possibility of overvoltages occurring due to breaker operation while work is in progress consists of having these circuit breakers changed to manual control for reclosing.

If a line should drop out while work is in progress, there would be a five-minute delay for which a hold card is placed on the control switch before the line is re-energized. This provides enough time so that workmen can be in the clear before the line is re-energized.

Another hazard which is not so commonly recognized but which may be of equal importance is the fact that at the higher voltages the space between conductors and towers becomes charged with electricity. If a workman should be within this field, and adequate precautions are not taken, he could, by coming into contact with the tower, receive an electric shock that could so startle him that he might be in danger of falling.

This could happen if a man were standing on a dry wooden ladder which was suspended from a crossarm when he ascended the ladder and touched the tower. This hazard is eliminated by the use of aluminum ladders and by having workmen equipped with shoes having conductive soles.

The combination of the metal ladder and conductive soled shoes eliminates the static charge from the workman's body so that he feels no effect from the charged electric field. Thus, the use of metal ladders is mandatory at the higher voltages whereas a few years ago at lower voltages, their use was prohibited.

PLATFORMS USED

In the performance of replacing defective suspension insulators in a tangent assembly, platforms are a convenient aid for pulling and driving the cotter keys. We, therefore, provide wooden platforms that are attached to the tower at such a point that the workman standing thereon will be within working range of the conductor end of the assembly.

Since in this position a man is in the charged electric field, the platform is equipped with copper braid tacked on to the standing surface and bonded with the hardware of the platform so that it is grounded to the tower. In performing this work conductive soled shoes also are mandatory.

Additional safety precautions must be observed prior to performing 345 Kv. hot-line work. Moisture on hot sticks renders them semi-conducting and therefore no hot-line work can be done in inclement weather.

The weather conditions must be checked not only in the vicinity in which the work is to be done but also in the whole area through which the line extends. A sudden rain or lightning storm could require abandonment of work that is in progress in order to protect the workmen.

In addition to stick work on 345 Kv., we are successfully washing and cleaning insulators on voltages up to and including

345 Kv., with a high pressure water jet. Safety precautions necessary in such operations are as follows and must not be overlooked.

First, the water must be of a high resistance, *sufficient* to avoid electric current leakage into the stream once it is directed against the insulator.

Second, the nozzle and all other necessary equipment such as the pumper, pump truck, ladder truck, tank truck, etc., must be securely grounded at all times.

Third, the nozzle operators must stay and remain a safe distance away from energized equipment.

Fourth, prior to actual washing, a test should be made to determine the resistivity of the water you propose to use. We consider 1200 ohms per cubic inch as a minimum resistance for washing insulators hot.

To double check this test and to be doubly sure there is no current leakage in the stream, taking a bit of additional time, you mount a piece of sheet metal 12 inches x 12 inches at a convenient point on a de-energized bus with a hot clamp arrangement. Then, place the nozzle in a fixed position ungrounded with the stream directed against the plate; then, energize the bus.

The leaking current is measured with a milli-ampere across from the nozzle to ground. If the current in the stream exceeds 3 milli-amperes, we consider the water too low in resistance and unsuitable for washing insulators hot.

THE DEVELOPMENTAL METHOD OF TRAINING FOR SAFE POLE CLIMBING "YOU LEARN BEFORE YOU GO ALOFT"

by LOWELL S. ORTH

area installation supervisor, Southwestern Bell Telephone co., Dallas, Tex.

Some of us believe safe pole climbing equipment has kept better pace than safe pole climbing training technique or safe pole climbing supervision. The pole climbing learner has problems. Men are fearful of learning and fearful while learning. Consequently, learning progress is sometimes slow because of such fears. Their legs do not act right. Some get off the ground before they are prepared. Fatigue, lack of physical development, cause accidents. New men have questions. Gaff cut-out often cannot be accounted for.

The instructor has problems. Men who climb acceptably have had difficulty in safely sharing their skill with others. The trainer finds as many methods being used as there are trainers. Sometimes instructors of pole climbing change methods between men. Others change approaches during the course of training a single man.

We were asking the men to leave the ground before they were prepared to do so. Leg control was uncertain. They were not sure what we wanted them to do, or how they should do it. They would try to climb like the instructor, but it didn't work. Some were fearful. Others fatigued easily, and cut-outs occurred. I became concerned, because the training approaches were getting out of control at times, and responsibility for the safety of the trainees was causing considerable personal concern.

LEARNING TO CLIMB ON GROUND

One of my hobbies was pistol shooting. I knew that a pistol shooter could teach another to hold a pistol, to aim a pistol, to squeeze the trigger properly *without firing a shot;* and when live ammunition was placed in the gun, a creditable job of shooting was done *from the very start.*

If men can learn to shoot creditably *without firing a shot,* why couldn't pole climbing be taught *before* leaving the ground? Why not tell the trainee about climbing before he

starts? Give him the basic detail—permit him to practice. Develop muscle, develop leg control, strengthen the wrists and hands. Loosen the hips. Know exactly what must be done and do it before leaving the ground.

Also, why not permit some over-learning—develop habits through repetition, fortify and discipline the trainee on the ground so pole climbing would be easy when he leaves the ground.

For pistol shooting, we picked up empty milk bottles before matches—sometimes beginning two weeks before shooting. We extended the shooting arm out straight for several minutes. The next day we added water to the bottle. The third day, we added more water, and so on until the bottle was *full of water.* When the heavy target pistols were picked up in matches, they felt light.

Baseball players pick up two and three baseball bats to swing before they go to the plate and then the bat they use seems light.

In keeping with this same idea, leg stroking is carefully and repeatedly done until the trainee moves his legs from *habit.* It becomes difficult to do wrong.

At first, we had difficulty selling the idea of learning to climb poles on the ground. But we have seen an expert swimmer, stomach-down on a kitchen chair perfecting a stroke. Expert golfers get out in the *back yard with cotton balls.* Fighters, boxers—*men who do not fear other men,* spend days with a *punching bag.* Dummies and false lines of stuffing and wood are found on football fields. Flying is taught in the link trainer *on the ground.* It should not seem unusual to anyone if we choose to teach safe pole climbing *on the ground.*

Most new men have difficulty learning where each gaff should go into a pole. Also, a question usually is asked concerning the proper distance or angle between the gaffs or feet. There is a definite target, no matter what size the pole, and the distance or angle between the feet can be forgotten. We explain what and why.

The emphasis is on descent. We do *not* descend in the same manner as we climb. Descent is an altogether different procedure. Men have often experienced gaff cut-out and accidents on taking the first step down. The very first step in descent gives trouble because descent has not been taught. Teach proper descent, and the problem no longer exists. Fail to teach descent, and the trainee is in trouble, when the first step down is taken.

You have seen men *freeze* after climbing. They can't move. Why? They have never been taught to go any direction but up. An extension ladder has often assisted in getting men, who have not been taught descent, back down to the ground. If descent is not taught, leg stroking instead of dropping will be done during descent—leaving an opening for an accident at any time because of lack of leg control and tendency for the gaff to miss the pole completely.

EXPERT SUPERVISION NEEDED

Often unsafe procedure results *in* gaff cut-out—whether or not there is personal injury. When these cut-outs occur, no-one seems to know what happened. Ask the trainee or experienced lineman what happened. He will say "My gaff cut-out." Ask what made it cut-out. He will reply "I don't know." Ask a fellow workman who may have seen the gaff cut-out. He will say "I don't know." Ask instructors or foremen what happened, and the reply will often be "I don't know."

We need foremen, who supervise climbing employees, who know what can and does cause cut-out. We need foremen who can see, in a split second, what can cause cut-out. We need foremen who can spot an unsafe habit in a moment's observation. We should be able to ask what happened and get a real answer. A foreman who is familiar with the necessary detail can tell all about a lineman's basic habit in a very small climbing sample. A few steps up—a few steps down.

Some foremen do a fair job of noticing unsafe procedure, but do not seem to know what to do about it when it is observed. A lineman may not be *at home* on a pole, or moves as if he *is afraid.* Something is wrong about *the* leg stroking. *The whole job is* done questionably and awkwardly. Cut-outs sometime occur. Ask these foremen what they intend to do, or are doing, about the nonstandard procedure. They don't know what to do. Perhaps a poor habit could be corrected in fifteen minutes. Why postpone correction until after the accident occurs?

You can begin as soon as unsafe procedure is noticed.

Approximately 18 hours of training are spread over a five-day week. If schedules are followed, as much can be done in 18 hours as is sometimes accomplished in 40 hours, and more safely. Do not be tempted to cut the recommended schedule short to get men off the ground more rapidly. It takes time to develop what is required to climb poles safely.

Before going aloft, important ideas about *climbing and descent must be understood.* Leg muscles require development. The wrists and hands require development. Leg control must be developed. For these reasons, the approach is called: "the developmental *method* of training for safe pole climbing."

A SUGGESTED TRAINING SCHEDULE

		Hours
First Day (Practice WITHOUT climbers)	1 hr. A.M. 1 hr. P.M.	2
Second and Third Days (Practice on the ground WITH climbers)	1 hr. A.M. 1 hr. P.M.	4
Fourth Day (Climb to five or six Feet)	2 hrs. A.M. 2 hrs. P.M.	4
Fifth Day (GRADUALLY progress to top of 25-30 foot poles)	up to 8 hrs.	8
		18

After the fifth day, most men will be at home on poles and will have acquired the basic conditioning and technique to fortify them against cut-out—permitting them to learn and continue to climb without an accident.

Knowledge of the detail described in the instructor's manual will equip line foremen to observe readily unsafe climbing habits, and to correct them effectively.

Foremen will be equipped to do observing and correcting. The success in these two *abilities makes the approach exceedingly valuable* to men supervising safe pole climbing activity.

The developmental method of training for safe pole climbing is:

Safe—

Gaff cut-out while learning is nearly unheard of. Most training is done on the ground—all within five or six feet of the ground. No fear exists OF LEARNING or fear WHILE LEARNING. The confidence that prevails from the very beginning of training encourages progress. Muscular conditioning and climbing skill is developed BEFORE going aloft.

Efficient—

Now, 18 hours can do what used to be done in 40 hours. Less physical exertion is required when proper technique is used.

Training in Descent—

Men are not only trained to "climb" poles, but are *given adequate instruction as to how* to come down safely.

Anticipates Problems—

Difficulties of men who have never climbed poles before are explained. The ideas and the reasons for operations which give learners the most difficulty are given trainees *in advance of the time they are needed.*

Objective—

The technique makes allowance for the normal physical and emotional differences in men: Often men are observed to climb exactly like the instructor who taught them. The developmental method is objective in *that it is generally impossible to tell WHO* taught them. The basic climbing habit they have learned is not related to the personal and sometimes peculiar climbing habit of the instructor. Each man climbs as he should *climb.*

Scientific—

At first glance, the thought of teaching another to climb poles "without leaving the ground" might not appeal. However, more than 90 per cent of pole climbing training can be given with the learner on the ground, and *the balance with the learner within* five or six feet from the ground.

Whenever physical development and a high degree of physical and mental coordination must be realized, a large per cent of *the training necessary can be most efficiently* accomplished through the aid of "processes" and "apparatus" sometimes remotely related

to the performance of the specific skill sought after. On the ground stroking develops the necessary physical equipment and leg control.

Detailed—

It gives attention to the necessary detail which enables instructors to "spot" unsafe climbing habits in those already climbing poles:

Wrong habits are *those basic climbing* habits that affect efficiency and safety and which should not be allowed to continue.

The effective remedy for unsafe climbing habits readily suggests itself. The approach permits locating with certainty and without delay those few individuals (one in 150 to 200 men) who may be constitutionally fearful of being aloft or have basic difficulty in coordinating movements.

Economical—

The method is economical in both trainee's and instructor's time. What is often accomplished with questionable results in 40 hours is accomplished with more certain results in 18 hours. The time saved is available for other training or for productive work.

The procedure is also economical in timber because of:

1. *No* pole gaffing the first day.
2. Gaffing in only two spots the second and third day.
3. Gaffing up to five feet the fourth day.
4. Minimum gaffing the final day because gaffing is normal.

There is absence of anxiety on the part of the instructor concerning the safety of trainees.

Pole climbing with climbers becomes easy to teach and just as easy to learn.

The simplicity of the development training approach is in marked contrast to the many satisfying results obtainable through its use.

SAFETY IN THE USES OF CYLINDER GASES IN OXY-FUEL GAS WELDING AND CUTTING

by F. C. SAACKE
safety director, Air Reduction co., Inc., New York city

Despite the use of welding and cutting torches involving flammable fuel gases, oxygen, high temperatures and flames, and high pressures, there is no justification for an accident with this equipment.

The characteristics of these materials and processes are well known so these processes can be and are being handled daily with complete freedom from accident or injury. Then why do we have accidents involving these processes? We don't have *many, but the few that occur cause unnecessary* damage yearly and are always capable, as is any fire, of becoming catastrophic in scope.

Do these fires and accidents occur because of a lack of understanding of what constitutes safe practices? Possibly some of them do! But there is a greater probability that the welders and cutters and their *supervisors do not understand their joint* responsibilities for the prevention of accidents.

A man wearing goggles cannot see where his sparks are flying. His whole interest is centered in making a workman-like weld or cut. Protecting the surrounding exposure from fire cannot be solely the welder's responsibility. The supervisor must also know the risks involved and take appropriate *preventive measures* before instructing the welder or cutter to work in an area or before permitting hot work in the area.

Even where the only exposure is possible injury to the operator, the supervisor can *still help. Certainly the welder should* know how to protect himself. But the supervisor still has a partial responsibility!

Whenever conditions differ from the normal, the supervisor should instruct the welder in how to cope with such situations and why they are hazardous. A man will not knowingly weld in or near an explosive atmosphere, or in a room filled with oxygen where a spark may cause his death. But unless the supervisor has specifically trained the welder to recognize these conditions and avoid them, the welder is liable to assume the work area is safe because he was told to weld or cut in that area.

SUPERVISOR MUST HELP

Naturally, the better the workman is trained, the less supervision by his boss is necessary. Unnecessary supervision when the workman knows his job can be resented as readily as it is missed when it is needed. The correct approach must strike a happy medium and is accomplished when the supervisor has recognized his joint responsibility and permits the welder or cutter to operate alone only within the scope of his limitations.

The safe practices needed to guide a welder or cutter and his supervisor past the risks involved in his work are readily available and quite readable. The following list of *organizations publicizing safe practices* for handling compressed gases in welding or cutting is given alphabetically together with some of their publications. The most comprehensive is the ASA Standard Z49.1. However, for oxy-acetylene welders and cutters, the IAA pamphlet will be the most applicable.

*AWS—ASA—Z49.1—"Safety in Electric and Gas Welding and Cutting Operations"

CGA—G1—Acetylene Data Sheet
G4—Oxygen Data Sheet
P1—Safe Handling of Compressed Gases

Equipment Supplier—Recommended Safe Practices in Cutting and Welding (See Airco)

**IAA—"Safe Practices for Installation and Operation of Oxy-Acetylene Welding and Cutting Equipment"

ICC—Interstate Commerce Commission Specification and Regulations—Freight Tariff No. 10

Insurance Company—Safety Data Sheets

City Codes and Ordinances

MCA—SD7—Acetylene

NBFU—#51—"Standards for Installation and Operation of Gas Systems for Welding and Cutting"

NFPA—#51—"Standards for Installation and Operation of Gas Systems for Welding and Cutting"
—#58—"Standards for Storage and Handling of Liquefied Petroleum Gases"
—#566—"Standards for Bulk Oxygen Systems on Consumer Sites."

NSC—#95—Safe Practices Pamphlet on "Compressed Gases"

State Regulations

USAEC—#2—Safety and Fire Protection Bulletin—"Hydrogen"

*American Welding Society Inc.
33 West 39th St.
New York 18, N. Y.

**International Acetylene Assn.
205 East 42nd St.
New York 17, N. Y.

However, these publications are too long for an effective discussion. Instead, I would like to touch briefly on the compressed gas containers into which these gases are packaged, describe briefly the gas properties in which we are most concerned, and explain the reasons behind five recommended safe practices which, in my experience, would prevent the large majority of accidents and injuries caused by improper handling of these materials.

TEST EACH CYLINDER

The cylinders are manufactured under ICC Specifications and given rather complete individual inspection and tests. The high pressure (over 500 psi service pressure) cylinders are of seamless construction; the low pressure (under 500 psi service pressure) are usually of welded construction.

Each individual cylinder is tested to make certain that it is tough, ductile, strong, tight and will act elastically under service pressure filling at temperatures as high as 130°F. In addition, safety devices consisting of relief valves, fusible plugs, frangible discs or combinations of these devices, are used to protect the cylinder from exposure to temperatures above 130°F.

In general, the weakest part of a cylinder is the valve so that it is important to keep the valve protection cap in place when the cylinder is not in use.

I don't believe that people need be reminded that pressure vessels should not become exposed to fires. If they need advice, it should be to the effect that the "safety" relief valves can limit the maximum pressure to which the vessel may be exposed, but that this maximum pressure may be more than the vessel can withstand at excessively high temperatures.

When transferring gas from one cylinder to another, the possibility of overfilling is a constant one. Pressure gauges must be accurate, pressure regulation reliable, and the state of the gas under operating pressures understood.

For instance, gases such as propane or carbon dioxide are partially liquid at charging pressures. However, the vapor space over the liquid should be the result of precise control and not chance. Liquids, even water, expand faster than steel shells when heated—and unless a vapor space is present to permit the liquid to expand freely, the cylinder is likely to rupture if it is filled "liquid full" and subsequently warms up. If the cylinder is filled "liquid full" while chilled, the cylinder may fail before it warms up to room temperature. For these reasons, the industry ordinarily recommends against transfilling by other than charging plants.

PROPERTIES OF GASES

Some of the properties of the compressed gases in which we might become interested are:

Density—Does the gas rise or sink when released in the atmosphere according to whether its molecular weight is lower than, or greater than approximately 29 for air?

Flammable range—Will the gas burn over a wide range of concentrations in air?
Hydrogen 4—75 per cent
Acetylene 2.5—81 per cent
Propane 2.2—9.5 per cent
Heptane 1.2—6.7 per cent
Is the lower limit of flammability (LEL) so low that small leaks can sustain greater volumes of air to ignition and explosion?

Phase—Does the compressed gas liquefy under cylinder pressure so that a vapor space must always be present in the cylinder to avoid the high pressures which will follow when a "liquid" full cylinder is warmed?

Pressure—How high is the pressure in the cylinder and do we have adequate pressure reducing regulators and over pressure valve protection?

Oxidizing—How clean must we keep oxygen metering equipment?

But where should a safety engineer begin in his approach to educating the welders and cutters and their supervisors?

JOINT RESPONSIBILITY

First, I believe both the individuals performing hot work and their supervisors should be taught to recognize a joint responsibility for the protection of the individuals performing the hot work and for the protection of the surrounding property.

Where a man's life or well-being is involved, the workman should be in a position to satisfy himself that the job can be safely performed. Where the building, equipment, or property can be jeopardized, and regardless of the training of the workman doing hot work, the supervisor should feel a special responsibility to see that the workman cannot cause severe damage.

My personal feeling is that the failure to recognize joint responsibilities has permitted so many fires to occur, particularly where construction, repair, maintenance, or demolition operations involving hot work have been performed in areas not customarily exposed to hot work. Not only have the workmen and their immediate supervisors often failed to recognize their joint responsibilities—but too often the management personnel on the premises involved have also failed.

Where an outside contractor is involved, a misguided effort to economize can overemphasize the need for speed with insufficient attention to preventive measures. When this happens with building and maintenance crews, the lack of adequate preventive measures cannot be justified. The excuse that one is covered by insurance collapses under experience rating practices.

Next, in order to discharge their responsibilities properly, I would suggest that a suitable reference source of safe practices be chosen, studied, and followed.

USE SAFETY REFERENCE FORMS

The most comprehensive of the pamphlets listed heretofore is the ASA Standard Z49.1. This should be the supervisor's reference. He may also avail himself of any or all of the other pamphlets listed—but the ASA Standard has been compiled by all interested technical groups.

For the welder or cutter, I would suggest the IAA pamphlet: "Safe Practices for Installation and Operation of Oxy-Acetylene Welding and Cutting Equipment." This covers the best way to handle compressed gases and should be supplemented by whatever recommendations are provided by the supplier of the equipment he is using.

Finally, I would suggest that every effort be made to sell your supervisors on the value of all the safe practices listed. Everyone of them is the result of a past history of accidents or injuries. Sometimes the reasons for the recommended safe practices may not be apparent, but ordinarily they need little explanation. What is most important is having the supervisor start his men off on the right foot and correct them the first time anyone gets out of step.

Since there is not sufficient time to explain the accident experience behind all the recommended safe practices listed in these pamphlets, I would like to take the remaining time available and describe, from my own experience, the results of failure to follow several of the more frequently violated safe practices.

SAFETY VIOLATIONS

These five safe practices, based upon the use of equipment and gases furnished by reputable manufacturers, are believed to be the most frequently violated safe practices and responsible for the major number of accidents, fires, and injuries. Because they are so frequently violated, it should be of equal importance to consider the individual's reasons for these violations.

1. KEEP EQUIPMENT IN GOOD CONDITION AND CLEAN particularly with oxygen where oil is hazardous.

The results of a study of accident reports last year involving compressed gases in welding and cutting where sufficient information was available to justify a conclusion as to the cause indicated that 31 per cent were caused by poor maintenance.

In one case, a check valve element had been removed to permit a slight increase in flow capacity. Two inlet screens had been removed from oxygen regulators after they became clogged, and were not replaced. An oxygen recording gauge was tested with oil. In another case, an oxygen regulator had become oily from careless handling and storage. The final accident in this group was the result of a corroded pipe line caused by burying in cinders.

2. AVOID GAS LEAKS

During this same year, 38 per cent of all accidents reported were traced to gas leaks —usually of the flammable gas. I wonder how many of the welders or cutters in your company operations can be seen with a bottle of soap suds and a brush? Some typical accident reports are reproduced verbatim:

> "Fuse plug leaking at threads. Ignited by cutting sparks. Smothered by glove. Plug showed evidence of damage from blow."
>
> "Arc welding overhead and sparks ignited acetylene leak at regulator connection."
>
> "Operator burning overhead. Sparks ignited leaking acetylene—causing fuse plugs to release. Operator stated after hook-up of regulators and hose, noted odor of acetylene gas. Turned valve all the way out to limit—thinking to force bottom of stem against packing. Operator believed leak to be stopped. Attempted burning operation which resulted in fire."

Do not let your workmen sell you idea that they can see any leak that may ignite while they are present. Consider the following report:

> "A welder was using steel electrodes about six feet away.— (someone) saw flames near the arc welder. He shouted to him and made welder aware of danger. Shop personnel could not put out fire and called fire department. Firemen confined fire to cylinder and let it burn itself out in about half hour."

Besides the risk of property damage from fire due to leakage of fuel gases, there is the additional danger to personnel from leakage of oxygen. Consider the following:

> " . . . a fatal accident occurred aboard the . . . ship while under construction. A pipe fitter, working in a tank on the 4th deck, struck a match, lit a cigarette and threw the burning match to the deck. His clothing was almost instantaneously enveloped in flame." The accident investigation indicated that both the tank and the victim's clothing had become saturated from a hose line that had been inadvertently turned on."
>
> " . . . a fatal accident occurred aboard the . . . ship while installing sprinkler piping . . . when the welder first struck the arc, a flash fire resulted and ignited his hair and then spread to his clothing."

MATERIALS IGNITE RAPIDLY

Most people, because of their familiarity with an oxygen cutting torch, appreciate the rapidity with which combustible materials burn in contact with oxygen. What they may not be familiar with is the rapidity with which materials ignite in oxygen.

When a workman's clothes are soaked with oxygen or when standing in a room with the oxygen content up to 30 to 40 per cent, a spark coming in contact with cotton, wool, denim, corduroy, or even asphalt tile and wood may break into flame immediately and sweep over the entire surface of the clothing in a second.

Prevention starts by preventing high oxygen concentrations in work areas. If welding is to be done in a small compartment, the cylinders and regulator are left outside and the torch kept inside only during the work period. It is preferable to purge and light outside and then bring the lighted torch into the compartment for as long as the welding or cutting is in progress.

3. PURGE OXYGEN AND FUEL GAS LINES BEFORE LIGHTING

About nine per cent of the accident reports in this group were the result of failure to purge gas lines before lighting. Typical accident reports always mention the gas being lit at the time:

> "Operator was lighting up a cutting torch—As he lit the torch, it backfired and set the acetylene hose on fire approximately 12 inches behind the torch."
>
> " . . . Operator was adjusting torch in preparation to start flame cleaning. Torch backfired and attempt was made to relight. A popping noise was heard and fire started burning at the acetylene regulator."
>
> " . . . Started to light cutting attachment with spark lighter and as he used the flint—the torch backfired and ignited the hose."

FLASHBACK CAUSES

These flashbacks occur when the gas lines feeding the mixer have been contaminated. Not only can the two gases being used be found mixed in either line by feedback through the mixer, but air can contaminate the fuel gas line. This condition is quite unusual but operating mistakes do occur. For instance, air will be found in acetylene hoses if the torch valves have been left open over a weekend shut down.

To take care of the occasional failure to keep torch valves closed while not in use, it has become established practice to purge each line for several seconds (or longer depending upon the hose capacity) before lighting. When purging before lighting becomes automatic, the possibility of flashbacks traveling back past the mixer and into the hose and regulators and even the cylinders will be eliminated.

4. OPEN CYLINDER VALVES SLOWLY

Despite the fact that no accidents were reported on this category during the period being summarized, the precaution is being repeated since we cannot afford to forget it.

The sudden application of 1800 to 2400 psi of oxygen to regulators can develop fires if the equipment has not been kept clean, if worn and leaking seats have not been replaced and if the inlet filter screens are damaged or missing.

While our main concern may be fire, we still should not forget that these gases are under high pressure and that the pressures should be applied slowly to the equipment for most reliable operation.

5. KEEP HEAT, FLAME, AND SPARKS AWAY FROM COMBUSTIBLES

Of the accidents summarized, six per cent were caused by doing hot work near combustibles (other than the fuel-gas supply). Nationwide, only one-half of one per cent of all fires were caused by welding and cutting. In 1956, the one-half per cent ac-

counted for 4,300 building fires costing eleven million dollars.

The need to separate combustibles from hot work or to protect by tarpaulins or screens is usually understood but I am afraid what is not understood is who should have anticipated a fire and acted to prevent it.

PERMIT SYSTEMS

Hot work permit systems are in use by all safety-minded organizations to cover areas not ordinarily subject to the hot work proposed and are doing an effective job—particularly where the individual issuing the permits knows fire prevention and extinguishment techniques, applies them in accordance with the risk involved, and maintains the respect of the personnel performing the hot work.

The fire permit must take into account the type of work, its location in the plant or building, the degree of hazard from the surrounding exposure, the adequacy of accessible fire extinguisher equipment and trained firefighters available, and the need for fire watchers after the job.

Wherever the hot work permit system is established, the first major step in the prevention of welding and cutting fires has been taken.

Safe working practices are available covering all possible situations. The problem is to make personnel who are responsible for supervising welding and cutting operations aware of the probabilities of an accident (not just the possibilities) without overemphasizing the hazard involved.

Safety engineers interested in safety in welding and cutting should familiarize themselves with the ASA pamphlet Z49.1. Supervisors also should be familiar with the IAA pamphlet: "Safe Practices for Installation and Operation of Oxy-Acetylene Welding and Cutting Equipment." Welders and cutters should not only be familiar with the IAA pamphlet but should also have studied the recommendations of the manufacturers who have supplied the equipment being used.

Wherever hot work is done in areas in which welding and cutting are not ordinarily performed, the hot work permit system should be followed with particular emphasis on outside contractors.

Finally, accident prevention activities should be based upon training of welders and education of their supervisors not only in the techniques of safe operation but in their joint responsibilities to see that these techniques are followed.

HOW TO SET UP AND MAINTAIN A GAS UTILITY SAFETY PROGRAM

by MARK FLAD

director of safety, Dayton Power & Light Co., Dayton, Ohio

You cannot be concerned with just the mechanics of setting up a safety program. Accidents will develop unless we work at preventing them. We must believe:

- Accidents can be prevented.
- It is good business as well as humane to prevent accidents.
- Accidents are symptoms of something wrong.
- The development of most accidents reflect back to supervisory and executive forces.
- Safety must be an integral part of every job.
- Certain responsibilities must be assumed by executives and supervisory forces before a safety program can really be effective.

Three groups of people who must assume responsibility before any safety program can achieve results: the executive, the supervisor and the employee.

First, the executive must recognize the need and authorize the cost of a safety program. He has to follow up and check results of the program, and actively support the safety program. Lastly, the executive must subscribe to a written safety policy, such as:

a. "There is a safe way to perform every job in the conduct of our business."

b. "There is no job so important or pressing that safety can be by-passed in any way."

He must sign this policy and back it up without exception.

Second, the supervisor must provide adequate tools, equipment and materials for the job, and protective equipment whenever necessary. He should offer adequate training necessary for safe, efficient job operation and give job demonstrations that convince.

In addition, the supervisor must be tolerant, understanding and impartial in dealings with workers. He must be a real salesman of safety.

The role of supervisor is a difficult one. He must sell his program by generous portions of sincerity, accompanied by a good, wholesome sense of humor. He must demonstrate a point so clearly that each employee will completely understand.

For example, have you had difficulty selling your gas workers on the idea that a dead-end must be securely anchored for a leak test before letting the pipe down in the ditch? Here is a simple convincing demonstration:

A short piece of pipe is placed in a vise with a coupling and dead-end on one end; the other end is open. Several men are handed 1-inch square sticks and asked to insert the sticks in the open end of the pipe against the dead-end and push to the pressure of approximately 90 pounds. (A bathroom scale is provided to get the feel of 90 pounds pressure.)

As more sticks of varying length are provided the increased pressure starts to move the dead-end off the coupling. The participants and observers are definitely sold on the extreme pressure of 90 pounds per square inch acting against the dead-end. Figuring the area of the head of the dead-end multiplied by the pounds per square inch applied, now takes on a very practical meaning in the minds of crews.

Here are some additional helpful hints for the supervisor:

He should have first aid training and urge all employees to do the same. His group safety meetings should be short, crisp and interesting. Contacting at least one individual each day about safety is effective and conducting regular inspections and occasionally a surprise inspection by a special committee is most effective.

The supervisor should delegate part of the job to employees, and never hesitate to spend money to eliminate a hazard or unsafe procedure. He should have a safety committee representing executive, supervisory and employee groups, and consider all suggestions and take action.

He must make it easy for employees to report all accidents regardless of how minor the injury, and then he, himself should investigate all accidents and act on the basis of facts to prevent reoccurrence. When the supervisor needs help, he can share the problem with:

a. the boss.
b. fellow supervisors.
c. employees.
d. local safety council.
e. National Safety Council.
f. American Gas Association.
g. any safety man in area—there are no secrets in accident prevention work. Every safety man is eager to give time and apply his knowledge and experience to the problem.

Each employee must be made to feel that he has a personal responsibility for working safely. This is the specific selling job of first line supervision.

Whether you are an executive, supervisor, or safety man, for any gas utility, regardless of size, here is what you personally need in order to set up and maintain a really effective safety program:

- Courage to stand by your convictions and an honest fear of real hazards.
- Tact enough to disagree without being disagreeable and brass enough to command attention.

- Dedication to work constantly toward the objective and humor enough to laugh at yourself when the joke is on you.
- Drive to overcome obstacles and patience to get results before being discouraged.

This is a personal challenge. We know it isn't easy, but we all agree—"It will work."

Water Utility Safety

WHAT'S NEW IN WATER SAFETY—1957?

by RAYMOND J. FAUST

executive assistant secretary, American Water Works Association, Inc., New York city

I am pleased to report the water works industry is rapidly becoming safety conscious. We know this because of the number of letters we receive on the subject; the continued popularity of the "Safety Practice for Water Utilities" manual and the decrease in both the frequency and severity rates for the industry.

Last year I reviewed the safety award plan which the American Water Works Association Committee on Safety Practices developed. In January 1957 the award plan was presented to the Board of Directors of AWWA, and was approved. Since then the committee has implemented the Board's action. For example, section committees on safety were established. To date 22 of the 30 sections have safety committees, and the remaining will establish committees in the near future.

Section safety committees are important because they have direct contact with the management of the local water utilities, and are in a favorable position to "sell" the safety program. In addition, the section safety committee gathers all the statistical evidence to determine the utility section award winners; it promotes and selects program material on safety for the annual section meeting; it also chooses the section candidates for the AWWA Wendell R. La Due Safety Award. Thus the section safety committee is an important cog in the safety program in the water industry. Its activity can make or break the whole program. Fortunately, the section committees are doing a splendid job. Several bold regional safety meetings for utility operators to familiarize them with the rudiments of the program. Work of this character can only produce favorable results.

A special report form for submitting information on utility safety was prepared and sent to all section committees. The form is short, with only seven questions. It is hoped that each section will obtain a good response to the questionnaire, and can select winners.

SECTIONS COMPETE FOR AWARDS

Section awards will be announced and presented at the annual Section banquet. The presentation will be dignified and impressive, and we hope the recipients will have them framed and hung in a prominent position in the utility office. By giving publicity to all awardees, competition should soon develop among the utilities for top honors.

Although it is an honor for a utility to win an award, the big winners are the employee, the utility, and the public. The employee wins because he is well and on the job, earning a full pay check; the utility wins because it has its trained employees on the job doing superior work; the public wins because it is receiving better service from trained personnel.

Everyone wins when the services of trained workers are available for the day, the week, or the year. The answer to good utility operation is quite simple—work safely and have the trained personnel stay on the job—it pays! Water works management is learning this fact, and is starting to do something about it.

One obstruction delaying a safety program adoption in some water utilities is the slow acceptance of safety equipment as a necessary part of utility operation. For example, the simple act of providing safety hats for a water main construction job is resisted in our industry.

ADVERTISING CAN SPEED UP PROGRAM

To overcome precedent in safety in our industry, the committee on safety practices is enlisting the aid of manufacturers who advertise in the Journal of AWWA, as well as trade journals. A review of the present advertisements shows that few, if any, include safety features. For example, a manufacturer of pipe often shows in his advertisements an open trench with pipe being installed. The workmen in the trench laying the pipe are wearing ordinary headgear.

Water works employees not trained in safety see these advertisements but are unaware the picture represents an unsafe practice. However, trained and alert executives and employees notice the omission immediately. If advertisements do not show employee safety features they may inadvertently discredit the manufacturer and his product as not being up-to-date.

The number of advertisements that can show safety features is limited to a small percentage of the total. The majority of advertisements could not normally aid in promoting a safety program. To overcome this deficiency and give all advertisers an equal opportunity to support the program, one manufacturer suggested AWWA provide advertisers with a small cut calling attention to the safety program. This idea has been considered carefully, with the result that the committee is now developing one for manufacturers in their advertisements.

Instead of trying to promote the regular use of these cuts on a monthly basis, it is presently considered advantageous to have the Board of Directors of AWWA establish by declaration, a *Water Works Safety Month* each year, at which time the safety program would be featured. The AWWA Journal would carry papers on safety, while the manufacturers might feature in their advertisements the safety device built into their equipment, and also use the safety cut AWWA would supply to them.

By concentrating our efforts, the safety program could be given added impetus and brought to the attention of the executives of the water utilities. Such a program would have a far-reaching effect.

HOW AND WHERE TO GET STARTED

by V. A. APPLEYARD

chief, Water Operations, Philadelphia Water Department, Philadelphia, Pa.

In 1952—our city started operating under a new charter—which set up water and sewer utilities under one department. The revenue received for these services can only be used to operate our department, and the commissioner operates the department as a self-sufficient unit, that is — revenue must equal expenses. This reorganization started us off on a sound basis. By this time—the department had launched a large rehabilitation and new construction program costing $30,000,000 per year. However, during all this turmoil, employees' safety was ever present in our mind.

The department has four major segments —water operations, 1,140 personnel; sewer operations, 280 men; design and construction, 340 men; and administrative staff, 40 men—a total of about 1,800 people. The function of the safety engineer is in the administrative unit, under the commissioner's office.

With this setup the commissioner created a departmental safety committee of five members with water operations, sewer treatment, sewer maintenance, and the construction branch represented. We were to reorganize the safety and accident prevention program, recommend and standardize practices and procedures, work with National Safety Council to introduce current safety practices and set up safety sub-committees within the department units. We also reviewed all accident and safety reports, developed statistics, and utilized the information to reduce the accident rate.

ACCIDENT SURVEY TAKEN

This committee met regularly—but meetings were spaced too far apart. Most of the members were "line" supervisors, and the "growing pains" we were having left little time to devote to setting up the safety program in the department. The approach to the whole problem was to find out what our record was—particularly in the various operating units. A survey of accident reports reflected the following:

1. Reports not complete
2. Reports very late in processing
3. Not all accidents reported
4. Reports not followed up—no statistics compiled
5. No differentiation between chargeable and non-chargeable accidents.

In other words—we preached "safety"—but that was virtually all. Our conclusion was the need for a full time employee to head the program—so we created a safety engineer job classification then recruiting—examination—and placement.

RECORDS, HANDLING ACCIDENTS

In 1956, the personnel unit made a thorough review of motor vehicle accidents for the previous year—this area needed most immediate attention and these records were the most complete. An action program was developed requiring "accident prone" drivers to take a physical examination (particularly eyes) after two accidents occurred within 12 months. This program has been quite effective. Few people like to be cross-examined or physically examined—it seems to be easier to avoid an accident!!

Since we employed a safety engineer the committee pursued the problem with much more vigor. Records were systematized and showed that the ratio of lost time injuries to no-lost time injuries was grossly out of alignment compared to national figures. Investigations found that the clinics and the doctors were extremely liberal on permitting an injured employee off for a day or two for a very minor injury.

Also, the method of processing an employee on taking care of an injured employee enabled an employee to take time off without the supervisor checking and consequently spending excessive administrative time on the problem.

Those were two areas of getting started —accurate records and expeditious handling of accident cases—but, *that doesn't prevent accidents!* Step three was forming sub-committees in all operating units. A review was made of the safety committees in the three sewage treatment plants. They consisted of three men who make a plant inspection once a month—and reported to the supervisor in charge of all the plants. Our committee felt that similar sub-committees should be set up in water operations. There are six major divisions in the water works:

1. Pumping
2. Distribution
3. Filtration
4. Meters
5. Plant maintenance
6. Service section

"GRASS ROOTS" SUBCOMMITTEES

The safety engineer interviewed these division supervisors, and was received with varying degrees of welcome. The extremes were the prompt appointing of a three man committee to—"It can't be done by my shop." This was resolved when a higher level supervisor met the men and discussed the problem. Management is 100 per cent sold—a basic ingredient to a successful program.

The sub-committees have three skilled workers. The foreman can be a member—but, generally we encourage workmen to keep it at a "grass-roots" level. There are a chairman, vice-chairman and secretary—each serving two months in each capacity. The terms are staggered every two months

—the chairman goes off the committee, a secretary is appointed and the other two members slide up in position. This gives continuity as well as everyone a chance at the coveted position of chairman. With the right guidance they will continue to be safety exponents — preaching the gospel of safety.

Each month an inspection is made of the plants by the sub-committee. They are given a check-off sheet to guide them on points to inspect—plus room for comments. Their report is submitted to the area supervisor and to the safety engineer. They will take part in a safety meeting called by the supervisor—and their recommendations will be discussed. The safety engineer will follow-up these reports with the supervisor. If a policy decision must be made it is referred to the department safety committee. Although this program has just started, it has been well received.

This organization in safety will cost the department about 30 man days/month of non-productive work—.08 per cent of total man days worked. According to the department severity rate for the first three months of this year—we lost 160 man days/month.

So, if the record could be reduced by one-fifth—we certainly could justify this expense —plus accomplish the primary aim to reduce the "pain and suffering" of an employee—no disruptions created at time of accidents —no interrupted work schedules by less man-power and a higher morale of the whole working force. To work the safe way is also one of the most efficient ways—so, the gains are endless.

SAFETY EQUIPMENT USED

Safety equipment was installed in a number of areas—hard hats for ditch gangs, first-aid kits in plants and vehicles, inspections by the fire department and fire fighting equipment, working clothes, plus goggles, face shields and gloves were furnished by the department in various working areas. Traffic cones and barricades were furnished for street gangs, and a number of other safety practices were put into effect. This definitely was an indication that management and some of our men were thinking.

Our committee has asked our safety engineer to write up safety standards,—first a general one for any and all areas—then specific ones for individual divisions. This is a big job and will take time. In the meantime we are using the Council poster service liberally and distribute magazines and bulletins. We have instituted virtually a promotion campaign and use our *Water Department News*— monthly house organ—to publish statistics and other safety news.

Our committee decided to enter the National Safety Council's "Safe Driver Award" campaign, which should reduce and keep our vehicular accidents to a minimum.

To summarize "How and Where to Get Started," the following points must be accented:

1. Top management sold on "SAFETY"
2. Set up a safety committee
3. Appoint or employ a safety engineer
4. Set up accurate records
5. Set up expeditious handling of accident cases
6. Set up safety sub-committees in working organization
7. Plant inspections
8. Promotion compaign
9. Furnish safety equipment
10. Set up campaign and make awards to safe drivers

We have received invaluable help from other water utility safety engineers. This spirit of cooperation among the Water Works will bring our records down to where we can give the other utilities a "run for their money." If cooperation, active participation and application of good "SAFETY" principles is a criteria of success—IT WILL BE DONE!▲

A FIRST LINE SUPERVISOR'S SAFETY PROGRAM

by ALEXANDER C. RENER
district operations engineer, Department of Water and Power, Los Angeles, Calif.

Safety is an interesting subject with many sidelights that defy explanation. We are constantly reminded of safety—when we leave home our wives tell us to be careful on the job—when the children leave for school or play we tell them to be careful. Many organizations develop and maintain safety programs with motion pictures, lectures and posters to remind employees of job hazards. In spite of all these reminders, accidents continue to happen.

The purpose of any safety program is to develop safe thinking among the employees individually and collectively to maintain the accident frequency and severity rates at a low level. Without a safety program every individual acts on his own and safe thinking is a hit-or-miss proposition depending on the individual attitude.

There is no safe thinking by the group as a whole. In contrast to the safe thinking attitude there is the negative attitude toward safety. The fatalistic attitude is the most common—"Be reasonably careful but when your number is up, you'll be hurt." Another dangerous attitude is that "Someone will get hurt but it won't be me." Then, of course, there is the attitude called forgetfulness.

Safety in a water utility is no different than safety in a factory, railroad or a construction project. For an effective safety program, the basic requirements must be fulfilled. A safety program must have the complete and enthusiastic support of management and all supervisors. The first level supervisor must direct the safety program because top management cannot be aware of detailed problems involved in reaching employees.

Accidents are not reduced by bulletins urging safe thinking. They are reduced by continuous contact of the first level supervisor with the employees. In a large organization, the safety engineer is a great value in organizing a safety program, preparing safety material and developing safe methods. But the first level supervisor must be the contact with the employees.

The distribution division of the Water System of the Department of Water and Power constructs, maintains and operates the water system in Los Angeles. This includes installation, maintenance and operation of all water mains, trunk lines, fire hydrants, meters, services, pressure regulating stations, tanks, some of the reservoirs and all other appurtenances dealing with the distribution of water. These functions require 1,200 personnel, of which 1,000 are field employees ranging from district superintendents to laborers. The Water System, 44 miles by 28 miles, is divided into five self-sufficient districts.

For the past 10 years, the distribution division has had an assigned safety engineer from the accident prevention section. He visited the various districts with a field superintendent to inspect construction projects. He had no authority to enforce safe methods but his advice on safety was generally followed. On his recommendation, safety equipment such as toe guards, goggles, respirators, hard hats and gloves were purchased and their use encouraged. His position and title promoted safety; however, no one else took the same interest in the problem.

The foreman respected his comments but only saw him once every two or three months. With 110 crews in the field, he couldn't devote much time to any particular foreman or construction project. Every two months a district safety meeting was held after work on an overtime basis, and was attended by all superintendents, foremen and lead men. A lecture on safety with demonstrations and motion pictures followed by a general discussion constituted the meeting. The men were expected to practice the lessons they had learned at the meeting. The safety engineer was doing everything within his power to promote safety and reduce accidents.

After operating in this manner for years, it became apparent something was missing. Our accident frequency and severity rates were static. In spite of the support by management and the purchasing of safety equipment and the personal contact of the safety engineer, people were still injured at the same rate. In analyzing our safety program, we found the source of our trouble was that the entire program was the personal activity of one man, the safety engineer. He did all the talking and everyone else listened.

But with 1,000 men, his contacts were necessarily infrequent. We had to find a way for his effort and enthusiasm to be utilized and transferred to the first line supervisor. Our foremen and lead men were not neglectful. They just didn't get enough material from bi-monthly safety meetings for the next two-month period.

After considerable discussion with safety engineers, other utilities and management, a new safety program was developed. The new program was announced at a safety meeting attended by top management so that the personnel would realize the support this program was receiving. Essentially, it consists of seven major points which I will describe in detail.

WEEKLY MEETINGS ON THE JOB

The foreman will conduct weekly trench-side or yard meetings on safety subjects. The meetings, held every Monday, will last from five to 15 minutes. The Accident Prevention Section will furnish topics and the necessary information to the foreman.

This is most important in the safety program because it gives the first level supervisor the entire responsibility of getting the message to the employee. The safety engineer prepares the material and mimeographs copies for all foremen to use. The safety engineer must provide interesting safety material written in a form readily understood by the field personnel. Here is a typical weekly safety talk to illustrate the type of subjects used:

The Subject for this week is "Hoists and Cranes."

1. "If we're using a hoist, we'll have *one* man give the signals. Nothing confuses an operator as having two or three men telling him what to do.

2. "If it's your job to hook pipe, be sure your slings are in good condition and strong enough to do the job.

3. "If you are using a clamp, be sure it is free from grease and dirt and in good working order. Make sure it is fastened securely on the pipe and then fasten the safety so that the pipe won't scissor out.

4. "Never swing a load over another man. Stop the operator until every man is in the clear. If men are in the trench, do not bring the load to the edge of the excavation until the men are beyond all danger.

5. "Never attempt to catch or hold a length of pipe that appears to be slipping. It's better to have a cracked pipe than a cracked back.

6. "If pipe is stored along a roadway or street, securely block each length separately. Not only our own men but children at play have been injured because we did not securely block our pipe to keep it from rolling.

7. "If in lowering we knock out some of our timber, stop proceedings at once and replace the timber. Remember, the man in the ditch must be protected at all times.

8. "When lining up pipe in trench, keep your hands away from the ends. *Never* attempt to remove dirt from the pipe until you are *positive* that the hoist man knows what you are going to do.

9. "Never stand directly in line with a suspended pipe. It may slide in the clamp or sling.

10. "Never take hold of a hoisting cable. You may have your fingers cut off between the cable and the block.

"Any comments?"

That concludes the lesson for the week. The language and the sentence structure are plain and to the point. The subject "Hoists and Cranes" is one from an almost inexhaustible source. Many of the foremen read the lessons; others talk extemporaneously on the subject. Both methods have proven effective.

The districts will hold five safety meetings a year, devoted to a review of the accidents in the past two months. A discussion of the weekly topics for the trench-side or yard meetings to be held during the following eight or nine weeks is included. The discussions will be led by a field super-

intendent with the safety engineer as advisor to enter discussions only when specifically requested.

The entire proceedings are directed by the line organization rather than the safety engineer who is a member of the staff organization. Taking the meetings away from the safety engineer and having a field superintendent take charge made the foremen and lead men aware that promoting the safety program was their problem. Upon the request of the field superintendent, the safety engineer advises the foremen on the most effective presentation of the material for the weekly meetings.

NEW EMPLOYEES EDUCATION

The foreman or the lead man will instruct every new employee assigned to his crew. This instruction will include: handling shovels and pneumatic tools, correct methods of lifting and other crew functions. A check list to indicate the instruction given will be filled out and signed by the new employee and the foreman.

This eliminated a great source of trouble of new men injured on the job claiming they had never been instructed.

As soon as possible after an accident on the job, the foreman will assemble his crew describe the accident, explaining why it happened and how it could have been avoided. The foreman will use these opportunities to develop a safety-conscious crew.

This idea is effective because a discussion of the accident immediately after it happens always impresses the crew. Safety consciousness in the crews has made the men suggest safety gadgets and equipment such as heat-resistant sleeves for use when pouring lead, and cutting holes in shovels for handling wet adobe.

ACCIDENT INVESTIGATIONS

A committee in each district will review each lost-time accident. The committee will consist of the district superintendent, the field superintendent, the foreman, the man involved in the accident and the safety engineer. The purpose is to determine, if possible, why the accident happened and how it could have been prevented. The findings of the committee meeting will be reported on the "Foreman's Report of Investigation of Accident" form.

This point has also made quite an impression on the foreman and his crew. Although the committee only determines causes and cures, the foreman and his men do not like being included because it is their lost-time injury being investigated.

LOST TIME CHARTS

Each crew of four or more men will have a safety board mounted on the truck showing the number of man-days worked without a lost-time injury. The foreman or truck supervisor will change the totals every day.

Each crew has a group pride in this ever-changing number posted on the safety board on the curb side of the truck. As the man-day figure increases, a rivalry develops between the various crews and a lost-time injury upsets the crew. Teamwork has developed and the men take care of each other, watching, advising and helping to prevent accidents.

A safety plaque will be awarded to each crew working without a lost-time injury one year. These plaques will be mounted above the safety board on the trucks.

AWARD SAFETY PLAQUE

At the end of the first year, our top management appeared at the safety meetings and presented plaques and certificates to the foremen. The impression on the men was very favorable and they appreciated the compliments and pats on the back. Their presence at the meeting assured the foremen of the continued enthusiasm and support of management.

This new safety program has operated for more than a year. From the start the first line supervisors were cooperative and enthusiastic because they felt this plan would produce results. In a very short time there was a decided downward change in accident frequency and severity rates, and with management voicing its approval, the first line supervisors redoubled their efforts. The results were gratifying and the record of the first year shows a 30 per cent drop in accident frequency and a 52 per cent drop in accident severity. Now in our second year, we are continuing to reduce our accident rates even further.

This seven-point safety program excludes records and reports because they have been in operation for years. An organization

starting a safety program should have an eighth point dealing with active records and reports to determine the effectiveness of the program.

A system of bulletins on repetitive accidents such as strains, sprains and lead burns reminds employees of injuries from carelessness or neglect in using safety equipment. Continual repetition by an employee of the same type of accident brings a warning of disciplinary action.

In this program promoting safety is the first line supervisor's direct responsibility and gives him experience in leading group discussions. The "tail gate" meeting is not new but is successful in our distribution division because the foremen receive the necessary material at the district safety meetings and are coached by the safety engineer. The cost of maintaining this type of program is no greater, since it just rearranged our responsibilities.

The ideas developed in this safety program may be used in any size organization. Many water utilities are small and do not have enough employees for a full-time safety engineer. However, the material necessary for first level supervisor meetings is readily available. The American Water Works Association recently published a manual *Safety Practices for Water Utilities* containing safety information and program material. By using the manual at foreman discussion meetings, an adequate safety program can be organized and maintained. The benefits of safe practices—both humanitarian and monetary—are derived by a small as well as a large water utility.

If the first line supervisor feels that promoting safety is his responsibility, and if he is backed and encouraged by management, safety consciousness will become a definite part of every employee's thinking. With that positive attitude, accident frequency and severity rates will be reduced.

SAFETY PAYS OFF

by ARTHUR J. WEBB
safety coordinator, East Bay Municipal Utility District, Oakland, Calif.

Have you ever been in a busy railroad station and watched the trains come in? Have you noticed the joyous looks on the faces of the men and women and children as they meet one another at the station after a trip? When these people are protected and helped to go home at night through your assistance, we have had the big payoff.

This is one type of a payoff. In addition to the human side of the accident picture there is the cost side. Dollars and cents are important. There is no better way for a businessman to make a dollar than to have a good safety program. Safety pays off! It not only gives the business the margin of profit it needs but it gives men the chance to arrive home each night safely to the ones they love.

An important study of injury frequency rates in the water-works industry was conducted by the United States Bureau of Labor Statistics. The industry, one of the worst in the nation, was selected for the special survey in 1953. The industry had a frequency of 24.8 lost time injuries per million man hours compared to an all industry frequency of 8.4. This is almost three times the national average. Since then the frequency has been 25.3 in 1957 and 24.1 in 1955. The industry had not changed much since 1946. However, it will and can change as more utilities begin safety programs.

HOW COSTS ARE REDUCED

One easy way to save money through a safety program, especially if the injuries are high or if the utility has not had a safety program, is the insurance dollar. Company insurance rates are figured on the experience rate of the industry. As the industry lowers its number of injuries, the insurance rate decreases for all companies whether or not they have an injury prevention program.

Secondly, not all the insurance rates are set by state law. If your experience is bad, the insurance company can either raise rates or cancel the insurance. All states do set basic rates for different industries but the insurance companies can charge more than 100 per cent of the basic rate. In fact there was a time when our company was paying 125 per cent of the basic rate.

To compute your rate, the insurance company will average your previous three year accident costs and frequency. It considers whether you have a planned program to reduce injuries and sets the next year's rate from that. Deaths or amputations reflect for a three year period in insurance rates.

Some insurance companies have a refund system. The company reviews your actual compensation and medical costs at the end of the year and refunds money on the per cent of actual costs below the premium you were charged. In the East Bay Municipal Utility District we recovered more than $213,000 since 1949, saving about half the premium. In addition, our premium rate went from 125 per cent of the basic rate set by California to the 71 per cent we are now paying. This is a direct dollar saving to the people of the district.

The National Safety Council reports that for every compensation dollar saved, you save four to six more dollars in indirect or uninsurable dollars.

INDIRECT AND UNINSURABLE COSTS

1. Worker costs—those not injured. These are observers, people who helped the injured party, time to take them to the doctor or hospital, time to describe the injury to other employees. If ten men take 15 minutes each at $1.50 per hour, this will be $3.75.
2. Supervisors time—helping the injured man, home calls, doctor visits, insurance interviews, telephone calls within the company, report making, investigations. This could easily take one to two hours or more at $2.50 an hour. Possible cost could be $2.50 to $10.00.
3. Loss of working time when the employee received pay. If an employee is injured during the day, he is usually paid for the whole day. This could amount to approximately $1.50 to $12.00.
4. Many times the loss of time from an injury causes other men to work an hour overtime. The cost for three men for one hour would be about $4.50.
5. Decreased production results from the injured man when he returns to work.
6. Cost of training a new man.
7. Clerical costs for processing report forms through the insurance company and accounting.
8. Repairs to equipment damaged—includes costs of tractors rolled over, cables broken, doors to trucks damaged.
9. Rental costs for equipment while repairs are made, and other expenses such as liability costs for damages to property.

These are the main elements of the cost picture of accidents. Now—the methods we use to combat costs, our safety program.

We aim to operate the safety program so that the man on the job and his foreman make a team of accident prevention. The program operates through them as much as possible. The safety unit functions by coordinating the information and stimulating the program.

LEVELS OF SAFETY ACTIVITY

There are three levels of action taken by the district. The first is the basic one in which the facts are determined. Then comes a plan for teaching the facts. Finally there is learning the facts to develop teamwork.

To show how effective this approach has been the five year accident frequency of 24 reduced to a three year accident average of 3.4 in four years. When a person realizes that the lost time accidents cost money, the curve is more significant.

In addition, the premium lowered with the continued reduction of accidents. It dropped from 125 per cent in 1949 to around 70 per cent in 1956.

A great impact on the morale of the employees results from a good accident prevention program and is another reason why safety pays off.▲

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where'er we go
Regardless of amounts,
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

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CURRENT SAFETY TOPICS **Volume 9**

FARM SAFETY

Transactions of

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NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscr[illegible]ith any charts or illustrations used, are available in the National [illegible]ty Council files. Views expressed at the Congress or in any volum[illegible] Current Safety Topics are those of the Congress participants, and not n[illegible]arily those of the National Safety Council.

THE FARM CONFERENCE

This volume is a record of the sessions held at the 1957 National Safety Congress by the Farm Conference. The conduct of these Congress sessions each year is only one of the many cooperative activities which the conference carries on in behalf of its members, and for the benefit of accident prevention work on the farm.

The activities of the conference are under the direction of its executive committee, the members of which are listed at the close of this volume.

SAFETY MAKES SENSE

by EARL L. BUTZ
dean of agriculture, Purdue University, Lafayette, Ind.

Safety makes sense in any occupation. It certainly makes sense to farm residents, where there is a potential saving of nearly 13,000 lives annually. Add to this the more than one million non-fatal farm accidents each year, and you have a substantial accident toll on the farms and in the farm homes of America.

More farm workers have fatal accidents than in any other major occupation. Last year's toll was 3,600 farm workers killed. The total number of farm residents—men, women, and children—killed accidentally last year was 12,800, and 1,050,000 others were disabled. Among farm workers themselves, 300,000 suffered disabling injuries. The farm death rate per person employed was exceeded only by the mining and construction industries.

The National Safety Council estimates that the accidental death rate of farm residents declined from 58.7 deaths per 100,000 population in 1955 to 57.5 in 1956. This was only a one per cent reduction in the accident rate in the one-year period. One per cent reduction per year is far too slow. We must do better than that.

The financial loss from farm accidents is appalling. This has been estimated at approximately $1.5 billion annually. This is one-seventh of total realized net farm income in recent years. Substantial reduction of this figure would be a wonderful way to raise net farm income.

STATISTICS HAVE MEANINGS

Figures and loss ratios like those cited above are cold and impersonal. Losses are just a number. But these figures take on concrete meaning at the place where they have their beginning—with the family of the accident victim. The measurable loss from accidents and fires is tremendous, but the part that can't be measured is even greater. It encompasses all those things that are not replaceable—including human life itself. And who can place a monetary value on a human life snuffed out at the beginning of its productive period?

The really heartbreaking thing about all this is that most of the accidents that kill some 13,000 farm people each year and injure another million are caused by unsafe practices and hazardous conditions that could be corrected. That's something to think about, isn't it?

DON'T KNOW HOW SERIOUS

Yes, the farm accident situation is really serious. However, many farmers and farm leaders have had their attention directed elsewhere by newspaper headlines telling about airplane crashes, train wrecks, and similar calamities in various parts of the world. At the same time, farm people are being killed at the rate of 38 a day in the United States alone. But these deaths happen at different times and in scattered places, and never make the headlines on a national scale.

Our first need, then, is to make people aware of the situation. In general, progress is being made in this area. Fourteen annual National Farm Safety Weeks have helped greatly in calling attention to this need. National leadership for this event is provided by the Safety Council and the U.S.D.A. Farm Safety Week and the continuous efforts of local, state, and national groups have combined to make people more aware of the problem. Needless to say, the excellent cooperation of press, radio, and TV has been a major factor.

Unfortunately, awareness alone does not prevent accidents. People must act. There has been improvement in this respect too. However, action might be more plentiful if we could only convince more farm people that something can be done to prevent accidents. Many still seem to believe the situation is hopeless. We have positive evidence that something can be done merely by looking at the lower and lower accident rates in states and communities which have had active safety programs and where accurate records have been kept. We need to tell this story to those communities where safety is still an accident.

TEACH THE ADULTS TOO

One of the things at which we excel in the United States is all kinds of programs to "teach the youngsters." We do it in the schools, 4-H organizations, Boy Scouts, church organizations, and a dozen other places. We frequently overlook the necessity to teach the adults too. And that includes ourselves.

In many cases our teaching the youngsters takes the form of preaching rather than teaching. Our group leaders will tell them how to do it or how not to do it, but frequently will not follow through by practicing what they preach."

Many parents openly violate safety rules and, at the same time, warn their children, "Don't let me catch you doing it this way." They might as well add—"Wait until you become an adult, then you can do it." Some of those youngsters just can't wait until they reach adulthood to imitate the people who tried to teach them to do otherwise.

HAVE NO TRAINING

Most farm leaders have received practically no formal training in safety. It's no wonder they so seldom consider it as part of their job. However, they are often in an excellent position to teach safety on a practical basis. In one state, a subject matter extension specialist remarked that if his state wanted safety taught, it should hire a safety specialist because he had enough to do without pointing out the safety aspects of his specialty. Obviously, he was overlooking the fact that safety should be a part of every job. The reason for establishing educational programs is "to make living better" for people, but without safety, "*we may not live at all.*"

People who are worth teaching "how to live better" certainly should be worth teaching "how to live!"

Some stories fit so many situations that they are used over and over again. For example, many times we've all heard about the house that had the leaky roof. Someone asked the owner why he didn't fix it. He explained that he couldn't work up there when it was raining and when it wasn't raining, the roof didn't leak.

In many ways, safety is just the same. People seldom see a need for it until the accident happens, and then it's too late.

American agriculture is in the middle of a far-reaching scientific and technological revolution. It is changing from an industry of "arts and crafts" to an industry undergirded by science and technology. Adjustments which have occurred in agricultural production and marketing during the past 10 years have been phenomenal. Still greater changes lie ahead.

The rapidity of change is greater now than ever before in our history. Research and education are shortening the time span of progress.

Adjustments have always had to be made in American agriculture. But because these adjustments in previous generations were spread through several decades, farm families were pretty well able to "take them in their stride." Today the agricultural revolution is advancing with such rapidity that farm families and rural communities often find it difficult to make the kind of economic and sociological adjustment required.

In any period of rapid change like this it is doubly important that we be safety conscious. New machines, new techniques, new ways of doing things, and expanded scales of operation create unfamiliarity and breed new hazards. This will be increasingly true as our farms continue to grow in size, in capital investment, and in technology. Some of the old hazards may be eliminated by these advances, only at the expense of introducing newer and more perilous ones.

RESEARCH IN FARM SAFETY

Why all this talk about changes in safety problems? What does it mean to people like you who are promoting farm safety? Today's safety facts may not be true at all tomorrow. Certainly, the relative importance of many farm hazards will be changing almost constantly. Obviously, this makes up-to-date research important. Without it no program can operate effectively. Farm safety is no exception.

While commending those who have helped provide farm safety research, I would quickly point out the need for much more help in this particular field. Some of this help will come from highly trained engineers and other professional research specialists. On the other hand, every farm family can help in the important job of accident reporting and other phases of research.

Through constant, well planned research, farm life can be made safer. Much progress has already been made. In the farm machinery field, for example, we have had improved shielding, safety decals, self-starters, standardized hitch point, and other features that have some safety in their background. The fact that some farmers do not use all the safety divices that are now provided should not be used as an excuse by manufacturers for not providing more and better safety features as fast as they can be developed by competent research.

In past years there has been a tendency for some farm equipment manufacturers to "let the sales manager design the equipment." Although this obviously may be good business from a short time point of view, the design engineer cannot ignore safety features if he wants to stay in business over a period of years.

Moreover, it is our public responsibility to include every possible safety feature, even though the sales manager might contend that the added cost will not be recoverable in increased sales. Then again, some sales managers might be surprised if they tried to "sell the safety features" on their equipment. With the broad educational programs in safety going forward among farm people, farmers will increasingly look for those equipment items with the best built-in safety features.

PUSH SAFETY EVERYWHERE

Let's not be so satisfied with the progress we've made in few isolated cases that we overlook the need that still exists in many other situations. Outstanding safety programs by a few 4-H Clubs or Future Farmer Chapters or adult farm organizations should be commended and used as examples for other less active groups. They should not lead us to think the entire job is practically solved. We can't expect much progress from anyone who is not reached in some way by our safety educational programs.

Careful planning is necessary to reach the most people with a convincing program. I undestand the *1958 National Institute* for Farm Safety will be conducted on a workshop basis in a special effort to pool the best ideas from many different sources. But ideas are of no value unless they are put into action.

Therefore, it will be up to each state, each county, and each local organization to see that ideas for action reach farm families and individuals in a way that will inspire them to eliminate hazards to their life and property. To do this, planning must not be limited to the Farm division of the National Safety Council or the various state farm safety committees. Planning must be evident all along the line until safe conditions and safe habits are thoroughly a part of farm life everywhere.

By definition, an accident is unplanned. Safety can result only from planning and good luck. We must not depend entirely upon good luck.

THREE T'S OF SAFETY

An effective program in farm safety should be built around "The Three T's of Safety." There are:

1. *Training.* Everyone working in farm safety must constantly train himself regarding incidence and causes of accidents, new hazards that come with changed agriculture and rural living, more effective ways of *motivating people to "live safely," and methods* of mobilizing communities for action programs. Training of both self and others must be a never-ending process.

2. *Teamwork.* Safety is a job everyone. It can't be left to the so-called safety expert, to the teacher, to the county agent, to the farm organization, or to the farm editor. It's a job for all of us. To the extent that we get full teamwork in the attack on accidents, success will be achieved.

3. *Tenacity.* This is a job that calls for a lot of "stick-to-itive-ness." Progress will be slow. Discouragements will be many. Frequently accidents will occur in spite of everything we can do. There will be times when all of us will be tempted to throw in the sponge. But farm safety education is a job that calls for the highest degree of tenacity. If each of us sticks to it, then the community program will be advanced.

We who promote farm safety deal with one of the most precious resources we have —*human life itself. The Lord* gave each of us three precious and irreplaceable gifts. He endowed each of us with a human life, a human mind, and a span of years in

which to use that life and that mind. These gifts constitute the ultimate scarce resource we have on this earth. When they are taken from us, they can never be duplicated. They are irreplaceable.

GIFT OF HUMAN LIFE

Our real goal in farm safety promotion is to preserve those three divine gifts a little longer for some of the 13,000 farm people who otherwise will be killed this year in farm accidents, and to make life more meaningful and more productive for some of the one million non-fatal accident victims on our farms this year.

Our real goal is to make it possible for an increasing number of these people to be spared death and accident so that they may continue to make a lasting contribution to the service and growth of the America we love so much.

Our basic goal in farm safety, therefore, is the advancement of human welfare and human happiness in our time. This is a goal worthy of the best efforts and highest talents of all of us.▲

RESEARCH—A KEY TO SAFER FARMING

(A Panel Discussion)

V. S. PETERSON, (Discussion Leader) E. I. du Pont de Nemours & Co., Ames, Iowa; FRANK B. LANHAM, head, Agricultural Engineering dept., University of Illinois, Urbana, Ill.; G. H. LARSON, head, Agricultural Engineering dept., Kansas State College, Manhattan, Kan.; CHARLES LOGAN, superintendent, Beltsville Research Center, U. S. Department of Agriculture, Washington, D. C.; E. W. TANQUARY, International Harvester Co., Chicago, Ill.

Research is an "organized quest for knowledge," and is generally divided into two areas: applied and fundamental. Research, the panel emphasized, must be based on facts.

Farm accident research now in progress continues to search into the underlying causes of accidents. Standardization of safety equipment and operating principles are being applied to farm equipment to reduce confusion and to safeguard operators.

In regard to cornpickers, the best safeguard for the operator is to make sure his machine is maintained in the most efficient operating condition.

A question and answer period designed to bring out important research subjects produced the following proposed areas for study:

1. The effect of vibration on the machine operator
2. The effect of dust on the health of the farmer
3. Insecticides and their effect on humans
4. Basic research on human behavior in relation to accidents
5. Causes of accidents from the view point of human tolerance and behavior
6. Research into the causes of hay baler accidents
7. The effect of nutrition in relationship to fatigue and accident rate

Four factors stand in the way of expanded research. They are: 1. lack of manpower. 2. lack of funds, 3. lack of facilities, and 4. lack of administrative support.

The way to overcome these obstacles is to do a complete study of the present research situation and on the basis of it present a strong case for the need.

In his closing remarks Lanham stated that technical societies should play up safety factors in technical papers. Others stated that there should be further use of commercial institutions in furthering safety research and that the Farm Conferences of the National Safety Council take the leadership in accelerating such programs.▲

THE OHIO STORY—A RURAL ACCIDENT SURVEY

PROGRAM MEMBERS:

W. E. STUCKEY, farm safety specialist, Ohio State University, Columbus, Ohio.

W. B. WOOD, director of extension, Ohio State University, Columbus, Ohio.

R. H. BAKER, associate professor, agricultural economics, Ohio State University, Columbus, Ohio.

DAVID GERBER, associate agricultural extension agent, Ottawa, Ohio.

LITTA ROBERSON, director, Women's activities, Ohio Farm Bureau Federation, Columbus, Ohio.

The Ohio rural accident survey, conducted during the 1957 calendar year, was a stratified random sample survey to ascertain the frequency, severity, types, causes, time and places of accidents occurring to farm people in Ohio.

The survey was launched because "A program in safety education, to be most effective, must be based on the needs and interests of the people involved. It is imperative that we have the facts pertaining to a problem before we program to improve the situation. This survey is an attempt to collect the facts pertaining to the accident problem affecting farm people in Ohio. In the process of collecting these facts we are actively involving thousands of people in a safety program—this fact alone, justifies the work and expense involved."

Four hundred forty voluntary, trained interviewers contacting 4,300 families in eight counties in Ohio are the survey work force. Counties included in the study are Putnam, Hancock, Clinton, Fayette, Perry, Carroll, Medina and Lake.

Results of the study will be scrutinized at both the county and state levels to determine further safety education programs.

The following is the letter sent to the voluntary interviewers:

Subject: Accident Study

Dear Friend:

Welcome aboard! We are delighted to have your help in this splendid public service project.

Will you please visit the 10 farms in your sample area as soon as you can, preferably this next week.

Your sample is the 10 farms that lie between your farm and your usual shopping center. They should be the farms on both sides of the road you usually travel going to town.

If you live in town, a sample area will be selected for you.

If two interviewers live too close together to get a full quota, let the one closer to town choose an alternate area, usually the road that parallels your road on the right as you face town.

Even though these samples contain only 600 to 800 families, we expect to have enough representative information to estimate accurately the nature, cause and extent of all accidents that took place in the county in 1957. The eight counties that are carrying on this study will provide enough information to do the same for the state.

Visit 10 farms. What is a farm? Any tract of land of three acres or more on which agricultural operations are performed by the operator, either alone or with the assistance of his family and hired labor (or even a tract of less than three acres producing $150 worth or more of agricultural products for sale), is considered a farm. As you see, this includes part-time farmers, even a farm if all of it was in the soil bank. A farm may be one tract or several, provided it is handled by the same operator.

Report all accidents. What is an *accident?* For this study let us define an accident as any injury to any person living or working on a farm, that requires professional medical care—doctor, hospital, nurse, X-ray, or loss of ½ day or more of time from work or play.

Report all accidents to farm people, regardless of where they occurred.

Any information that you receive should be treated confidentially. Assure the persons being interviewed that no names will be used in any reports, news stories or even in your conversation with others.

All of us thank you for what you are about to do. Good luck!

FARM ACCIDENT STUDY SHEET

☐ No accident this farm or family this period.

A. *WHO* was injured? Husband, wife, son, daughter, hired help. Age, M, F.

B. *WHEN?* Month, day, hour, A.M., P.M.

C. *WHERE* did it occur? In home or dooryard, in field, building or barnyard, while away from farm.

D. *WHAT* were they doing when injured? Working, playing.

E. *WHAT TYPE* of injury? Cut, bruise, sprain, burn, fracture, infection, poison.

F. *HOW SERIOUS* was the injury? Slight, severe, permanent, fatal.

G. *WHAT THING* was involved? Tractor, machinery, tool, animal, knife, chair, bed, ax, auto, truck, tree, gun, lightning, nail, ice.

H. *WHAT KIND* of accident? Fall, same level; fall, different level; slip; caught in or between; struck against; struck by falling or flying object; burn; electric; inhalation.

I. *TIME LOST* from work (or play)—days at home, days in hospital.

J. *COST.* Doctor bills, drugs and medicine, hospital, help hired to replace person injured.

K. Give any other pertinent facts about the accident.

COWBOY HIGHWAY SAFETY

by CALVERT R. DODGE

executive secretary, Wyoming State Farm Safety committee, Laramie, Wyo.

The cowboy state of Wyoming is known for its wide open space, friendly people, wonderful hunting and fishing and its wide highways enabling all comers to get where they're going easily and with a fairly good measure of safety. Yet, with all these attractions 7,707 people were involved in accidents in 1956. During June, July and August, when the fish run to bite the visitor's hook, the visitor is getting himself hooked on the highway.

The driver of the car, truck or other vehicle in Wyoming gets so excited or anxious about this great state that he speeds; he fails to grant the right of way; he drives on the wrong side of the road and he engages in the consummation of toxic liquids that not only dull his sense of beauty in the west, but in many cases plant him within six feet of the top of this wonderful earth.

Twenty-six per cent of these folks that kill themselves in Wyoming do so by ramming into the rear end of someone else's car. Another twenty-two per cent are so anxious to die in Wyoming they sideswipe other cars. An additional four per cent ram head-on to cure their desire for speed and thrill. Our Chamber of Commerce presents the inquiring traveler within Wyoming a brochure, which, among other suggestions, asks the driver to pull off the road occasionally and take in the sights. But this suggestion didn't imply that they should jet propel themselves off the road and into eternity. Yet 80 per cent of Wyoming's noncollision type accidents resulting in fatalities are caused by people driving off the road.

Since Wyoming has some outstanding state highways, 80 per cent of the folks killing themselves use these highways, while five per cent use the county roads.

WYOMING RACES

One race you probably haven't heard too much about is the chuck wagon race held at our famous frontier days in Cheyenne. It's thrill-packed and exciting. Someone usually gets hurt each year but he recovers. Then, we have what is known as the potato race at many of our rodeos. Cowboys on horseback race with a javelin to see who can stab the most potatoes in a box. Once in a while someone gets hurt. But, perhaps the strangest race we have in Wyoming is the race between residents and non-residents to get killed.

In the past five years, for example, the residents have won the race almost two to one which proves that home is where you find most, the kids and the crazy drivers. In 1956 the race ended something like this —119 residents killed and 54 non-residents killed on the highways. Twenty-six per cent of the racers were between 25 and 34 years of age. Sixty-three per cent of all fatal accidents involved Wyoming licensed drivers.

Now, our ranchers and farmers ever since the days of the Oregon Trail and the Lewis and Clark expeditions, have never been outdone. They boast the most of everything and the biggest of anything that's left. We've got the most antelope, the most deer, the most hot springs, and the most scenery—and we're bigger than Texas when you flatten us out. Well, by some poor luck only 49 per cent of instate drivers are rural residents. That's less than half . . . but not by much.

Which proves only this . . . that the slow drawl and easy going way of the 'ole cowhand generally turns into a blood curdling scream and a tense, eager highway hunter when he mounts the 'ole Ford or Chevie for a run to the market. Now, this is a slight exaggeration and we don't want to imply the Wyoming resident has no regard for others, because he certainly has. It just seems like a few of them want to paste up some sort of record, and it just happens that the highway is generally where they get pasted up.

COWBOY HIGHWAY ILLS

But all this preliminary is nothing short of a buildup to point to the true picture of the cowboy and his car in Wyoming. Some years ago, 1949 to be exact, we organized a Wyoming State Farm safety committee. It was reorganized in 1955 and we believe that in the near future it will change its name to Wyoming Rural safety committee so as not to leave out a single cowboy, rancher or sheepherder.

The Committee isn't going to attempt to cure the state of all its ills along highway safety lines, but its members feel that by using constant reminders, working on local levels, creating interest and setting up challenges . . . the 'ole cowboy will become interested enough in himself and his family to want to keep them alive just to see if the committee succeeds.

On the state level the committee developed a state-wide highway safety program. It helped organize 23 (that's all the counties we have) county safety committees. Each of these committees (in 1956) worked out plans for Highway "Slow Down and Live" signs six feet by three feet and placed them along the highway right of way with the help of the highway department. News releases are made to appeal to local residents once a week. Radio releases are also prepared.

DIVIDED UP STATE

To get the program on a surer footing the committee developed an intensive training program for local committees. Each member of the state committee had a district of three to four counties which were his or her responsibility. Safety materials were purchased from the National Safety Council for distribution to local committees. As an example of the result of this seeding process, we'd like to tell you about the Lee Cummins' safety committee story.

One exceptionally bright morning (you must remember that in Wyoming every morning is bright, but some are exceptionally bright) a state committee member went to the county agent's office in Johnson county, Wyoming. In case you don't know where Johnson county is, remember that Buffalo is the county seat and that it is the gateway to the Big Horn Mountains which in turn form the gateway to Yellowstone Park.

Now, in the county agent's office it was suggested that someone call someone to help get a safety committee organized. In another three-quarters of an hour on the same exceptionally bright, morning five safety-minded citizens met for coffee. One of them happend to be Lee Cummins. Lee is manager of a local co-op. The others included an auto dealer, an electrician, a hardware dealer and the county agent.

COMMITTEE'S ACTIVITIES

Six weeks later the Johnson county safety committee, which was formed that morning over coffee, had:

1. Helped complete the highway sign project.
2. Set up a regular series of radio broadcasts.
3. Set up a program for regular news articles on safety.

4. Started a safety message insert program for mailing with regular monthly statements of all business concerns.
5. Prepared safety window displays.
6. Started gimmick program. (with pencils)

This doesn't end their story, however, for they are now planning a whole new year's worth of ideas and they plan to carry it out with gusto. People in Johnson county are becoming fully aware that they themselves are responsible for being alert and for being careful.

Again we at the state level find ourselves in some sort of a race. This time it's a race to keep ahead of Johnson county. So, we have now thrown into the hopper of ideas such items as:

1. A welcome arch at all main highways entering the state. Here a patrolman would stop each visitor's car and issue a welcome ticket, which tells of the wonderful cowboy state and also lists a last chance warning to slow down and live and be careful or else!

2. Stimulate the auto testing program handled in many towns by the Junior Chamber of Commerce.

3. Support and promote pay increases and increase in numbers of highway patrolmen.

4. Promote an improved Justice of the Peace program.

5. Increase our efforts on local safety programs, including the Scout Good Turn Program for 1958, the 4-H and FFA programs and others.

6. Develop an incentive awards program for participants.

These are just a few of the ways in which we believe we can keep reminding people to be safety-minded.

We hope you will come to see us and our program in action. We know you will enjoy Wyoming more than ever because you can be confident we are going to help you help yourself to safety and pleasure in the Cowboy State.▲

BOY SCOUTS OF AMERICA 1958 NATIONAL SAFETY GOOD TURN PROGRAM

DONALD M. HIGGINS, director, health & safety service, Boy Scouts of America, New Brunswick, N. J.

EDWARD WATSON, Explorer Post 2604, Chicago.

JOHN HAYES, Sea Explorer 5733, Chicago.

STEVE SCHOOLMAN, Boy Scout Troop 599, Chicago.

Higgins: I've had the chance for the last two or three days of going around and meeting with various groups to tell them about the National Service Project being planned by the Boy Scouts of America for next year. However, the two finest presentations have been the ones that have been made by boys themselves.

One of those happened Monday morning when, at the annual meeting of the National Safety Council, Scout Warren Meland had the privilege of giving one of the principal talks at the opening meeting of this National Safety Congress. Scout Meland explained the three different phases of the 1958 program which will emphasize traffic safety in the spring, outdoor safety in the summer and home safety in the fall.

This morning I have the privilege of presenting not one but three young men who are going to tell you briefly about the different phases. The first speaker who will tell you something about the Safety Good Turn and the traffic safety phase of the program. I introduce Scout Steve Schoolman of Troop 599, Chicago.

Schoolman: The slogan of the Boy Scouts of America is do a good turn daily, but this concept of personal good turn has been expanded to something bigger. We are ready to announce our 1958 national project. It will be a Safety Good Turn. Safety has long been a part of Scouting.

It will be the job of the Senior Scouts and the adult leaders to impress upon the boys the need for safety practices. We have a membership of nearly four and one-half million Scouts and Scouters. If we do our job properly we have four and one-half million safety conscious young men. Remember, too, that a Scout's activities are apt to rub off on the members of his family, thus expanding the program's effectiveness.

I would like especially to discuss our contribution to the traffic safety program. We will have to function in terms of Scouting tools. Our basic tools are our Scout oath and laws. By applying these laws, particularly alertness, courtesy and obedience, to the traffic problem we can best make our point. We must make our point that alertness is absolutely necessary to traffic safety for motorists and pedestrians. Even a momentary lapse can mean injury, suffering and even death. Neither drivers or pedestrians can afford to daydream in our streets.

The young boy gets the impression that courtesy means tipping his hat to his neighbors on his way to church, or giving his seat to a woman should he happen to be on a crowded bus. We must make the young boy realize that it is more than that. It is the difference between being a civilized human being or the pack of the jungle. To give way to another, regardless of right of way, is a small gesture that will often avert an accident. The small kindnesses cost so little in time, but pay big dividends in good will and safety.

Obedience, as courtesy, is taken from the Scout law. Our country is based on law. Our laws are made for the good of the majority. They must be obeyed to avert chaos. No laws are more important than those concerning traffic. For safety's sake the Boy Scout must learn that he must obey both the written law and the laws of common sense.

If our program can prevent one accident during 1958 it has been successful. We hope, however, to have our achievements surpass this.

Higgins: To speak on the outdoor safety part of this program I present Sea Explorer John Hayes of Ship No. 5733 of Chicago.

Hayes: The summer months offer a great deal of activities for the average boy. He may go camping, sailing, or fishing. He will have a great deal of fun if safety is applied, that is if he uses common sense. It is only good sense to do things as they should be done.

I am most interested in sailing, but sailing can be extremely dangerous if proper precautions are not observed. The same applies to a good many other outdoor sports. Our outdoor activities are designed chiefly for fun, and there is very little sense in marring these occasions with accident tragedies.

HOME SAFETY PROMOTED

Higgins: I like to present the third of our group of speakers who will emphasize the home safety phase which is what we will emphasize in the fall of 1958. This is Ed Watson of Explorer Post 2604 of Chicago.

Watson: The 1955 statistics of the National Safety Council show that some 9,450,000 people were injured in accidents. The home is not safe because more than half of these accidents which occur every year, occur in the home. This is more than 4,000,000. More than 200,000 of these accidents result in death. The financial loss is also great. About $600,000,000 a year in wages are lost just because of home accidents.

I will explain just approximately what will be done in my own council so that you will see what kind of a job will be done. Here in Chicago, in February the program will be kicked off. The first thing will be pamphlets distributed and parades and the whole safety program will be highlighted. There will be individual and unit projects and demonstrations given by each unit. We will also use the help of public officials, the fire department and other local safety organizations.

We will take the first three months of March, April and May for safety on the highways. We will take June, July and August and safety in the outdoor will be our theme. In the last three months September, October and November, we will stress the home safety phase of our program. In these months there will be home safety projects by each unit and there will be a booklet distributed to some 40,000,000 homes to facilitate our campaign and to help reduce and correct danger spots in the home.

The American public will receive the most concentrated dose of safety education which we can give them. Let us all hope that it takes.▲

SAFETY WITH FIREARMS

by ROBERT J. CLAVIN

field representative, Remington Arms co., Inc.,

It has been said that at least 95 per cent of all hunting accidents due to firearms can be avoided if every gunner will acquaint himself with the fundamentals of gun handling and constantly practice them. These fundamentals are simple and serve a dual purpose. First, they help keep hunting a safe sport and second, they make for better marksmanship. There is no excuse for carelessness in gun handling, whether the weapon is loaded or not. The cardinal rule of gun safety is "treat your gun with the respect due a loaded gun."

Here are some simple, *easy-to-follow* suggestions that, if made a definite must on every hunting trip, will assure the hunter and his companions a safe return:

Carry only empty guns, taken down or with the action open into your automobile, camp or home. Whenever you pick up a gun, whether you are indoors or outdoors, always first point the muzzle of the gun in a safe direction and examine the piece carefully to make sure it is not loaded.

The pointing of a loaded or unloaded gun toward a companion is a violation of every principle of good sportsmanship. It is the unpardonable sin of shooting ethics. Do it just once and you have lost the respect and comradeship of your companion, and branded

yourself as either a thoughtless novice or a careless, dangerous shooter with whom it is unsafe to go afield. *Watch that muzzle!* Never indulge in horseplay with firearms. This fool-hardy practice has caused many fatal and near fatal accidents.

Leaving loaded guns unattended is extremely dangerous. A companion may pick one up thinking it unloaded. If it is propped against a tree, car or post, a frisking hunting dog may bump against it, knocking off the safety and stepping on the trigger. These things have happened!

When you are resting in the field or woods, always lay your gun down flat, preferably unloading it first, with the muzzle pointing away from everybody. No one can enjoy a lunch looking down the muzzle of a gun, loaded or unloaded.

In climbing over fences or obstructions, always first pass your gun over to your companion, or pass it through the fence and lay it on the ground. A stumble or a fall might prove disastrous.

CHECK GUN'S BARREL

Before loading your gun, always make sure that the barrel and action are free from obstructions. Foreign matter in the barrel causes more "blow up" guns than any other factor. Should you stumble badly or fall and your gun muzzle touches the ground, always unload and look through the bore to be sure that it is not clogged with mud, snow or other substance.

If you are walking single file, keep your muzzle pointed forward. If you are walking behind your companion, see that your gun points away from him at all times. It is best to walk abreast in the fields or woods, but in doing so, see that your muzzle is always pointing away from him. Never crowd your companion in the duck blind. Be sure that each of you have plenty of room in which to shoot safely.

Never, never pull a gun, loaded or unloaded, toward you from a boat, car or through a fence. You are flirting with a date with the undertaker when you do this.

Always see that your safety is *on* until you are ready to shoot. Sudden jars and brushing against twigs or brush can release the safety catch without your knowing it. Examine it frequently.

When you approach camp or your automobile, always unload your gun. Take it down or open the action before putting it away or setting it aside.

Always make sure of your target before pulling the trigger. Take a good look . . . and then look again! Never fire in the direction of a sudden sound. It may be caused by some farmer's livestock, or, worse still, another hunter. And this has happened, too!

When you are in the woods or close cover, it is best to wear some article of bright color, preferably yellow. No deer goes prancing around wearing a bright colored bandana.

Be careful of shooting at flat, hard surfaces or the surface of water. Dangerous ricochets may result from such shooting.

Don't be afraid of being accused of having "old maidish" ideas in the practice of these simple principles of gun safety. By observing them, you will gain the respect and admiration of your fellow sportsmen and by example, encourage them to do likewise.

Be on the alert always. This will avoid confusion and allow you to bring your gun into action quickly. Alertness makes for good marksmanship. Carry your gun at the "ready" position, hands on the fore-end and grip, muzzle elevated at an angle about in line with your eye. Adopt a free and easy attitude. This will allow you to bring your gun up to your shoulder quickly, get your cheek down on the stock easily and permit the free swing which gets results.

Watch your footing carefully. Try always to be in position to gain solid, comfortable shooting stance which will allow quick coordination of mind and muscle.

Always go comfortably shod. Pinched or blistered feet will spoil any day's hunt. Dress as lightly as possible. If the weather is cold, a couple of light sweaters under your hunting jacket will keep you warm, and if they become uncomfortable, one or both can be removed and carried in the game pocket.

It is a compliment to be invited to go hunting with an experienced gunner. It means he believes you will observe all the rules of safety and practice good sportsmanship. Don't let him down by taking chances and you'll help make hunting a safer sport.▲

HAVE YOU MET OTTO?

by ELAINE PETERS

winner, 1957 State 4-H speaking contest, West Bend, Wis.

Have you ever met Otto? He can be seen most anywhere, on streets and highways, in parking lots and garages, in the city as well as in the country. He comes in assorted sizes, shapes, and colors. He is most happy when filled with sufficient amounts of gas and oil, washed occasionally, and always kept in repair. I think by now you have guessed that Otto is an auto. Yes, Otto is an automobile.

He probably has some of the same characteristics of your own car, because all cars have something in common with Otto. I think Otto knows you pretty well. He knows how you react to certain situations. He knows how long it takes for you to get disgusted with other drivers on the highway.

I wonder what Otto would say if he could talk? He would probably say, "Listen here. The next time we go around a corner you better slow down, because I can't go around the corner at such a speed and still stay on all four wheels." Or he might say, "The next time we come to a railroad track, let's wait for the train instead of getting across in the nick of time." Yes, I guess Otto knows you pretty well.

OTTO FEARS ACCIDENTS

Otto has talked to many of his friends and relatives who have been close to dangerous, yes, even fatal accidents. I wonder what he is thinking as he's waiting for you to drive him? He's probably thinking "If it's happened to them, it could happen to me; if it's happened to their drivers, it could happen to mine." Yes, it could happen to you.

Nine hundred thirty-seven people thought it couldn't happen to them in 1956. Nine hundred thirty-seven people were killed on Wisconsin highways because someone was in too much of a hurry, careless, or didn't use common sense.

Directly or indirectly there is a cause or reason for every accident. We as human beings, like to pass the blame on someone else. I wonder who we can pass the blame on this time. Let's see—could it be the sign's fault? The sign reads "Slow—Watch Out for Cars," but still the driver tries to get across but doesn't make it. It isn't the sign's fault. Well then, maybe it is the road's fault. Yet, the road with its many hills and hollows and sharp turns and curves. No, it is not the road's fault. Oh, maybe it is the weather's fault—the rain, sleet, and fog that make it hard to see.

You have all heard drivers say, "Why, I can handle my car under any condition." Sometimes they can't. No, it is not the weather's fault. How about the car? Is it Otto's fault that his brakes weren't adequately adjusted the last time he was in the garage? No, we can't blame Otto. Then there is only one place we can put the blame—that's on the driver. Every man and woman who attempts to get behind the wheel of an automobile can directly or indirectly be to blame for an accident.

I don't have to list a book of facts or a roll of statistics to prove that there are accidents. You are all aware of them. The most important thing is how they can be prevented. Four-H Clubs, Boy Scouts, Girl Scouts, safety councils, yes, and even motor corporations put out posters, signs, and slogans urging the American people to drive safely.

You have heard them all: "Drive With Care Everywhere," "Drive to Arrive," "The Best Safety Device Is You," "Look Out For the Car Behind the Car in Front of You." Don't the American people know that when they are behind the wheel of an automobile, they are behind the wheel of potential death? What do we have to do to convince the American people to drive safely?

SHOULD WE THREATEN?

Do we have to put out signs and posters that say "Let's See How Many People We Can Slaughter in 1957," "Let's Make It an All-Time High This Week End," "Can You Come Home Minus a Leg or Arm After This Motor Trip?" I don't think it would help. The American people read, and

that's as far as it goes. They don't take it to heart and they don't take it to head.

What is my advice, my opinion? I think we should educate the American people—educate them to use their common sense, to use their God-given ability to use their mind. If there is any doubt that everything will turn out safe, they shouldn't attempt to try it. When driving down the road, a driver should make sure there isn't a car in the other lane when he attempts to pass. In this way he will be using his common sense.

We don't have to let our buttons pop just because the death toll stands at 345 today—much lower than last year's death total through June. We won't let our buttons pop until that death toll stands so low that every state in the Union will look at us and admire Wisconsin. They will wonder what we did to convince the people to drive safely.

BLAME DRIVER ONLY

We must put the blame on the driver because we can't blame the car, the road, the weather, or the signs. Along with signs, slogans, and posters, as well as articles written, we must educate the American people to use their common sense.

I wonder what Otto would say if we asked him. He would probably smile, blink his headlights and say, "I think the American people should invent a car with common sense—a car that wouldn't let you go 75 mph in a 65 mile speed zone because the car, not the driver, has common sense—a car that wouldn't let you cross the railroad track because the car, not the driver, sensed the danger." It certainly would be wonderful, but most impossible.

I would like to leave you with this final thought. The only way we can equip a car with common sense is if we equip you—the driver—to drive with common sense.

PEACEFUL AND SAFE USES OF ATOMIC ENERGY

by COL. WILLIAM D. JACKSON

chief, office of research & engineering, Dept. of Army, Washington, D. C.

The generation before you progressed from the horse-and buggy age to the automobile age. You are witnessing and will actively participate in the beginning of the atomic age. My subject is the Peaceful and Safe Uses of Atomic Energy. My generation failed to make the use of the automobile safely and the pathetic part is that we seem to have become accustomed to the high death, injury, and destruction figures from the automobile. I'm glad to see that you people are trying to do something about it.

Regarding the safety of the use of atomic energy, I honestly believe that the nonmilitary use of atomic energy will be one of the safest forms of energy we have. After all, fire and gasoline are certainly not safe, unless handled properly.

The factor that contributes to the additional hazard of atomic energy is the radiation effect. The Atomic Commission and the other agencies engaged in this work are mindful of the problems and every indication points toward the careful and systematic solution of these problems. May I quote from an article entitled "Reactor Safety" in the September 1957 issue of the magazine *Nucleonics:*

"Since its formation, the Atomic Energy Commission has been concerned with the reactor safety problem. It first set up the reactor safeguard committee, then the industrial committee on reactor location problems, and now the advisory committee on reactor safeguards. AEC has established a technical staff to deal with the evaluation of reactor hazards. It has sponsored the development of more reliable and safer reactors and has invested and is investing large sums in research on the many unsolved problems related to reactor safety.

"Regulations are in effect now requiring a complete description of proposed reactors, their site, and proposed operation. The regu-

lations also require that the applicant make a study of the possible and probable accidents and show that all reasonable precautions have been taken to protect the public and employees. All applications, including the applicant's hazards summary report, are available to the public as are the evaluations and actions of the AEC."

You can see that the excellent safety record, to date, is the result of a concerted effort to proceed with caution during this development period.

Background of the Peaceful Use of the Atom

During World War II, much was learned about nuclear technology. The practical application was toward the developing of a weapon. After the War, the effort was to develop further nuclear weapons; but, in addition, a whole new era has begun. We refer to it as the peaceful uses of atomic energy as contrasted with the military application. We should not refer to it as a new industry because it is much more widespread. Actually, nuclear energy has a potential of spreading across almost every type of industry that we know.

Until 1953, most of the investigations of the potential of atomic energy were sponsored by the Atomic Energy Commission. The address of President Eisenhower before the General Assembly of the United Nations on December 8, 1953, entitled: "The Atom for Progress and Peace" was the real "kick-off" for nuclear applications. It put this challenging program on a world-wide, inter-national basis rather than being limited classification. It is less than four years since this expansion began and the progress is actually unbelievable.

PEACEFUL USES OF ATOMIC ENERGY

Thermal energy for the production of heat and power is only a small part of the potential we have in this field. When coal or oil burns, energy is released during the process of molecular rearrangement. When uranium fissions, the weight of the fission products is less than the original atom. The weight is not lost, but is converted into energy and mostly thermal energy; and it is a potent source of energy, indeed. A many times greater source of energy is the fusion process which is the principle of the H-bomb.

The successful harnessing of this energy is at present limited to the fission principle. It is interesting that with all the advancement we still must rely on water being heated to steam and the turbine-generator to generate electricity. The use of atomic energy has been visualized for the various forms of transportation and, of course, is a reality with the submarine.

The phenomenom of radioactivity has certainly opened up a big field in the form of the use of tracer elements. Radioactive elements can be fed to humans, animals, and plants. The path of the element as it journeys through the life cycle can be traced. Much has been learned about the metabolic processes of the body and much valuable information has been gained on the action of fertilizers in plant life.

RADIOISOTOPES

A widespread application of atomic energy in industry is the use of radioisotopes as gauges, for radiographic testing and as tracers. The basic principle is simple. Essentially a radioisotope with known radiation is placed on one side of the material to be measured and a calibrated detector on the other. Continuous measurements of mass per unit area can be made without contact with the material. The resulting data can then be fed back into the system to control the process. By use of shielding and continuous use of radiation monitoring instruments, these techniques are safe and free of health hazards to the plant personnel.

Wiggin, of the Atomic Industrial Forum, Inc. reported that a manufacturer of coated abrasives found that the installation of five radioactive thickness gauges on his production line paid for themselves in less than a year through a reduction in rejections, waste, machine down-time and inspection personnel and an increase in operating speeds.

The use of radioactive tracers in industry is also well known.

The Quartermaster General of the Army is charged with the problem of feeding the Army. Feeding soldiers in a garrison mess isn't too great a problem, but when large groups of men are fed in the field under adverse conditions, the problems multiply. Good food is one of the greatest morale builders we have. Food is not a luxury, it is a necessity, so we feel that if we can improve on its acceptability we will gain in many ways. For example, there will be less

discarding of food by the troops from the monotony. If all of the ration is consumed, we know the men are subsiding on a balanced diet, and of course, the men are happier and more contented.

Canned foods are acceptable to us in our homes. The main reason is that we can and do supplement our daily ration with fresh meat, fruit, and vegetables. In other words, we don't go to an extreme in eating a particular type of food and become tired of it.

In the field a long distance from base support, we must rely on a preserved food product. We feel that food preserved by radiation may greatly assist us in our problem.

NATURE OF THE PROCESS

As you are aware, the principal cause of food spoilage is the growth of insects and micro-organisms. In frozen foods, preservation and protection is affected by slowing the activities of these organisms. In the conventional canning methods, the food spoiling organisms are destroyed by heating. In this process the food is often subjected to high temperatures, under pressure, for periods in excess of an hour.

In radiation, there is almost no heating and the particular rays used can be either the beta or gamma type. The samples are exposed to these invisible penetrating rays and, through this penetration, the micro-organisms are either killed out-right, or their internal functions are so disrupted that they can no longer reproduce, and we eventually end up with a preserved product which can remain fresh for extended periods of time.

The entire process resembles that of taking an x-ray. Thus, if the food sample has been pre-wrapped before exposure to the rays, to prevent re-infestation by insects and micro-organisms, it will remain preserved in the fresh form—just as is now possible in your freezer. The principal distinction, however, is that with irradiation, foods will require only a minimum of refrigeration and many of them may not require any at all.

Let us examine where we are from the point of view of the two principal technologies involved. First, food—

There are four prerequisites that this method of preservation must satisfy:

1. The treatment must kill the germs in food.
2. The irradiated food must be wholesome.
3. The treatment must not adversely change the color, odor, taste or texture of foods.
4. The process must be economically feasible.

Let us see where we stand on these four points.

Killing Food Germs

There is no question but that radiation will in fact kill all the micro-organisms found in food, provided enough radiation is used. The amount of radiation required to produce an effect varies with the specie, with man being the most susceptible and bacteria the most resistant. For the same organism the lethal dose may depend upon the conditions of irradiation. In general we are fairly certain of the radiation requirements:

(rep—That amount of radiation that would be absorbed in tissue to the extent of approx 93 ergs/gm).

a. At 12,000 reps: potatoes and onions are inhibited from sprouting.
b. At 30,000 reps: trichina worms, insects are killed.
c. At 200,000 reps: Most micro-organisms are killed (Pasteurization).
d. At 2,000,000 reps: The most resistant of bacteria are killed (sterilization).

For comparison purposes only, at 500 reps, 50 per cent of exposed personnel would be killed. (Factor of 4,000).

Wholesome food

We are reserving final judgment on the wholesomeness of irradiated food until more information is accumulated. This conservative attitude is due to the potentially sizeable fraction of our diet which may be irradiated when the process becomes successful. From the data already available we can state that the treated foods do not become radioactive; they are not toxic or harmful, and are often more nutritious than foods treated by other preserving methods.

No adverse changes

We find that foods respond individually to radiation by changes in color, odor, taste and texture. Milk, for example, will develop undesirable flavor changes at 100,000 reps

while dried prunes will withstand 3,000,000 reps without change. For doses up to 30,000 reps needed to kill such things as trichina, insects or liver flukes, only few foods are adversely affected.

We have irradiated cheese. The flavor of the cheese is close to that of imported cheese. It may be possible to develop an acceptability for irradiated food, a method of developing an imported cheese domestically. These changes in flavor are departures from the accustomed flavors. Some of these may be acceptable departures. Other times they are not acceptable.

Process must be economically feasible.

Economic feasibility is somewhat a matter of conjecture at the present time. This is due to uncertainties surrounding the cost and capacity of radiation sources which will be required in commercial practice. There is at present no reliable experience upon which to base firm economic estimates. The best present estimates for different types of treatment techniques are as follows:

—To stop sprouting in potatoes or onions, .03 (plus or minus .02) cents per pound.

—To kill insects in grain, .06 (plus or minus .02) cents per pound.

—To sterilize meat, three (plus or minus two) cents per pound.

These costs will drop and the range rapidly reduce as we develop better methods for producing commercially acceptable radiation sources. This makes a fitting introduction to the next subject—radiation sources.

RADIATION SOURCES

The radiation sources may be of two kinds: reactors using nuclear fuel which produce gamma rays or electron generators which produce beams of electrons. The types of sources available are fairly clear to the food industry. What is uncertain are the respective speed of development, convenience of use, and economics.

The electron generator industry appears capable of constructing any number of machines at the desired operating ratings if orders were placed today. Electron generators have the advantage of portability, low operating cost, high efficiency, and do not use fissionable material. However, they are limited to treating foods processed in slabs such as bacon, steaks, fish fillets, cheese or grain. Electron generators appear to have the best application to foods which have a seasonal or transient processing cycle and relatively low volume at any one location but are not necessarily restricted to such use.

For gamma radiation it appears that reactors are the most feasible. It can be shown that specially designed reactors can be constructed to irradiate food and the heat thrown away and still prove to be a profitable venture. This need not be done since the surplus heat can be used for space heating and low pressure steam, both required in food processing plants.

Reactors for the food industry appear to have the strongest application for foods brought to central locations for processing in volume, such as meat, poultry, fish and possibly grain or for large packages such as roasts, or quarters of beef.

ACCOMPLISHING THE RESEARCH

At present we have contracts with approximately 50 academic, governmental, and industrial research laboratories. Within the quartermaster the main effort of the food program is centered at the QM Food and Container Institute for the Armed Forces, Chicago. Representatives of the Air Force and the Navy are on duty at the institute. Through these representatives, the needs and interest of the other services are considered and studied. Also, it is through these representatives that the other services are kept informed of the progress that is being made.

An interesting means of gaining assistance and creating interest on the part of industry in areas that may or may not be of direct benefit to the military is through "cooperative agreements" or "no cost to the government" type of contracts.

We will irradiate a firm's products in return for the firm's technical evaluation of the resultant product. Abstracts of all progress reports are compiled at the QM Food and Container Institute at Chicago and distributed to all interested and participating companies. We have approximately 30 of these agreements in effect now and negotiations are being made with five or six more organizations.

Let's take a few minutes to discuss the wholesomeness studies on irradiated foods. The work on toxicity, human feeding, and

wholesomeness is being conducted through the cooperation of the office of The Surgeon General, United States Army.

Since March 1954 short-term feeding experiments on irradiated foods have been conducted at three research institutions. After eight weeks feeding of these foods to rats and having obtained toxicity clearance on the basis of negative findings (based on growth of animals and food consumption) these foods are then tested by a palatability panel at the Quartermaster Food and Container Institute. Acceptance of irradiated foods by this palatability panel permits these foods to be actually tested on human test subjects at the Army Medical Nutrition Laboratory in Denver.

Irradiated foods have been fed to these human test subjects at levels of 35, 65, 80 and 100 per cent calories in the diet for as long as four weeks with no toxic effect.

RESULTS OF TESTS

Complete physical examinations were conducted periodically on the human test subjects with follow-up examinations for one year after they have been separated from the project. To obtain information on digestibility of such foods, complete analyses are conducted on the metabolic waste products from all test subjects on an unirradiated diet and irradiated diet. No significant differences have been observed in total energy value, utilization of protein, or digestibility for the untreated and irradiated diets.

For all the foods tested the human test subjects have found the irradiated foods nearly as acceptable as the non-irradiated foods. There are, of course, some exceptions such as irradiated powdered milk and strawberries which in first test were not as well received as the untreated products. Through all these tests no evidence of residual toxic effects from the consumption of irradiated foods has been reported. Work is continuing with future plans being concentrated upon longer term feeding of irradiated foods and the critical testing of irradiated foods that have been stored at 70 degrees F. for three to six months.

The Food and Drug Administration of the Department of Health, Education and Welfare has worked closely with the office of The Surgeon General in the design of certain experimental phases of the broad program. The Meat Inspection division of the U. S. Department of Agriculture has also been apprised of the progress in the program.

The long-term wholesomeness studies, which will carry the foods through to the point where the long-term human feeding can be started, are under way on the following foods:

Meat	*Vegetables*
Pork	White potatoes
Bacon	Sweet potatoes
Chicken	Green beans
Beef	Carrots
Sea Food	Corn
Codfish	Cole slaw
Shrimp	*Fruit*
Tuna	Peaches
Dairy Product	Oranges
Evaporated milk	Jam
Composite Food	Fruit compote
Beef stew	*Cereal Product*
Chicken stew	Flour

These are two-year studies and will be carried through four generations of two different species of animals on each food.

The foods will then be carried through the long term human feeding program, troop acceptance, plant production, and the specification phase.

CIVILIAN POTENTIAL

What the successful development of the process can do for:

a. *Farmer*

Food preservation will provide an important contribution to our agricultural economy since this treatment will result in the distribution of foods at the consumer level on a more economical basis.

The inhibition of sprouting of onions and potatoes may make possible a more orderly marketing of these products since the storage life may be significantly extended. Farmers cooperatives and other collection centers may have facilities for irradiating potatoes. This will minimize disposing of excess "overage" potatoes at distress prices because of the relatively short normal storage life.

Extended shelf life without refrigeration of some foods may expand foreign markets. Markets now closed because consumers do

not own the requisite refrigeration can be opened. This is particularly important in considering exports to lands less appliance-minded then the United States.

b. *Food Processing*

The expansion of markets cited for the farmer would also accrue to the food processor. Foods which now have a limited marketable life because of preservation difficulties may be more plentifully distributed. Oysters and shrimp for example, which are difficult to preserve even under refrigeration may be available to a widespread market.

Potato chip manufacturers, who are concerned about sugar concentration in potatoes will find that irradiated potatoes may be held longer and at higher temperatures without the formation of sugar from starch. A lighter chip will result which is more acceptable from the consumer standpoint.

Marketing of prepackaged meats might be simplified as refrigeration requirements will be greatly reduced.

c. *Public Health Officer*

The Public Health Officer's job of controlling food-borne diseases such as trichinosis, salmonellosis and liver fluke infestations can be facilitated.

d. *Grocer*

The grocer will of course share in the extended market possibilities that will accrue to the farmer and the food processor.

Overall extension of safe preservation time for many foodstuffs will reduce the grocer's losses. For example, the shelf life of luncheon meats, held under refrigeration, may be extended five to 10 times when irradiated. Irradiated tomatoes can be stored up to 14 days at room temperature. Cole slaw, stored at refrigeration temperature in perforated polyethylene or cellophane bags, is satisfactory at the end of 25 days.

Irradiated canned hams need not be kept under refrigeration. Many other meats now requiring refrigeration would be capable of being stored and displayed at room temperature when irradiated. Likewise some vegetables and fruits now requiring refrigeration will be held satisfactorily at room temperature when suitably packaged.

e. *Consumer and Housewife*

The consumer of irradiated foods would benefit in several ways: (a) an increase in the number of foods available; (b) improvements in the quality of certain foods; (c) economies due to lowered cost of refrigeration handling, and extended storage of perishables. Shelf life of items held under refrigeration will be extended reducing spoilage that may take place in the home. The storage life will begin when the package is broken rather than when packaged by food producers. In other words, the food will react to the influences of spoilage similar to that of fresh foods or canned foods after the sealed container is opened.

Future Outlook of the Industrial Applications of Atomic Energy

In research with glass, for instance, the reports are that irradiation experts in this field are within striking distance of producing a glass which is not brittle and which will withstand extremely high temperatures. Standard Oil has already reported that its researchers have produced gasoline by direct irradiation.

In Dun's Review and Modern Industry (a Dun and Bradstreet Publication) of August 1957 it is reported that the General Electric company is producing an irradiated polyethylene tape that has special sealing and protecting qualities. The Upjohn company are sterilizing heat sensitive drugs; such as antibiotics, by radiation. In the Atomic Energy Guideletter of August 7, 1956, it is reported that Westinghouse developed a process to produce silicone rubber, a synthetic rubber, from silicone gum in a matter of seconds by electron irradiation. This rubber is on the market.

OTHER IRRADIATION PRODUCTS

Atlantic Refining is producing hydrazine, a powerful rocket fuel, by irradiating ammonia; experimentally sawdust has been produced which is edible by cattle as a food; a layer of plastics over wood makes a case-hardened product impervious to moisture and insects or fungi; sugars are changed into acids; paraffin can be converted into an insoluble rubber-like material; liquid hexane can be converted into formaldehyde; castor oil is changed into a solid; ordinary colorless glass burns brown; pure white diamonds turn pink or a light green.

A highly potent insecticide has been produced by using radiation to combine benzine and chlorine; new plastics, both hardened and flexible, such as squeeze bottles, are being produced conceivably which will withstand certain amounts of heat and corrosion.

Of course, we are familiar with the use of radioisotopes in medical therapy such as in the control of cancer.

These are only a few examples. One point should be made clear, ionizing radiation does not, just naturally, produce good in all cases. The process must be controlled and properly applied to obtain the desired results.

There has been much discussion about the health hazards from radioactive elements. It is a factor contributing to the anxiety of many people toward the use of any material that is radioactive. The objective approach you are taking to learn more about the developments of the peaceful uses of atomic energy is highly commendable.

I hope that I have been able to impart to you a feeling that every effort is being made to conduct these programs, with safety being one of the primary objectives. You will play the major role in the world's realization of the many benefits from this source of energy. I have every confidence that you will contribute to and witness more advancement in better and safer living conditions than we ever dream of today. I wish you every success in this worthy objective.

CAREERS IN SAFETY

by JAMES D. HILL
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A very prosaic—a very "safe" way—to start any speech is with a definition. So let's try to define safety.

Webster says it this way: Safety is the condition of being safe; the quality of being devoid of whatever exposes one to danger or harm. In the immediate sense in which we use the word here, he says safety is "of or pertaining to the safeguarding of the public, or of a group of employees, or the like, from accident."

Another way to describe it is to say that safety is doing things the right way—not the bush league way, but the big league way. It is keeping things in proper proportion. It is getting things done without "getting done in." It is accomplishing without risking the loss of more than we could possibly accomplish.

In Webster's definition—"of or pertaining to the safeguarding of the public, or of a group of employees, or the like, from accident"—is our first clue to the nature of a career in safety; safety is not something in and of itself, but always a quality of something else—always related to something. Among the world's most misguided souls are those who try to make safety stand alone—who try to make a career of safety in and of itself.

Safety is like a muscle: unless it is attached to something, it draws up in a knot and withers away. The more things it is connected to, the more things it can move, and the more useful and healthy it will be.

ACCIDENT COST $700

The economic basis of a career in safety is that accidents in our country cost more than $11 billion a year—about $70 for every man, woman and child. I could use my $70—couldn't you? If you doubt that it costs each individual $70 a year, find some individual who has one accident in 10 years and ask him if he got out for any less than $700. Even if we never have an accident, it still costs us; because money spent on an accident is just that much less to spend on something else—and all of us have something to spend money on.

The human basis of a career in safety is that accidents kill 95,000 people and injure nearly 10 million every year. This is about one in every 16 of our total population—every year. The 95,000 dead leave perhaps a quarter of a million widows, widowers and

orphans, and grief and hardship beyond measure.

The spiritual basis of a career in safety is our belief that human life and human well-being are the most important things in all creation—that the individual human being, be he high or humble, is the most precious of all values—that concern for our fellow man is second only to concern for our God—"Inasmuch as ye have done unto the least of these, ye have done it also unto Me." There can be no higher calling than serving the cause of life itself.

JOB IN SAFETY

Do you want a job in safety? No one can tell you that any more than can anyone tell you whether you prefer winter or summer; red or blue; tennis or canasta; blondes, brunettes or redheads; football heroes or "brains"; strawberry shortcake or rhubarb pie.

What you like or don't like—what you want or don't want—only you can decide to your satisfaction. If someone else makes decisions large or small for you, to the extent that they do you are courting unhappiness. For those who are deprived, or relieved, or incapable of making their own decisions never amount to quite as much as they would if they did—and they know it. They don't quite understand the full satisfaction, the full significance of life. In a certain sense they have never lived at all.

So don't expect anyone to tell you whether you want a career in safety, or in anything else.

On the other hand, the one thing that can be worse than no decision at all is the wrong decision. We never get the chance to make the same decision twice. So it is important to get the best facts and the best advice we can find upon which to base our decision—any decision.

Here are the facts, and the advice, as best we can compose them.

PIONEER TYPE CAREER

A career in safety? If you want to make a million dollars—don't. But if you would like to make a million friends, you might consider it. If you want an easy job, and someone offers you a job in safety—run the other way, as fast as you can. But if you don't mind putting in that extra hour, and getting back that extra bit of satisfaction in a challenge fully met—you might look into it.

If you like to tread a well-beaten path, where many have gone before and the way is well posted—get into something else. But if you still feel in your heart beat the blood of the pioneers, you might find safety interesting.

If you can take a beating for nine rounds and two minutes, then bring one up from the floor that has every ounce of you in it—it just might be that safety is for you.

If you can travel along through life with a little less of the material things than you know you could get if you went after them and nothing else; if you would like to look squarely into the eye of every man you meet and know you are doing him a service; if a declining accident rate can give you the vision of a child kept whole, a life lived out, a family circle unbroken; if you are willing to take your pay not only in the currency of the market place but part of it also in the currency of the heart and soul; if you want, when you leave this life, to bequeath a little that wasn't here when you came—then maybe you ought to look into this safety thing.

It is only fair to warn you, though, that in a way of speaking, safety is "against human nature." All of our legend, all of our fancy, lean to danger. The tradition is of adventure and derring-do; meeting and conquering superior force; overcoming obstacles; of courage, risk, conflict and victory. Our folklore is a folklore of slaying dragons.

Of course if we look closely and are uncommonly perceiving, we just might discern that the biggest dragon of all is inside man himself—in his tendency to destroy himself, to raise the bet when the cards are stacked, to sell his birthright for a mess of pottage. We might comprehend that educating man out of his foolhardy tendencies is the greatest challenge of all.

This is the challenge of a safety career. If your heart is not strong enough, your mind not supple enough for it, approach it with caution. But if you want a challenge bigger than you can ever be—try and turn your back on it!

Now for the practical side. What kinds of jobs are there in safety? The answer to this is, just about any kind you can imagine. There are safety jobs in industry, of course; and as our technology develops they will become more numerous and more varied. Yesterday, a safety job in a quarry was an oddity. It is no exaggeration to say that before you end your safety career, there will be safety jobs in celestial transportation.

KINDS OF SAFETY JOBS

There are safety jobs today in chemistry, mechanics, electronics, nucleonics, and many other fields. Tomorrow there will be safety jobs in the harnessing and transmission of solar energy, sea-water conversion and transportation, wireless power transmission, and in fields that today we can not even imagine.

There are safety jobs in teaching, construction, motor, rail, air and tubular transportation, traffic, recreation, home economics, civic affairs, agriculture, journalism, broadcasting, government, delving into the earth and sailing the seas—everywhere. Yes, even in garbage collection. Name any field of human endeavor, and there you will find a safety man or woman.

The pay? Average or slightly better than average for similar work in other fields, but never quite as much as you need.

VOLUNTEER, PROFESSIONAL JOBS

Of course, there are safety jobs in safety, too. Some people even work for the National Safety Council! Let me say in this regard that the volunteers—those who work for nothing—far outnumber the professionals. If it weren't for these volunteers, the efforts of the professionals would amount to nothing at all. So even if you don't follow a safety career for pay as you go through life, don't be surprised if you get put to work anyway—on a sort of "do it yourself" basis.

Speaking of experts—you know what a safety expert is, don't you? A safety expert is a person who, away from his native habitat, poses as an exacting professional on the basis of his being able to turn out, with prolific fortitude, infinite streams of incomprehensible formulae, calculated with micrometric precision, from vague assumptions which are based upon debatable figures taken from inconclusive experiments carried out by instruments of problematical accuracy by persons of doubtful reliability and questionable mentality, for the avowed purpose of annoying and confusing a hopelessly chimerical group of fanatics referred to altogether too frequently as being safety conscious.

The basic technique of a safety expert is to blow in, blow off, and blow out. He is sometimes described briefly as "X, an unknown quantity, a drip under pressure" expert.

We chide the idea of a safety expert for one simple reason—there aren't any. It doesn't take an expert to know the difference between right and wrong, sense and insanity—and that is yet another definition we can give to safety—the difference between right and wrong, sense and insanity. There are safety specialists, who work at it full time—but no "experts." All I know about safety you can know if you work at it and think about it and read on it as many years as I have. You should live so long!

BEGINNING SAFETY CAREER

This brings me to my next point: How do we "get there"—how do we get into a career on safety? This is really a good question.

Where do we get the education for it? The answer—everywhere. The only reliable basic course for a safety career is in "The University of Hard-Knox." It is the only school that offers a bachelor's degree—and by the time you finish it, you'll probably be married.

The unvarnished fact is that you can't start into college as a freshman and take a four-year course toward a career in safety. The reason is simple: just as safety to be safety at all must be a part of something else, so also you must be good at something else before you can do a job in safety. Every safety man or woman is an "ex" something else.

For instance, there are 20 other men like me working for the National Safety Council . . . well, not just like me, but working in the same kind of job. Four of them, and I, are ex-policemen. Five come from association work—chambers of commerce, trade groups and the like. Three are ex-school teachers and one a former school administrator.

Three come from journalism, one from professional fund raising, one from a state

motor vehicle department—this one was also once a shrimp fisherman—one used to be a city manager, and one is a former F.B.I. agent. In other divisions of the Council we have ex-miners, ex-farmers, ex-librarians, ex-engineers, ex-highway department employees, ex-statisticians, ex-college professors, ex-waiters, ex-butchers, ex-bakers, ex-candlestickmakers, and ex-experts.

NEVER STOP EDUCATION

These people all have one common characteristic: they have never stopped learning. Their education wasn't finished when they graduated from high school or college—it was only begun. They have had the curiosity to look behind the "how" and try to find the "why." They have tried to find a better way. They have put in the extra thought, the extra try, the extra bit of patience—and they haven't watched the clock.

The ones who are happy at it have enough love for their fellow man to be slapped down, misunderstood, misquoted, misapprehended and mistaken, time and again and still come back for more. Oh, yes—they have one more common qualification—their skulls are two inches thicker than normal, from butting them against brick walls. If you want to be a safety man or woman, this is something you can start practicing on now. Believe me, the experience will come in handy as your career develops.

So if you want a career in safety, first educate yourself well for something else. If you go into any branch of engineering, government, teaching, domestic law, journalism or business management, your chances are good. After you are well qualified in your chosen field, then broaden your experience, give a little more than you get paid for, think safety and keep your eyes open. An opportunity will come, never fear.

Now, at this point there is education available to you—highly specialized education, at places like the Center for Safety Education at New York University, Northwestern University Traffic Institute, Yale Bureau for Highway Traffic, Southern Police Institute, The National Safety Council, and a growing number of other institutions. This is specialized training to add to your qualifications once you have determined your heading.

I should retrace my steps just a bit and tell you that there are a number of things, actually, that you can and should take in your undergraduate college training that will better qualify you for a safety career.

If you go into teaching, by all means take all the safety education courses you can. As frequently as not, these are electives. There are courses in general safety education, special courses in traffic safety, driver education, visual education, and others. These are available to some extent in all good schools of education.

If you go into government, be sure it isn't all international. Take some municipal and state government and, if it is available, some training in police administration.

If you go into engineering, the most likely branch leading to traffic engineering is civil engineering. Just about every other branch of engineering has a strong safety aspect; and in many good engineering schools, special safety engineering courses are available. Look for them.

If you go into journalism, take pains to acquaint yourself with the part of the journalist in civic improvement programs and campaigns. Take some high-level advertising courses, some courses in newspaper and broadcast editorial planning.

If you go into statistics, accounting or business management, lend an eye to the economic aspects of accident prevention.

WHAT SAFETY MAN DOES

No matter what direction your college training takes, there is one critically important point to bear in mind—the basic nature of the safety professional's job. He has a technical job, yes; but fundamentally, his function is to get people to do what they should do and know they should do, but for some human reason don't do. He teaches—but more importantly, he persuades. He compiles information—but more importantly, he conveys the meaning of that information to people who wouldn't understand it but for him. He "sends"—but he accomplishes nothing until his target "receives." The most important thing he does is to communicate—information, understanding, spirit.

What does this mean, in terms of college training? It means, regardless of the area you study in, take all the courses you can manage in psychology, sociology, English and English literature, philosophy, logic, writing, public speaking, and the widest possible variety of courses, within scholastic requirements. Remember, no two people talk exactly the same language. To each the meaning of each word has a shade of a different meaning. The more peoples' languages you can speak, the more you can communicate with, make yourself understood to.

You know, anything I say can be any of four things: what I say, what I mean by what I say, what you hear me say, what you think I mean by what you hear me say. Only when all four are reasonably similar is a thought transmitted from one person to another.

This advice is especially important to those of you who will go into engineering training. The science of engineering is extremely well developed, and the work is heavy; but an engineer's usefulness is not only in what he knows, but also in how much of what he knows he can convey to others.

Regardless of his educational background, any safety professional has still more to learn, and needs to keep on learning as long as he lives. And having learned, simply to impart his knowledge is not enough—he must make it a part of the people he is dealing with. His merchandise is safety—but his business is human relations—communication, confidence, inspiration.

SPIRITUAL QUALIFICATIONS

Finally, the most important qualifications of all you won't learn from anywhere—they are already in you, right now. These are the qualifications of the human spirit. They were described well a good many years ago by a man who wasn't a professional safety man, but who had a deep and significant kind of safety in mind:

If you can keep your head when all about you
Are losing theirs and blaming it on you;
If you can trust yourself when all men doubt you,
But make allowance for their doubting too;
If you can wait and not be tired of waiting,
Or being lied about, don't deal in lies,
Or being hated, don't give way to hating,
And yet don't look too good, nor talk too wise;
If you can dream—and not make dreams your master;
If you can think—and not make thoughts your aim;
If you can meet with Triumph and Disaster
And treat those two imposters just the same;
If you can bear to hear the truth you've spoken
Twisted by knaves to make a trap for fools,
Or watch the things you gave your life to, broken,
And stoop and build 'em up with worn out tools:
If you can make one heap of all your earnings
And risk it on one turn of pitch-and-toss
And lose, and start again at your beginnings
And never breathe a word about your loss;
If you can force your heart and nerve and sinew
To serve your turn long after they are gone
And so hold on when there is nothing in you
Except the will which says to them: "Hold on";
If you can talk with crowds and keep your virtue;
Or walk with kings—nor lose the common touch;
If neither foes nor loving friends can hurt you;
If all men count with you—but none too much;
If you can fill the unforgiving minute
With sixty seconds' worth of distance run—
Yours is the Earth and everything that's in it,
And—which is more—you'll be a Man, my son!
—And you'll make a good *safety man*, too!

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

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THE FERTILIZER SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Fertilizer Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Fertilizer Section carries on in behalf of its members, and for the benefit of accident prevention work in the fertilizer industry generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of fertilizer companies.

The activities of the Section are under the direction of its executive committee, the members of which are listed at the close of this volume.

FRONT OFFICE SAFETY

by **FRANK A. GERARD**
safety manager, Olin Mathieson Chemical Corp., New York City

We all know that we must have the cooperation of top management for our Accident Prevention Program to succeed. Without this cooperation our program will collapse.

How many of you do have the cooperation of top management? What is your top management contributing to your Accident Prevention Program? It's the same question with a different twist—Are your answers the same? Sometimes I think we get all mixed up on the question of cooperation and become complacent in thinking that we have it. Yet when we analyze it we find that we have *little* and *what* we do have is shallow and leaves a lot wanting.

Now I'm not telling you that your top management isn't cooperative. Ask them and they will be the first to tell you that they want a safe place for their workers to perform their jobs. They tell you "No sir, we don't want to hurt any of our people," and add, "I'm 100 per cent for this safety business." Sounds natural, doesn't it?

ARE SAFETY, PRODUCTION EQUAL?

And do you know that they really are sincere in their beliefs that they as top managers are doing everything they can and should do in this accident prevention business. Let me pose another question: does your management give the same attention to your problem as a safety man as they do to the guy who is in charge of getting out production? I doubt it.

Now that we have taken our top management for a ride, let's take a mirror-like look at ourselves. We are the safety men, hired to do the job. Too many of us use that old excuse of "lack of cooperation," to cover up our own shortcomings. Let me point out that if you don't have the cooperation of top management, you are not doing your complete job.

You as safety men, must in some way get *the cooperation of that guy in the front office*. I know this is sometimes difficult because the path to the front office is long and many times cluttered up with persons between us and the guy in the front office. However, somehow, someway, we must get to him. Believe me, when I tell you that the guy in the front office is a regular guy fully capable of understanding your problems and willing to help you with them.

But remember that he can't help you unless he is aware of your problems. If you have a problem bothering you, you will find that they can be solved a lot easier and quicker by having the guy in the front office on your side.

INJURY PROBLEM

Let's take a look at a few of these problems that are common to most of us. Did you ever analyze the injuries occurring in your plant and find that you were having a lot of eye injuries, toe and foot injuries, head injuries, and the type of injuries that protective equipment would eliminate?

Sure you have and you started a program to provide safety glasses to prevent eye injuries, safety shoes to protect the toes and feet and hard hats to prevent the cracked heads. It wasn't easy, was it? The glasses fogged up, the safety shoes pinched and the hard hats caused headaches.

Now suppose we take that guy in the front office into our confidence and point out to him the type of injuries we're having in our plant and how easy it would be to eliminate them, at least part of them, by the simple application of protective equipment. How much is this program going to cost? You know the answer to that one—much less than the injuries cost.

And do you know another thing—when the guy in the front office puts out the Bulletin announcing the program to his foremen, the safety glasses don't fog up nearly as much as they did before, the safety shoes become as comfortable as bedroom slippers and the hard hats worn at a rakish angle improve the looks and "We were only kidding when we said they gave us headaches."

Of course, there is a lot more to this accident prevention business than prevent-

ing injuries with protective equipment—job training, inspections, meetings, posters, injury statistics, contests, machine guarding and many others. But let me assure you—they will all come easier when the guy in the front office lends you his support.

Now let's get back to this subject of cooperation. Let's take a fresh look at it. What are we trying so hard to get from top management—cooperation? Let's give it another name, participation. Let me stop here a moment to illustrate what I mean by "participation" and tell you a story.

Several years ago one plant had a bad accident and injury record. A new plant manager and I were assigned to reduce the accidents and injuries. Production and all other operational phases of this plant were satisfactory. The one exception was the unfavorable injury rate.

PUSH FOR PARTICIPATION

On the train going out to this plant, the new manager and I decided on the plan that we thought would bring results and reduce the excessive injuries of this plant. The new manager called a meeting of the top supervisor of the plant, the plant engineer, the production manager, the projects and planning supervisor and all the others. This is about what he said to them:

"Gentlemen, Gerard and I have been given the job to improve the injury record of this plant. Production and other phases of the operations are satisfactory so our immediate and most important job is to attack this injury problem. This is the way we propose to do it.

"I want each of you men sitting around this table to put your assistant in charge of what you are now doing. I want each of you to do nothing else but work toward improving the injury record of your particular division or department. You will continue to do this until I relieve you of the assignment."

"Now," he said, "Gerard and I have six months to improve the injury record of this plant. If at the end of that period the injury rate is as high as it is now, Gerard and I won't be here." Then he added, "But gentlemen, you won't be here to see us leave."

MANAGEMENT BECAME SAFETY ENGINEERS

I don't have to tell you what happened. Immediately accident prevention became of prime importance—everything else was secondary. Top management men were the safety engineers of this plant and, incidentally, good safety engineers. So good in fact that I had little to do. They did everything that was to be done. The results? This plant of 13,000 people operated a complete year with only one serious injury; that being the loss of an index finger.

The gratifying part of this entire program was the continuing interest these top management people displayed long after they had been restored to their original assignments. Accident and injuries were no longer a problem in this plant.

I think that about tells the story—cooperation, participation—call it what you wish. Top management—front office management must be a part of your program. Without it you cannot have a successful accident prevention program.

SAFETY—A RETREAT OR A CHALLENGE

by DR. JOHN H. FOULGER

director, Medical Research, E. I. du Pont de Nemours & Co., Wilmington, Del.

During 1956, 40,000 persons were killed in highway accidents. Public announcement of this stark fact caused little comment. In the same year in Rome, a pathologist said many chemicals used to process or package food might cause cancer. He offered no proof. His purely speculative statement was repeated and magnified in the press and its repercussions are still with us in Congressional Committe hearings on new food laws.

In 1956, 28,000 persons were killed in their homes. In the same year, a presidential candidate raised the question of damage to health by "fall-out" from atom bomb tests. Again the facts received little attention, but the speculation resulted in acrid discussion, with petitions signed by "scientists" and others who frequently were ill informed.

These two attitudes: complete ignoring of data on needless loss of life and undue preoccupation with fears caused by pure speculation must appear irreconcilable to an impartial observer. They form a pattern of schizophrenia in which behavior is completely dissociated from reality. Just as a patient suffering from this mental disease can harm himself and others, so can a populace greatly harm itself if it willfully ignores facts and acts on pure speculation.

Those speculators raise fears in the name of "safety" and "public health." In the name of "safety," they demand that advances in food technology and radio activity should be prescribed unless shown to be "absolutely without harm" to the health of a single individual.

CAN'T GUARANTEE SAFE ACTIVITY

On the surface, this is an admirable demand. But analysis leads to an impossible situation. No human activity can be guaranteed absolutely harmless. I can not be sure that, as I rise from my bed after a sound sleep, I will not suffer circulatory collapse, because in sleep my muscles relaxed and cannot suddenly adjust themselves to the hydrostatic forces in moving from a horizontal to vertical position, and so cannot assist the flow of blood to my heart.

I cannot guarantee, as I step out of my doorway, that a roof tile, loosened by wind or rain, will not fall on my head.

I cannot guarantee that my neighbor's dog, usually very friendly, will not suddenly become aggressive.

Guaranteed, absolute safety is incompatible with any conceivable activity. The demand for guaranteed safety prohibits advancement in either the arts or the sciences. Safety has no meaning if divorced from activity.

This matter is of vital importance to those of us who attempt to prevent illness, or traumatic injury. The extremes of attitude shown by people are themselves unsafe—dangerously unsafe.

The rising loss of life and greater incidence of injury on our highways stem from indifference, carelessness or even contempt of both the harmful potentials of the automobile and the police powers of the state. But unfounded fear, aroused by propaganda based on pure speculation, can be an even greater enemy of safety than can contempt. Drastic action can sometimes convert contempt into respect. But what action can allay fear?

As a physician I deplore the "fear technique" employed by many national organizations in fund campaigns for medical research. The fear engendered by "scare headlines" might do more harm in a short time than research could nullify in years.

Not long after the report from the Rome meeting of the International Union Against Cancer said materials used to process or wrap foods might contain carcinogens, I received a letter from New York. The writer, about 60 years old, was much concerned if he could safely eat foods wrapped in modern synthetic films. His physician had told him not to purchase fruit or vegetables wrapped in plastic bags. They might cause cancer.

In France, Belgium and Germany, following the Rome statement, an organization was set up to oppose wrapping food in modern plastics. The fact that modern wrappings protect food and reduce the incidence of poisoning from bacterial contamination is apparently of minor importance compared with the pure speculation on the cause of cancer.

FEAR RESULTS IN IGNORANT ACTION

A few years ago, when a national organization started a campaign for medical examinations to detect cancer in women, two physicians told me their great concern about the mental state of their wives. Both were older women. Both had read the bulletins of that society and feared they had cancer. But both were afraid to have an examination because it might prove they did have cancer.

Fear, inevitably, leads to an attempt to hide. Its immediate results are either deliberate inactivity or aimless flight with uncontrollable, unpredictable results. Abject fear can lead to panic. A single individual suffering from fear can panic a whole crowd. Again, we have ample examples—the Cocoanut Grove fire in Boston, the

circus fire at Hartford, Connecticut. The possibility of fear and panic was the greatest problem of civilian defense workers during World War II, and it is a still greater problem in the present atomic era.

If both contempt and fear are enemies of safety, what mental attitude should be developed in our fight for safety?

First, what do we really mean by "safe?" A good working definition by the Food Protection Committee of the National Research Council is "'Safe' means the practical certainty that no harm to health will result" from a given activity. Note the "practical certainty" not the "absolute certainty." Webster's dictionary defines practical as "given or disposed to action as opposed to speculation."

In our application of the words "safe" and "safety" therefore, we cannot divorce them from action. That action must be orderly action, not misdirected action induced by fear, nor careless, nonchalant action accompanying contempt.

What is the basis for this action and, therefore, for safety? Obviously, there must be knowledge. To establish safety in any operation, whether it involves simple or complicated mechanical apparatus, the use of chemical agents, or physical forces such as heat, electricity or radio activity, we must know what we are doing. We must know much about the mechanisms we use to know their potentiality for good and for harm.

Obviously, we must respect these mechanisms or these agents. When we realize hazards are involved in our operations, we must develop continuing respect for them. With this respect, we can carefully study the hazards and devise methods of reducing them or protecting against them.

In our plant safety programs we must remember that often those closest to the hazard may not be as well informed as we who set up the program. Ignorance leads to fear rather than respect, and fear disregards common sense. Fear can convert a safe situation into a hazardous one. In our training, therefore, we must be diligent in allaying fear.

RESPECT HAZARDS

Finally, we must never forget that despite all our efforts for good operation and maintenance, physical equipment can break down and human error can enter. Fatigue, incipient illness, improper nutrition and family worries lead to inattention in even the best worker. Limited knowledge may render a good worker incompetent to handle a serious emergency. For this reason a properly designed disaster program must be set up.

Safety looked at from this standpoint offers a challenge to all of us; a challenge to acquire all the knowledge about our operations and their possible hazards; a challenge to devise safer ways of attaining our ends, or better protected procedures or devices for hazardous operations or materials.

If we let fear prevail, if we demand the unattainable—absolute safety—and use this demand as an excuse to retreat from reality, we can only be certain of one result—complete, stultifying inactivity and the drying up of all sources of new knowledge and all social progress.▲

HOW WE CAN PROFIT FROM THOROUGH ACCIDENT INVESTIGATION

by JAMES E. KAVANAUGH

supervising engineer, Engineering & Loss Control Div., The Travelers Insurance Co., Minneapolis, Minn.

We are here to consider the accident and how thorough investigation of the accident can, and does, lead to effective accident prevention activities, and so contribute in a real way toward an overall effective program. We do not expect to treat the accident problem as a whole, but rather to consider how one accident at a time will serve as a means to bring this problem into range, and maintain a program directed toward the real target.

A number of accidents may be selected for analysis and study as a group at any time. Such a study may indicate some patterns which lead to certain statistical conclusions upon which a program of training, education, publicity, or other accident prevention activity is based to meet a definite problem established through such analysis study. Such conclusions can be reached only by analysis of the factors involved in each accident.

COMPLETE FACTS REQUIRED

Thoughtful consideration will show that the conclusions reached will be justified and worthy of recognition only if they are based on true and complete data concerning each one of the accidents in that group. Anything less all the facts surrounding each accident in the group will lead to erroneous conclusions, the adoption of unjustified activities in the safety program, and consequently, disappointing results from many of the things we try in this field.

As we progress I plan to show that a weakness in the accident investigation procedure is not only a weakness in this one phase of the program, but also supplies the lack of sound information and false data that leads to false conclusions upon which we base the activities set up in our entire accident prevention program. No wonder that so many of our plans seem to fall through.

FALSE FACTS HAMPER PROGRAM

A short time ago I had occasion to review a plant accident file to establish the points of problem and to recommend a program for improvement. If the conclusion set down by the supervisors were accepted as thoughtful ones, based on analysis of the occurrence, we would conclude that the accidents occurred, at least 90 per cent of the time, because the man involved did a stupid thing, contrary to well known and established rules, for no apparent reason other than a complete disregard of all consequences.

Obviously such a conclusion, if a just one, would make prevention of accidents an impossibility. The control of any problem is predicated on the proposition that all, or at least a great majority of those involved want to eliminate the problem, and are ready to work to that end. This situation existed only because the data established for each accident was not true or complete, and the conclusions drawn were for some other purposes than to identify a problem and establish a remedy for that problem.

One specific example will demonstrate the results from an incomplete development of the accident facts as well as from erroneous data. In this case a man came to work one morning suffering greatly from the effects of a night on the town. It was reported in the first investigation that this man accidentally took a drink from a whiskey bottle containing carbon tetrachloride.

Following this, the man, not feeling quite well, went home to his bachelor quarters. Two days later he went to the hospital with a heavy cold, and he died shortly thereafter from the effects of his drink of carbon tetrachloride. Based on this, the conclusion reached as a result of investigation by the supervisor, was that a more suitable container be used for carbon tetrachloride, and with this correction the case was closed.

MORE FACTS REVEAL TRUTH

Because a fatality was involved in this case, a subsequent investigation was made on a more thorough basis. It was found that the man came to work on this morning with the hangover. As he joined the crew the supervisor chided him for his weakness saying, "If you must drink why don't you try some of that sometime and make a good job of it" (pointing to the whiskey bottle containing the carbon tetrachloride).

Before the man could be stopped he took the advice offered and drank some carbon tetrachloride. Following this the man did become ill, went home, finally reported to the hospital saying he had a bad cold, and he died.

With the new information developed in this investigation, there are several additional, worthwhile conclusions which can be used to correct some obvious weaknesses in the safety program at this particular place. Some of these would be as follows:

1. The matter of the supervisor's handling of the employee who reports to work in unsatisfactory condition should be given attention. Analysis may show this to be an order on a

plant wide basis and perhaps an instruction program would be in order.

2. The matter of prompt and adequate medical attention for injured employees needs clarification, and procedures for properly reporting such instances may need revision, or to be established.
3. The matter of follow up on an employee who leaves the job under questionable circumstances needs attention. Note that in this case medical attention was not arranged at the time of the occurrence, no report was made to any other person so that follow up attention could be given, and no attention was personally given by the supervisor involved.
4. Of course, a more suitable container should be provided for the carbon tetrachloride, but we now find that this was only a minor factor in this case, with other more widespread weaknesses evident as a result of a real investigation.

Consider here that the only reason an investigation was made that could lead to some intelligent and effective handling of the problem was because a fatality resulted. If this seems to violate the foundation principles on which we wish to build our accident prevention program, we have another good reason for giving this matter of accident investigation work more attention.

TRUTH AIDS ACCIDENT PROGRAM

This accident problem often seems insurmountable when viewed as a whole, and often ridiculous when considered in the light of the false and incomplete data available to us. This problem can be brought into focus if we will give enough attention to the digging into the specific problem to get the full and accurate actual information, and to reach conclusions through our best efforts at problem analysis. To this end I would now discuss the matter of accident investigation.

To begin with, this procedure is justified on the basis that practically all men are honest, interested in their own well-being and security, as well as the well-being of their fellow man. The fact that the job performance is not always up to this standard has its cause in some specific factor that can be found only through a complete investigation.

Perhaps this was best said by one of our outstanding men in the field of training, "Most accidents occur because someone did not know enough about something." If we identify the something which was not known with accuracy, and relate it to the person or persons who are involved or can be involved, we have started a chain of action that can lead to successful accident prevention work.

As a second consideration, each person and each firm or organization has established certain standards of performance which they attend to attain in all phases of their enterprise, including accident prevention work. Sometimes, especially in the accident prevention field, these standards are obscured even from themselves when they feel standards set might not meet general approval if set forth for examination.

ACCURACY CUTS ACCIDENTS

As a consequence you will often find men, even in high places, will assure you solemnly that they most certainly want to prevent all accidents. Yet, they will point helplessly to a man who bumped his arm against a building column and lost time when the arm became sore. With a set of true standards set up and acknowledged, it will be obvious that this accident defied control because the injury or potential for injury from this type of accident was so slight compared to the expense and inconvenience required to correct or eliminate this possible hazard.

The dividing line between accidents in this category and those which result in a serious injury, or have a potential for serious injury, is definitely set in each organization. I would strongly recommend that everyone resolves to find his dividing line, recognizing that experience tomorrow, or next year, may cause him to shift the line one way or the other. With a clear view of how far you are now ready and able to go, you will be in good position to apply your efforts to make them count, and get good results.

We must also be certain that we are not trying to identify a person guilty of some defection in this investigation, for the end result of this would be a criticism, rebuke, penalty, or punishment for that person.

This could be great deterrent, and may be a good way of handling criminals, but fortunately we are dealing with good substantial men and women who are trying to do a good job to earn the best living they can.

Investigation should deal entirely with the accidental occurrence, to identify the cause, or causes, of the occurrence, and to establish measures for control of the cause. The end result can be that some person will be required to make some change, adjustment, or undertake some other specific action designed to control or eliminate the cause of the accident as determined.

MATERIAL HANDLING PROBLEM

Perhaps an example in line with this last statement would be well in order. A loading elevator was used in one plant to raise sacked material from ground level to the floor level of the plant. The elevator was loaded at ground level, and then the men would enter the building through a regular doorway to raise the load and transfer the material into the plant area. One man was accidentally injured because, contrary to instructions and rules, he climbed over the loaded platform to the building floor, instead of using the doorway.

At first consideration, how easy to say that rules were violated and punishment was in order. A good investigation, however, showed that the doorway was 75 feet from the elevator location requiring a walk of at least 150 feet each time a load was handled. This was a great inconvenience and a waste of time. Therefore, not only this one but all men assigned to this particular job took the more direct route over the loaded platform as a matter of course.

WHO SHOULD INVESTIGATE?

Investigation of the cause of the unsafe method of gaining entrance to the building, if such were ever noted by a responsible supervisor, could have determined this same reason for the bad procedure long before the accident occurred. In any case installation of a door and proper steps adjacent to the elevator eliminated the inconvenience, waste of time, and made unnecessary attention to enforcing the rule against climbing over the loaded platform.

With this change, the safe method also became the easiest and the most convenient, thus making the safe way more desirable to all persons concerned.

With this, we come to consider the actual investigation procedure. Obviously the person best qualified to do the job should do it. In industry this is the supervisor in charge of the operation and the person involved in the accident who knows and understands this specific planned job in question.

The fact that this supervisor will usually be the person responsible for making at least some of the adjustments in procedure and other matters, also makes this a desirable place at which to start. This set-up would result in getting the best possible job started and in training the supervisor in investigation, analysis and self analysis, and other qualities to assist him in all phases of his work.

The findings of this investigation should be reviewed by the department head, superintendent, safety director, and others who have a responsibility in this work, each to make the correction complete, perhaps even to draw plant wide attention to the problems disclosed.

OUTLINE AIDS INVESTIGATION

Although an accident investigation may be made with no tools, we have found that a much better job can be secured by providing the supervisor with an outline to follow. A little imagination will show that this outline can be so arranged that it will guide him through an orderly investigation, serve as a form to record his findings concisely and orderly and result in enough standardization of the record material to make further analysis and consideration of this report much easier.

My suggestion here is not to recommend any specific form of outline, but rather to analyze the purpose for which this form should be used, and give attention to proper application of the investigating procedures. Any form of outline and report can be considered satisfactory if it incorporates at least the following major points.

- Provision for full identification of the incident under investigation, including date, time, specific location, person, machine, and equipment involved.

The purpose of this is only identification to aid in consideration of other factors that may be involved in the occurrence. Let us emphasize again we

investigate one accident at a time, not as a type, but as a very specific incident.

- A description of the injury or damage is recommended. This may give some idea as to the seriousness of the accident type, and will identify the evidence which motivates the investigation. In this connection the serious injury may have real value, but care must be taken to assess seriousness of a relatively minor injury for, in this case, it may be the potential for injury that should be considered as the guide to the seriousness of the accident.
- Description of the accident. This is the fact finding portion of the investigation upon which all of the conclusions to be made in following consideration finds its base. All factors involved in the accident should be established and recorded, beginning at the point with the men, tools and equipment are brought together, and continuing step by step to the point of accident. In other words, this should be a factual history of the job or task from its beginning to its conclusion in the accident.

  Perhaps a fall from a ladder might be said to occur when the man lost his balance and began to fall. The incident, however, also included the man who used the ladder, either under instructions or for some other named reason, to perform a specified job, and includes identifying the ladder, its set-up, and the progress of the work to the point of fall.

  All this must be factual and complete. Any tendency to alter, suppress, or otherwise depart from actual fact must result in false conclusions, and an inadequate corrective action.
- Name specific condition and/or acts which caused this accident. The condition and/or act which caused the accident may or may not be subject to control at this time. If the final conclusion is to be reasonable, the specific items named should indicate the exact point where the progress of the activity departed from the planned course of progress.

  In the case of the man falling from the ladder, it might be found that the man used both hands to carry an object up the ladder, and this could be identified as the specific cause of his losing balance on the ladder.
- The reason for the specific cause or causes named.

This item is often included with the above item, but I feel that it should be considered separately in this discussion. In many cases, the reason for the immediate cause of the accident is much closer to the remedy than the cause itself.

CAUSE DETERMINES CORRECTION

In the case of the man losing his balance and falling from the ladder because he tried to ascend the ladder with both hands full, effective corective action might well depend on the reason entirely. Consider a few things that could have served as reasons in this case.

1. The man had performed a like task in this manner as a matter of habit, and did not realize the possible consequences of his action. Perhaps an explanation of the proper use of ladders and the reasons for the rules of use is indicated. This might well be made the topic of discussion at a tool box safety meeting, followed by special supervisory attention to observation and correction.
2. The object handled might have required both hands to handle it. Here it might indicate a lack of job planning on the part of the supervisor or the workmen, and may require correction there.
3. The ladder may have been a substitute for some other arrangement. If so the substitute of a substandard arrangement as a matter of work procedure would be the problem in question.
4. This could be a two man job. Because of shortage of help, or some other reason, this one man was assigned to the job. Here the balance of how far to go in emergency situations may be subject for control action.

Each reason, and perhaps other, would point to a specific corrective action as the one in order. The selection of the correct factor would lead definitely to the most effective corrective or control action.

- **Remedy.** Each investigation should conclude with the specific action to be taken to prevent a similar occurrence. A man convinced that a similar accident shall not occur, will not find any remedy, even one involving effort and real attention, to be a burden. The remedy will be anticipated as an opportunity to improve the quality of the work performed under his responsible direction. The remedy selected must be adequate and carried to a conclusion.

STEPS IN REMEDY

A conscientious and thinking man will know that a remedy is often difficult and may, on occasion, require some temporizing. Then too, with full knowledge of what must be done, he may find it necessary to program the correction. Many times he must consider that a remedy must include at least three steps in progress.

1. *Immediate or temporary action to control.* In some cases a final and complete control or correction of an existing hazard may be both impractical and close to impossible. In such cases the supervisor should take temporary action to prevent a similar occurrence, even if the temporary action may require specific attention on the part of the supervisor, some inconvenience, or other undesirable situation. It is not enough to identify the problem and arrange for correction, but immediate action must also be considered.
2. *Permanent correction.* Permanent elimination of the hazard through revision of progress, guarding, replacement, or other action as soon as practical should not be overlooked. This is important, for until this permanent correction is realized, the temporary controls, or other action of some inconvenience must be maintained. It is important to return operations to normal as soon as possible.
3. *Planned control of future problem.* Control procedures to identify similar conditions before a point of failure or accident occurs should always be considered. This might require inspection, testing, schedule for reinstruction of workmen, changes in overall procedures or schedules, or other action to be undertaken on a planned basis.

   Particularly in this phase of the work, it should be recognized that once this control action is set up it should be considered no longer a matter of accident prevention consideration, but is a revision in operating procedures set up for the overall improvement of performance.

This, then, is an examination of the case for your serious consideration of accident investigation work. Once started on a course of action that leads to a study of this procedure, you will find your convictions that accident investigation procedures can form one of the cornerstones of an effective accident prevention program at least as strong as mine.

Our accident problem is made up of the individual problems involved in each specific accident which meets one qualification, that it lies in the area wherein you, as an individual, or as a responsible person in an organization, are ready and willing to act. Followed with patience, perseverance, and vigor, applying a common sense remedy to each of these problems as you are able to identify them specifically, will certainly bring the results you seek.

VISUALIZING AMMONIA HAZARDS

by E. V. ANDERSON
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Before discussing handling of ammonia, we should review some of its chemical and physical properties. Chemically, ammonia is somewhere between calcium and sodium. The union of ammonia with water gives ammonium hydroxide a caustic material

with hazards similar to those of calcium hydroxide and sodium hydroxide. This is the form in which most people have seen ammonia. Being a gas, it is constantly escaping from the solution at a rate determined by the temperature and pressure on the surface of the liquid. Concentrated ammonia water has about 25 per cent ammonia by weight and will start to boil off rapidly at a temperature under 100 degrees F.

Even for a one per cent ammonia solution, the vapor concentration at equilibrium will have one per cent ammonia vapor in the air space of the container at room temperature. Except for the slower rate of evaporation, ammonia water solutions are equivalent in hazard to liquid ammonia from a toxicity standpoint. To cite an extreme example, it would be possible for a fatality to occur in a closed tank which had held even a one or two per cent ammonia-water solution. Of course, an open tank at this concentration would present no appreciable hazard since natural room ventilation would dissipate the gas as fast as it came off.

DANGER: LIQUID EXPANSION

In the *anhydrous (dry) gas*, ammonia is a liquid at one atmosphere pressure and minus 28 F. temperature. With sufficient pressure, it will remain a liquid as the temperature is raised and an ordinary ammonia cylinder will have this liquid under an internal vapor pressure of 114 pounds gauge at 70 F. Raising the temperature to 140 F. triples the pressure to 364 pounds for a partly filled cylinder. At the boiling point of water the pressure is 900 pounds, while at 270 F., the pressure is 1600 pounds, equivalent to the normal pressures found on oxygen cylinders for example. However, the hazard of ammonia cylinders is more serious than that of other compressed gases for several reasons. *First*, the gas is a noxious or toxic material. Leakage of an oxygen cylinder aside from possible fire hazards presents no damage other than loss of material. However, one-third of a pound or about one glass full of liquid ammonia if vaporized in a 10 by 10 room would be quickly fatal.

A second hazard is the liquid expansion as the temperature is raised. Comparing ammonia with water, and taking one cubic foot of each material at zero temperature, there are two-tenths of one per cent expansion of the water up to room temperature but 10 per cent expansion in volume of the liquid ammonia. Going to a temperature of 140 F., which is considered to be the maximum reached in direct sunlight, water will have expanded by 2 per cent and ammonia by 20 per cent. Increasing the temperature to 270 degrees as might occur with steam heated equipment, and water has expanded by a total of 7 per cent while ammonia has almost tripled in volume. This is the expansion of the liquid not the gas. The pressures developed by liquid expansion are entirely different in magnitude. It takes almost 10,000 pounds or five tons per square inch to cause a ten per cent change in liquid volume. Because ordinary ammonia cylinders are hydrostatically tested at 700 pounds it is always necessary to leave sufficient outage or room for liquid expansion when filling a vessel with liquid ammonia.

The common filling density leaves 12 per cent of the space empty at room temperature, but due to expansion the cylinder will be completely filled with liquid at 145 degrees F. Filling densities commonly refer to the weight of ammonia over the weight of water, which would completely fill the cylinder. Maximum filling density is set by ICC at 54 per cent for the usual cylinder. However since water is a heavier liquid, a cylinder which has 54 pounds of ammonia and which could hold 100 pounds of water will actually be 88 per cent filled at 65 F. Ordinary ammonia cylinders have no safety devices of any type. Most of the other gases will have fusible plugs or similar devices to relieve the contents in event of fire exposure.

Because of the absence of a relief valve, it is obvious that any ammonia cylinder in a plant fire is bound to rupture and discharge its contents into the room. It is also obvious that cylinders of ammonia should never be warmed directly by water bath, steam or flame. For the same reason they should not be stored near sources of heat or near potential sources of heat, such as highly flammable substances. A maximum temperature recommended by the Compressed Gas Association for any cylinder is 125 F. This point cannot be stressed too much because there is a tendency on the part of the user to increase the flow of gas by applying heat to a cylinder. Under ordinary conditions, a cylinder will give a maximum of 50 cubic feet per hour since heat must flow in through the walls in order to vaporize the liquid inside.

In the literature you will find that 50 p.p.m. is normally detectible by odor, and 100 p.p.m., which is the same as one one-hundredth of one per cent, is the suggested maximum allowable concentration for continuous exposure. Since there would be a definite odor at this concentration, you should maintain less than 50 p.p.m. as a reasonable working condition. This would be about one-tenth of the first real hazard, which is found at about 500 p.p.m. where irritation will take place in less than one hour and definite scarring of eye tissue might occur.

To repeat, 500 p.p.m. is about 1/20 of one per cent of ammonia vapor in air. A concentration four times as great as this or 2000 p.p.m. will cause burning of the skin and can be fatal in a half hour exposure. This again is only one-fifth of 1 per cent ammonia. Concentrations of 5000 to 10,000 p.p.m. or still under 1 per cent ammonia are rapidly fatal.

BODILY INJURY HAZARD

For rescue work in such atmospheres, a cannister type gas mask approved for ammonia will last a very short time. Such gas masks are good for only about five minutes when new in concentrations of 3 per cent or 15 minutes for a concentration of 1 per cent if there is no deficiency in oxygen. Anyone who must work for more than a few minutes in these concentrations should be equipped with a one-piece rubber suit plus the full face gas mask. For higher concentrations or where the concentration is unknown, supplied air respirators or oxygen breathing apparatus should be worn.

There are no chronic affects from continuous exposure to small quantities of ammonia except that the gas is soluble in perspiration and may irritate any skin surface where moisture has accumulated. Discomfort in these areas may be minimized or prevented by the application of oil or vaseline in addition to wearing of protective clothing.

The MCA Bulletin on ammonia suggests wearing cotton shorts, trousers and undershirt, rubber boots, gloves, aprons and raincoats, rubber or felt hats and safety goggles of an approved type. For optimum protection, collars should be buttoned, glove gauntlet tucked inside sleeves and trouser legs left outside of boots.

As mentioned before, one glass of ammona evaporated in a 10 by 10 room could give a fatal concentration. This corresponds with 1 per cent gas or 10,000 p.p.m. At ordinary temperatures and pressures one molecular weight of any gas will occupy about 388 cubic feet. Thus, 32 pounds of oxygen, 28 pounds of nitrogen, 28 pounds of carbon monoxide, or 17 pounds of ammonia will give 388 cubic feet of gas. To calculate, use a table of atomic weights of the various elements. It follows that 1 pound of ammonia will give about 23 cubic feet of gas. With a weight of 5 pounds per gallon, one gallon will give 115 cubic feet. With 4 quarts to a gallon and four glasses to a quart, one glassful will produce 7 cubic feet of gas or produce a concentration of 1 per cent in 700 cubic feet of air, thus giving a fatal concentration in a room 7 by 10 by 10.

Since 50 p.p.m. of ammonia is detectible by odor, for this very reason ammonia poisoning as such is a rare event. However, emphasize the subject with all employees both old and new. For oldtimers, familiarity has bred contempt, while with new people the danger increases. One incident occurred in a chlorine plant where an employee smelled chlorine all night long and being a new man, assumed that was the normal situation. He ended up in the bospital. The ammonia hazard should not be considered an occupational disease hazard. It is rather an accidental exposure hazard.

SOME ACCIDENTS OCCURRED

Almost all accidents will result from breaking lines or similar incidents which discharge a high concentration in a small air volume. One accident occurred when an employee kicked a control lever to shut it off and fractured the connection. Another accident occurred when cleaning an oil separator without relieving ammonia pressure from that particular line. Again, dropping a load broke a half inch pipe, resulting in one death. Dropping a cylinder from a truck to the dock also caused a death when a cylinder ruptured.

A very unusual incident occurred in salvaging some scrap pipe in a yard. This pipe had been taken from the ammonia refrigeration system 13 years before and was thrown in the scrap pile to salvage the valves when needed. When taking the valve off workers discovered that the section of pipe between two valves had filled with liquid ammonia during this 13 year period. But they discovered too late, and a temporary eye injury resulted. Several years ago in New York an employee was killed while cleaning an ammonia tank, when the valve leaked and a blank inserted in the line failed.

As with most chemical hazards, the exposures will interest operators and more important, pipefitters and maintenance men. Actually preventing accidents is *half* the responsibility of the pipefitting department when they install and maintain equipment setups.

Another hazard of ammonia systems comes from the compressors or refrigeration equipment. Every year, explosions occur in compressors, separators and generating equipment. Articles in *Refrigeration Engineering* in November and December 1931 discuss this type of explosion.

BEWARE OF LEAKS

Once an ammonia explosion occurred when ammonia was used as a [illegible] to cool a large building. A watchman noticed the odor and shut off the refrigeration system in a separate building. However, before masks could be secured to enter the building and open windows, an explosion blew out the upper floors. No one was injured, but there was great property damage. It was decided that rupture of a fitting had permitted the entire floor area to be filled with ammonia vapor which is normally considered explosive in concentrations between 15 and 25 per cent.

You will note in the literature that an ignition temperature of 1200 degrees is cited. However, *this should never be taken to* mean that the whole mass of gas must be heated to that temperature. In theory, a single spark or match flame heating a fraction of an ounce of material could set off a chain reaction which would produce an explosion. Again, oil vapors introduced through compressors, for instance, may increase the fire hazards somewhat. The incident just mentioned of a massive leak in an unoccupied building is the only one in the writer's knowledge involving a flammable vapor explosion. However, the hazard should be considered whenever a process involves heating ammonia air mixtures or large volumes of ammonia gas vented into enclosed areas.

The hazards of ammonia are no greater than many other materials. Safe practices for the maintenance of pressure equipment, the handling of cylinders and training of employees are the same here as in any department or operation in your plant. If you are running a safe plant, you will handle ammonia safely. If you do not handle ammonia safely, you are not running a safe plant. One follows the other.

REDUCING THE HAZARDS OF USING NITROGEN SOLUTIONS AND ACIDS; CARELESSNESS CAN BE COSTLY

by ELMER C. PERRINE

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Transition from the simple processes of past days to the complexities of modern industry is often neither simple nor pleasant. The fertilizer industry has successfully absorbed its personnel into the complicated activities of granulation and general modernization.

In most cases the transition was achieved with safety and efficiency. Where the transition has been attended with hazards, the

accusing fingers may be pointed at management and those who should know the hazards yet failed to carry the message through effective channels.

It is convenient, but certainly neither safe nor accurate, to believe granulation is merely an extension of the making of pulverized fertilizer. Several aspects of the use of sulfuric and phosphoric acid, largely confined to granulation, demand increased alertness.

Often, through misunderstanding principles or poor maintenance, the stage is set for trouble and the trained observer can possibly predict the outcome fairly accurately. Something can usually be done in time to bring the more happy results for which the plant is being operated.

More acid and nitrogen solutions are used in a ton of granulated fertilizer than in pulverized grades because the causing granulation, drying, and cooling will accommodate the products in large quantities and leave a fertilizer of good quality. Under some conditions pulverized fertilizers may also use large amounts of acid and nitrogen solutions, such as high analysis grades for bulk spreading and under other favorable conditions.

AMMONIA AND SUPERPHOSPHATES

The industry is now sufficiently advanced and formulation and analysis are no longer matters of chance. To be competent today an operator must know that superphosphate will readily hold large amounts of ammonia at high efficiency. But it can do this only if the ammonia is delivered to the superphosphates in direct proportions to the amount of superphosphates adjacent to the various regions of the distributor pipe.

He knows also that the ammonia should be mixing with the superphosphates as it enters the mass. Many operators are aware that ammonia gas is usually associated with high rates of ammoniation and this requires special consideration in design of equipment and in techniques of operation.

These are features developed ahead of granulation and have been adopted as originally developed, without many serious accidents.

However, only a few operators realize the sulfuric acid should be as uniformly matched against the ammonia as should be the superphosphates. The formula may be adjusted correctly as regards the maximum ammonia take-up by the superphosphates *and the sulfuric acid. But, through faulty* design of equipment or its maintenance, or some imbalance in the process, there may be local areas of varying sizes where excesses of acid exist.

BEWARE HEAVY CONCENTRATIONS

In some cases of fires in the mixers, certain conditions have been observed to exist. These same ones also exist in other cases where is is only "excessive fumes or the loss of nitrogen" concerning the operator.

The more conspicuous of these conditions permit heavy local concentrations of some ingredients. Fortunately, enough heat locally generated is usually dissipated throughout the mass by mixing, or by the evaporation of water, and the result may be only poor granulation or the loss of nitrogen.

The liquid phase favorable to granulation is achieved with less water if the temperature is raised. Since the heat of reaction of a pound of ammonia with sulfuric acid is *about twice that of the reaction with* normal superphosphate and the evaporation of water is cooling, the temptation is to react much sulfuric acid and to have a minimum of water present.

Correctly performed at fertilizer manufacturing rates this is recognized procedure and need cause little concern. Increased attention should be directed to all details, as such a schedule is advanced. Carelessness here can be costly.

Some operators apply the sulfuric acid in one large stream through an open pipe. Others through poor inspection or maintenance find an original good acid or ammonia distributor pipe corroded or worn so badly that nearly all of the material escapes through one hole.

MUST INSPECT PIPES

There is a very serious corrosion problem where the acid becomes hot and diluted with water. The abrasion on submerged *pipe is also severe. Close* daily inspection should be instituted. Some distributor pipes last no longer than three or four days before losing their good distribution pattern.

Stainless steels have often only about double the life of extra heavy carbon steel pipe. Various coatings have been tried and

some have a good promise of materially extending the life of these distributor pipes. Good distributor pipes are metering manifolds, meeting quite exacting requirements. To be effective, they should remain as originally designed.

PRESSURE CHANGES SERIOUS

The plugging of holes has been almost as serious as corrosion and abrasion in destroying the delivery pattern. Any inspection of the numerous acid and ammonia distribution pipes scrapped show they were used a great deal after they had become potential hazards. Any change on pressure requirements of acid, water, or ammoniating media should arouse immediate suspicion.

Failure of the distribution pattern of the ammoniating solution can have the same results as an erratic distribution of the acid. Both of these and any added water should be applied uniformly throughout the mass, allowance being made for the decreasing rate of ammonia take-up as the superphosphates approach saturation.

This applies to batch as well as to continuous operations. In the usual fertilizer plant, under no circumstances should the same distributor pipe be used for acid and ammoniating solutions. Mixing these two products in a chamber as they entered the mixer has resulted in serious troubles.

The interlock system in many continuous processes automatically arrests the flow of acid and nitrogen solutions when the flow of dry materials to the mixer is interrupted. In batching mixing, the hazards are greatly reduced by withholding the potassium chloride until after the acid has been neutralized by the ammonia. Where anhydrous ammonia is employed in addition to ammoniating solutions, the risks are also greatly reduced by adding the anhydrous ammonia to act on the acid before the ammoniating solution is added.

DISTRIBUTION IMPORTANT

Even with the large amounts of acid often used in some granulated fertilizer, where timely delivery and good distribution of the acid and the nitrogen solution are maintained, there need be very little ammonium nitrate present until after the ammonia has neutralized all of the sulfuric acid.

The problems are largely those of uniform distribution of both the acid and ammoniating solutions to the mass of the fertilizer.

Reference is made to the cost of carelessness. Barring the sudden breaking or plugging of the acid, water, or ammonia distributing pipes or an original design that was insufferable, some conditions associated with fires or explosions develop gradually from good or reasonably good conditions. Operating techniques, as well as equipment sometimes creep unnoticed from good to hazardous.

If the bookkeeper were looking over an operator's shoulder, observing the total cost of each ton, or even the last ton of the day, he could demand an investigation long before the operating conditions became a source of danger. He may still object only to the rapidly mounting costs of ingredients or poor working conditions, and may be totally unaware that the plant could be lost sometime later through reasons other than bankruptcy.

COSTS LOSSES

The loss of plant food through poor distribution and poor mixing of ingredients may reach a unit of nitrogen per ton of fertilizer. Add to this the cost of the extra acid that usually accompanies these cases and the total cost could reach one dollar per ton of fertilizer, and is sometimes higher.

Acids and nitrogen solutions are used in great quantities per ton and in many tons of fertilizer without serious hazards. Although the operators may not realize it, just plain effective and efficient operations are good precautions against hazards that arise from using acids with nitrogen solutions.

The risks in using acids with nitrogen solutions could be materially reduced through the same means that achieve maximum granulation, while retaining the maximum amount of ammonia and using only the minimum amount of acid at its peak of effectiveness for ammonia take-up.

The interests of safety would be served without any reference to hazards from carelessness. Any fires are too many, but there are relatively few though conditions are present for many more. Even gross inattention to techniques and equipment is rarely attended with fires or explosions.

Operations have been so poor in plants that personnel were driven from their operating stations by fumes. Such fumes should warn of impending trouble, without having fires in many plants from using acids with nitrogen solutions.

If there are potential hazards in using several ingredients, it is often believed that greater quantities create greater hazards. People active in safety in industries believe that a plant run with great industrial efficiency is also run quite safely.

CONTINUOUS MIXERS

There have been fires in the conventional continuous ammoniator when all equipment passed careful inspection. It was found that the mass was permitted to reach such a physical condition that it simply rocked in the mixer as one inert mass. Although all formula ingredients were present and equipment considered to be of good design—in good condition, the mixing ability of the mixer was handicapped.

Most continuous mixers, particularly those equipped with a good interlocking system and with dry ingredients reasonably well pre-mixed, can handle the problems of high analysis fertilizer manufacturing efficiently and with reasonable safety. The same is true with most rotary batch mixing installations that are well maintained and operated with skill.

As this condition adversely effects granulation and ammonia take-up, at least in the superphosphate, every effort should be and usually is made to prevent or correct it as soon as detected. This condition is not necessarily the result of poor equipment nor of any form of carelessness and some fires may result from causes other than carelessness or faulty equipment.

With present conditions it may not be possible or practical to offset completely by using the best present equipment and techniques, all existing factors in fires. These may even be increasing with the trends of fertilizer manufacturing because not all factors may be known.

However, those practices which generally result in good fertilizer, through efficient use of materials and equipment, have reduced fires in enough cases to be worthy of the most serious consideration. In no case has a switch to these more efficient practices increased fires with a given formula.

Many tons of fertilizer have been made with substantial amounts of acid and nitrogen solutions without fires, and much of this has been made under conditions that violate the general principles of operation suggested here to lessen the hazards.

Several conditions are required for acids with nitrogen solutions to be hazardous. It is possible for these conditions to exist at the required time and to the required degree in some fertilizer manufacturing. Enough of these conditions are known and enough of them can be controlled so that, in many plants, the risks can be and are being consciously held to a level that management deem the over-all operation to be satisfactory and practical. These operators are usually aware that carelessness can be costly.

The development of this theme became quite involved, but the summary can be brief:—

The technical properties of some of the ingredients used in large quantities in modern fertilizer making are such that indiscriminate use of poor equipment can result in fires or explosions in extreme cases. Some of the conditions have been exposed; there may be others as yet not isolated, but a high degree of control has been effected when the conditions revealed are respected in operations.

Although they are no guarantee of immunity, the practices and equipment that use the ingredients most effectively are good precautions against hazards.

The requirements are generally that all ingredients, liquid and dry, be uniformly mixed throughout the entire mass, the acid and ammoniating medium particularly being so delivered that they are mixing uniformly as they enter the mass. These are also good operating techniques.

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CURRENT SAFETY TOPICS

Volume 11

GREEN CROSS FOR SAFETY

FOOD, MEAT PACKING & LEATHER INDUSTRIES, TRADES AND SERVICES

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Illinois)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE FOOD, MEAT PACKING, TANNING AND LEATHER PRODUCTS, TRADES AND SERVICES SECTIONS

This volume is a record of the sessions held at the 1957 National Safety Congress by the Food Section and Meat Packing, Tanning and Leather Products and Trades and Services sections. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Food section and the Meat Packing, Tanning and Leather Products and Trades and Services sections carry on in behalf of their members, and for the benefit of accident prevention work in the Food and Packing, Tanning and Leather Products and Trades and Services industries generally. These sections give guidance in the preparation of a great variety of technical and educational material useful in the day-to-day plant safety programs.

The activities of these sections are under the direction of their executive committees, the members of which are listed at the close of this volume.

FOOD SECTION

CHANGES IN THE N. F. P. A. CODE FOR THE PREVENTION OF DUST EXPLOSIONS IN STARCH FACTORIES

by EARL GOMOLL

safety supervisor, Clinton Corn Processing co., Inc., Clinton, Iowa

The explanation of changes in the code for the prevention of dust explosion in the manufacture of dry starches would be difficult without a few words of explanation on what the National Fire Prevention Association really is.

This association is a non-profit technical and educational organization devoted to the reduction of loss of life and property by fire. Its efforts have been directed toward establishing standards recognized by industries throughout the country. I will summarize the recommended changes in the present code to meet the needs of industries manufacturing starch products today.

The code for the prevention of dust explosion in the starch manufacturing industries is set forth in 10 sections, preceded by an introduction explaining its purpose. In the introduction, the changes have been expanded to point out that starch can be manufactured from corn, sorghum (milo), wheat and other starch bearing cereals or vegetables. The starch, through conversion, can be made into sugar, syrups and dry starches, including chemically modified starches and dextrins.

EXPLOSION POSSIBILITIES

Explosion hazards are prominent in four specific points in the operation of starch manufacturing and the new code points out that they appear (1) in grain and receiving and starch departments in the form of grain elevator dust, (2) in the handling of bulk sulfur used for wet processing of grain, (3) in dust from conveying, milling, and storage and packaging of feeds, germ gluten, and gluten meal, (4) in dust arising from drying, grinding, conveying, storage, and packing of starches and sugar.

The handling of sugar should conform to the N.F.P.A. code for pulverizing systems of sugar and coke. In the manufacture of by-products in the feed departments, equipment layout should conform to the code for dust explosions.

BUILDING CONSTRUCTION, ARRANGEMENT

Under general standards listed in the N.F.P.A. code the wording has been clarified as follows:

11. The operation of starch drying, grinding, grading and packing dextrin cooking or conversion and packing will be permitted in the same building, provided the various operations are suitably isolated by proper sanitation and fire and explosion resistive walls.
12. Buildings housing operations where dust hazards exist shall have at least 50 per cent of the exterior wall space constructed of thin glass or similar material. Windows shall be equipped with explosion vent hardware.
14. The transfer of starch between buildings shall be by cart over tramway, enclosed spiral conveyors with positive choke cells, or approved pneumatic or mass flow systems.
15. Walls shall be finished smooth and irregularities brought flush with the surface to reduce the accumulation of dust.
17. There shall be no locker and change rooms within these departments except where rooms are separated by adequate fire and explosion resistive walls. Doorways are to be protected by self-closing exit doors conforming to N.F.P.A. code.

II. SPECIFIC STANDARDS

21. In this section of the code the recommended changes were modified to include the new type of drying equipment. It is recommended that dryers be designed to eliminate surfaces where dust might accumulate inside. Where air space exceeds the space occupied by the starch, steam vats or other effective fire extinguishing media shall be installed. All direct fired flash dryers shall be located in a separate detached building. Dryer cyclones should be provided with explosion vents. All cyclone product discharge outlets should be equipped with standard explosion choke and drives shall be interlocked with the combustion safety controls. Drying units located within all enclosures shall be equipped with power cut-off switches located outside the building.

III. DRY STARCH GRINDING, GRADING

31. Primary collecting systems for equipment ahead of the mills shall be separate from the collecting systems used for the grading, grinding, and packing stations.

32. Hoppers for bulk starch shall be constructed to minimize arching of the material. Interior shall be finished smooth. Maximum explosion relief venting should be provided as recommended in N.F.P.A. code number 68 for pearl and powdered starch bulk packing.

42. All packing equipment shall be equipped with an adequate dust collecting system. Electrical controls shall be of the class 2—group G type.

V. LUMP STARCH COOKING, PRESSING, GRADING, AND PACKING—No new changes in this section of the code.

VI. CONTROL AND REMOVAL OF SUSPENDED DUST—No new changes in this section of the code.

VII. REMOVAL OF STATIC DUST

72. The cleaning of surfaces shall be by vacuum sweeping if feasibly applied. This equipment including the hoses shall be properly grounded and regularly checked for electrical continuity for pick-up nozzle to piping system. This equipment should also be approved for class 2—group 2—group G locations.

73. Removal of dust from motors by a stationary compressed air system. Cleaning of this kind shall not be undertaken while the department is operating. If portable electrical blowers are used, electrical controls and motors should be of the class 2—group G type.

74. Repairs to starch drying equipment should not be done unless adequate precaution is taken to prevent fire. All departments in the repair area shall be shut down which involves the operation of welding torches, grinders or portable hand electric tools.

VIII. PREVENTION OF IGNITION

82. Smoking and the carrying of matches and lighters shall not be permitted.

84. Static electricity shall be removed from such machines as it accumulates by permanent ground wires, from joints by grounded metal cones, or other equally efficient systems. The use of bent type drives for equipment shall not be permitted for starting type machines which will cause the joints to slip and heat up unless other drives are impractical or more hazardous.

IX. MECHANICAL PRECAUTIONS

91. Unless ball or roller bearings are employed, the speed of revolution of spiral conveyors shall not exceed 100 revolutions per minute. The speed of drag type conveyors or elevators, unless made of completely non-sparking metals, should be limited to 50 feet per minute.

93. All elevator legs shall be equipped with automatic over-load releases or similar systems which will warn the operator of the possibility of a choke up. Faster type elevators employing a bend should be equipped with motion switches. Elevator housing be installed with a rupture type diaphragm to prevent equipment damage in case of an explosion.

X. HOUSEKEEPING—No recommendations to present code.

Our modern civilization, which has made it possible for us to enjoy life to a fuller extent, is based upon many many standards. The units of measure for instance guarantee that the things we buy, those necessities of life, are delivered to us in full measure. Homes, offices, and factory buildings are made possible by the acceptance of standards.

Yes, everything in our life is made safer and more comfortable by the formulation and acceptance of many many standards put forth in the form of codes.

BREWERS DIVISION

by WILLIAM A. MULVENNA
director, Safety & Fire Prevention, C. Schmidt & Sons co., Inc., Philadelphia, Pa.

During the week of the National Safety Council Congress, the National Safety Council Brewers Division and the United States Brewers Foundation conducted several sessions for safety personnel related to the brewing industry. It was felt that some of this material was of sufficient interest to the brewers unable to attend that it has been included as a part of the transactions. On Monday, October 21, 1957, Jack Cantrell, safety director of the Miller Brewing company spoke on, "Suitable Work Assignments."

BASIC SAFETY FUNCTIONS

Cantrell went into great detail explaining Miller's comprehensive program. Employees who lose time because of injury or illness must have releases from their attending physician. This release is more than a simple form as it contains the type of work the employee is able to perform in great detail. The form requires only check marks by the doctor in the proper squares designating physical qualifications.

If the department to which he is assigned cannot provide work as prescribed by his physician, other departments are surveyed for possible work assignment until the employee is able to return to his regular job. Cantrell stated that the progr m served its purpose well as the employees, department heads and the union are all satisfied.

On Tuesday, October 22, 1957, William Mulvenna, chairman of the Brewers Division introduced Mike Aicher of the United States Brewers Foundation and Nixon de Tarnowsky who portrayed a supervisor and safety engineer or director, respectively. The safety director was informing the supervisor that the company was implementing a safety program which required the wholehearted participation of all supervisory personnel.

The supervisor, quite skeptical and very candid, questioned the purpose and sincerity of the program. The following pertinent items resulted from the presentation and group discussion; supervisory training every two weeks on Saturdays for a total of seven sessions. Flannel board and films will supplement talks on basic safety functions. (This permits special training; even though it is on an overtime basis).

The following items were presented during the discussion period:

Accidents result in unnecessary waste and cost. It was emphasized that the fixed price structure on beer necessitated stoppage of waste; and higher efficiency in operation and prevention of accidents and injuries is an important step toward that goal.

INCENTIVES USED

Incentives for supervisors included dinners, passes to althletic contests, and other inexpensive yet effective awards. Incentives for employees included team awards of pencils, billfolds, etc. Emphasis was made for an immediate and thorough investigation of all back injuries in order to discourage malingering.

On Wednesday, October 23, 1957 the following panel participated in a special

presentation—Hebert Naegele, Carling Brewing company; Nixon de Tarnowsky, F. M. Schaefer Brewing company; M. B. Macaulay, Interboro Mutual Insurance company; and John Miskelly National Brewing company. Discussion by the panel and audience covered the followed items:

1. Providing eye protection for all employees and visitors in the bottle shop is a good investment.
2. Eye protection is provided in many breweries to maintenance employees, handlers of caustic, drivers and helpers handling open cases and others.
3. Safety work orders have priority over production and maintenance work orders when the safety problem is more acute. Safety personnel through proper evaluation must be practical in their demands for priority. Safety work orders should be followed through by checking for completion.

BLOCK TRAILER WHEELS

4. One solution to fork-lift truck accidents when loading trailers at docks —wooden chocks chained to docks must be used by truck drivers to block both back wheels of trailer. It is lift-truck operator's responsibility to check and see that these chocks have been properly placed and also to see that the chocks are hung on the dock by the driver after they have been used.
5. Employees are "sold" on reporting of minor injuries through education by a constant repetition of instructions, posters and signs. Prevention of infection and eliminating hazards or unsafe practices are two important points to stress.
6. Back complaints should be investigated promptly and thoroughly to learn facts and discourage malingering. "Back cases" diagnosed by nurse or physician as minor or non-existent may be alleviated by the simple pill treatment or heat lamp. Some of the "pains" may only be mental but exist in the minds of "injured" and should be "treated."

FIRST AID TRAINING

7. First aid training is given to all supervisors and employees who volunteer in many organizations. Many classes are conducted after working hours on supervisors' and employees' own time.
8. Approved masks for use in atmospheres contaminated with ammonia or CO_2 should be provided. Limitations of these masks must be taught and proper maintenance by periodic inspections of equipment. Used cartridges should be replaced immediately. In heavy ammonia concentrations a self-contained breathing apparatus should be supplemented with proper rubberized clothing to prevent burns to otherwise exposed skin.
9. Testing tank for CO_2 before entering—there are instruments for testing same but there was controversy as to the efficiency of these instruments. Proper ventilation and experienced personnel were stressed as major points in this regard.▲

THE NEW SOLVENT EXTRACTION PLANT CODE NO. 36-T

by GEORGE H. STEEL

safety director, Ralston Purina co., St. Louis, Mo.

Dick Hopkins of A. E. Staley Manufacturing co. and Paul Sheffer of Corn Products Refining co. related to the group many things about the new NFPA code 36-T that might be objectionable as far as some industrial applications were concerned. Many of these objections were discussed the week previous by the NFPA committee. This report gives those changes related which the committee recommended for adoption. The following is a resume of these changes:

1012 has been changed to emphasize management's responsibility by now reading "provide a means by which fire protection directors and supervisory personnel may evaluate the operations under their authority."

111 has been made to apply to commercial scale solvent extraction of animal and vegetable oils and fats. This alleviates criticism that our standard would apply to experimental units, laboratories, and pilot plants.

121 has been changed to read "the provisions of these standards pertaining to design, layout and construction do not apply to existing plants." However, modifications to existing plants shall comply with these standards.

FIRE STANDARDS

Old paragraph 131 has been eliminated and old paragraph 132 has been changed to read "the authority having jurisdiction shall follow nationally recognized standards for fire prevention and fire protection which have been prepared in such a way that they may be taken to represent the best informed judgment available on the subject and which are in such published form as to be available for a reference."

A new paragraph 2051 has been added which reads "electrical equipment and installations shall comply with the requirements of the National Electrical Code as herein after specified."

Paragraph 2051 is now 2054 and reads "There shall be no smoking within the fenced areas. Sources of spark or flame including matches, lighters, as well as smoking materials, shall not be permitted in the fenced area."

FENCED-IN AREAS

In several places through the standard, we have changed these requirements from within the restricted area to within the fenced area. There was quite a bit of criticism about the distances used in defining the fenced area and the restricted area and the point was well brought out that it would be possible to build the boiler room right in the extraction building and that sometimes 300 feet is not enough distance in case of severe trouble.

However, the committee felt that some distances should be used as a minimum and while we didn't think that anyone would want to spend the money to make boilers within the extraction building safe, it is a possibility. The members of the committee are fully aware of the limitations in using distances but we felt that if we could get 100 feet clear distance in every direction from the plant we'd be a lot better off than many of the installations that are now in existance.

We knew that from a practical standpoint that if we put that at 300 feet or 500 feet we would make it almost prohibitive to build plants and comply with the standard.

Paragraph 221 on hand tools and paragraph 223 on miscellaneous equipment has been eliminated. There was such an objection raised by the American Petroleum Institute to this statement that we felt that the standard would not be approved at the annual meeting if it was left in.

Paragraph #232 on purging was completely rewritten. The script for this was lifted mostly from pamphlet 327 of the N.F.P.A. on "Purging Small Vessels and

Tanks." As it is now written it describes the various methods including the use of steam, air, and inert gas.

Paragraphs #2544 and 2546 have been eliminated. One of these was providing for sleeves when going through floors or walls with pipes and the other was for all pipes entering vessels to enter from the top. Paragraph #263 about providing level, pressure, and temperature controls has been eliminated.

AUTOMATIC WATER SPRAY

Paragraph #281 about fire protection has been changed to read "an approved, acceptable automatic water spray or deluge system or equivalent shall be provided to protect the extraction process, equipment, or structure."

Paragraph #284 has been changed to read, 'approved first aid fire protection of appropriate size and type shall be provided."

The last sentence of paragraph 3122 has been changed to read "normal breathing vents with approved type flame arresters or pressure—vacuum relief valves shall be provided."

Paragraph #341 which read "tank cars shall be unloaded from the top only" has been deleted.

Paragraph #351 has been changed to comply with N.F.P.A. pamphlet #30 on the testing of tanks. As originally written, the method could not be used on such tanks as finished product storage tanks, etc.

Paragraph #421 has been changed to read "in buildings where explosive or flamable dusts occur, all electrical wiring and equipment shall conform to the requirements of class 2 group G division 1 locations. As this was originally written, it required the use of 2G equipment in such occupancies as a packing house where meat scrap was being prepared for extraction.

Paragraph #514 was changed so that solid floors may be used at upper levels in the extraction building.

It was decided to eliminate any drawing of the separation sump but to leave the details of the design up to the engineers and the insurance companies and the inspection authorities that will have this say at the time the plant is built. In this connection, I know that several objected to that wording "authority having jurisdiction" but from a practical standpoint the local fire marshal, building commissioner, or inspection bureau have the authority anyway so we're only spelling out what their duties are.

The Committee had quite a bit of discussion over the flammable vapor detection section but finally agreed that permanent detecters should be required.

GRAIN HANDLING AND PROCESSING DIVISION REPORT

DISCIPLINING FOR A SAFETY

by WARREN RINDERKNECHT
safety director, Penick and Ford, Ltd., Cedar Rapids, Iowa

How can you justify discipline in a safety program when you need the cooperation of all the employees in the organization?

When you feel you have a good safety program and have done all that is possible and practical to have safe working conditions but you continue to have unsafe workers, then it is time to consider your responsibility to the employee's family. This will be your conclusion after you have met several individual families after accidents—then you realize that if the employee will not voluntarily work safely you are going to have to do something about it.

How do you introduce discipline into a program?

First, discuss your program with your supervisors and then with your union labor committee and emphasize that your reason for the disciplining of the employees who fail to work safely, is to insure the economic future of the employee's family, the safety and welfare of his fellow workers, and that the goal of your safety program is to make certain that your employees go home to their families the way they came in that morning.

SORRY ENFORCEMENT

Who can argue with this reasoning? If a supervisor shows little interest in correcting his employees who work unsafely—invite him to go with the safety supervisor the next time you have to inform a family that their husband or father has been hospitalized due to an accident. This same invitation should be issued to any union steward who resists this part of your program.

What kind of plant safety rules and discipline for the violation of these should be considered?

- —Rules should be justifiable and reasonable because unnecessary or harsh rules cause bad morale.
- —Rules must be known by all employees and supervisors.
- —The rules must be uniformly enforced throughout the plant.
- —Don't have too many rules. It is better to have a few basic rules thoroughly understood than detailed rules not too well known or understood.
- —The discipline handed out must be in proportion to the offense committed which means repeated offenses justify increased penalties.

Discipline in a safety program must fit into the discipline procedure set up for the entire plant. If the plant uses steps in discipline, then increased penalties are in order for subsequent offenses of the same nature—such as one day for the first unsafe practice, three days, 10 days for subsequent offenses and discharge for the fourth offense. Some plants treat each rule violation separately and affix a penalty according to the seriousness of the offense also taking into consideration the past deportment of the employee.

In either system the result of any discipline should be that fellow employees will feel the penalty was justified and the individual will understand that its purpose was to correct him and make him a good employee.

BORDER CASES EXCUSED

There is a disadvantage in treating each offense separately and fixing a penalty for each individual case. Borderline cases will cause management to back away from a penalty or if a penalty is applied, cause the plant to feel that the man was unjustly treated. Therefore a minimum penalty must be decided upon and then you only have to decide whether or not an unsafe practice was actually committed.

Our system is to use steps as mentioned before, of one day, three days, 10 days and discharge for consecutive unsafe practices, for those cases written up by the foreman and handled by the safety department through the usual channels set up for handling violation of plant rules. On borderline cases it is left in the hands of the foreman to handle. If the man continues to work unsafely then the foreman warns him that he will be written up and steps taken if he does not correct his work habits.

Obvious and deliberate unsafe practices are written up immediately. Any case written up is followed through the entire procedure resulting in the man being called to the Labor Relations department with a steward and the proper penalty imposed. A foreman will not write up a case he cannot prove because he knows his writeup will be respected and followed through. At the same time the men in the department know that if they do not heed the warning of the foreman, they will be written up.

We have a form for the foreman's use with the heading "Personal Safety Report." This is to be used to record unsafe practices by employees. On this form is a definition "An unsafe practice is performance of work in a manner which might result in injury to the employee or to other employees." If a department continues to have accidents as a result of unsafe activities and a foreman has not been writing reports, the obvious conclusion is that he does not know an unsafe practice when he sees one. That, of

course, would be a reflection on his selection as a foreman and your safety training.

Before you again face the responsibility of knocking on the door of an employee's family to inform them of a fatality or a serious injury, you will convince yourself that rules and discipline for the violation of these rules, should be made a part of your overall safety program.

The following plant rules concerning the problem of discipline as it relates to safety, have been developed by Penick and Ford, Ltd., Cedar Rapids, Iowa in their Joint Labor Relations committee. The material and comments are quoted, with permission of the corporation, from a letter written by Warren G. Rinderknecht, safety director, on April 8, 1957 to a special committee of the Grain Handling and Processing division, Food Section, National Safety Council.

Unsafe Practice or Act by an Employee

One day disciplinary layoff for the first offense

Three day disciplinary layoff for the second offense

Ten day disciplinary layoff for the third offense

Discharge for a fourth offense

However, in addition to the above we set forth the following steps in regard to discipline for violation of plant rules—the following being excerpts of those that apply to safety.

Four step procedure:
(1) Warning
(2) 3 days off
(3) 10 days off
(4) Discharge

1. Threatening to do bodily harm or use abusive language to fellow employee.
2. Failure to report injury incurred in plant.

Except where specially noted, the above four step violations are the only violations to plant rules which will revert to first step discipline if subsequent offense does not occur within 12 months of previous offense.

Three step procedure:
(1) 3 days off
(2) 10 days off
(3) Discharge

1. Reporting to work under the influence of intoxicants.
2. Horseplay involving definite possibility of injury to himself or others.
3. Use of abusive or threatening language to a member of supervision.
4. Fighting with other employees. Subsequent offense must occur within five years or penalty reverts to first step.

Two step procedure:
(1) 10 days off
(2) Discharge

1. Smoking in plant area other than critical areas, as shown in one-step procedure except in cafeteria, time office, railroad gate, watchman shanty, pump house and laboratories (not including storage or sample preparing room).
2. Leaving plant and drinking intoxicating beverages during his scheduled time to work.

One step procedure:
(1) Immediate discharge

The following violations call for immediate discharge:

1. Smoking in critical areas which are defined as follows:
   Tank car washing shed
   Extraction plant
   Dextrine department
   All dry starch departments
   Feed house and feed grinding and loading
   Oil department
   Pregelatinized starch
   Corn unloading department, inclusive of elevators, sewing room, bag room, carbon storage, and all areas used for warehousing of starch or supplies and combustible materials.
2. Violation of safety rule regarding the carrying of non-safety matches.
3. Possession of, or partaking of intoxicating liquor or narcotics in the plant, whether brought in by that individual or not.
4. Fighting which results in serious injury to another employee, while on company premises or in area where workmen's compensation would consider company liable for injuries sustained.
5. Any fighting or assault on any member of supervision at any location, or at any time, if issue relates to job or company.
6. Deliberate damage to fire extinguishing equipment or tampering with any fire equipment or system.

The discussion on the above disciplinary steps resulted in the company and union agreeing that each discipline case should be handled as an individual matter and the framework of steps shown above used as a general guide.▲

PANEL QUESTIONS AND ANSWERS:

Q. Does the Industrial Relations department within your plant impose penalties for safety rule violations?

A. Not entirely. Warnings may be issued by a shift superintendent, but time off is given only by the plant superintendent, master mechanic, or the director of industrial relations.

Q. Can you give some examples of the types of safety rule violations and penalties imposed within the past year at your plant?

A. Since January 1, 1957, seven penalties have been imposed for safety rule violations. Some of these were:
   February—10 days off—fighting on the job
   February—three days off—abusive language to supervisor.
   February—dismissal—bringing liquor into the plant
   July—three days off—intoxicated on the job

Q. How do you determine whether or not an employee is intoxicated?

A. The shift superintendent charges the man with being intoxicated in the presence of a shift steward using his judgment based on the man's behavior.

Q. You say that repeating offenders are subject to more severe disciplinary action. How do you keep track of this?

A. A card record is kept on all disciplinary action in the personnel department.

Q. Are these penalties for violations a part of your union contract?

A. Only the penalties involving coming on duty when under the influence of intoxicating liquors.

Q. Have you ever found that foremen allow personalities to influence their reporting safety rule violations?

A. Occasionally, but not as a rule. To circumvent this, we use a cooling off period of one day before any disciplinary action is taken.

Q. Can the plant's safety director discipline plant employees for safety rule violations?

A. No, not directly.

Q. What training did you give your supervisors before this program of safety rule enforcement went into effect?

A. We had a series of meetings with all supervisors discussing the program and the form to be used before it was put into effect.

Q. Have you had experience with outsiders (truckers making plant deliveries) violating company safety rules?

A. Very little.

Q. Do you feel that it would be helpful to have union representatives on the development of safety rules?

A. It would lead to a better understanding but the company should retain the perogative of establishing the rules.

Q. You mentioned a penalty imposed for failure to report an injury. Will you explain this?

A. We believe it is good safety practice to insist employees report accidents promptly.▲

FIRE PREVENTION AND FIRE CONTROL (A Symposium)

WHAT MAKES A GOOD PLANT INSPECTION?

by CLAUDE C. STUBBE

Fire Prevention engineer, Mutual Service Insurance co., St. Paul, Minn.

Fire prevention and fire control in plants is our concern. People living in peaceful communities go to work daily with little thought that fire can destroy their plants. Superintendents, supervisors and management personnel must be concerned with preventing fire in these plants.

We can never be 100 per cent sure that we will not have a fire. If we could, then fire insurance and fire departments would not be needed. We would not have fire drills which take a lot of time. Often we cannot get management to have fire drills because " it can't happen to our plant."

We cannot eliminate chances of fire even if the building is so-called fire proof. There is no "fire proof" building even if it is constructed of steel, concrete, brick or other "fire proof" material. A structure is only as "fire proof" as its contents, occupancy, and the housekeeping in that building. A blazing interior fire developing up to 1800 degrees Fahrenheit heat will reduce any structure to shambles of twisted steel and broken masonry. From here on, we shall refer to so-called fire proof buildings as fire resistive buildings.

We are interested in two things—fire prevention and fire control in our plants. We make periodical plant inspections to save lives and property. The saving of lives is our first concern, and saving property and fire prevention our second.

FIRE PREVENTION

Fire prevention is most important to all fire prevention engineers because where there is no fire, there is no loss of life or property. *Fire prevention and control is a* complete fire wall from the basement to the roof with Class A fire doors for the openings. This in most cases, saves half of the building or whatever is cut off by the fire wall. Good housekeeping and good plant maintenance are fire prevention. A sprinkler system, fire extinguisher, and hoses and standpipes are fire control.

A fire prevention program depends upon how well you get everyone in the plant to heed your suggestions and ideas. You are no fire marshal, you have no governmental authority. You are a detective without a badge. You have no more authority than management gives you. A good plant inspection depends on how well you sell the plant manager or company president on your ideas. Therefore, you must be a good salesman. Fire prevention engineers with insurance companies must also have salesmanship qualifications.

You first must know a plant's construction. There are very few plants alike in construction. Therefore, a good plant inspection in one firm may not be so good in another. However, there are basic principles that are the same.

Fire resistive buildings are most desirable. However, there are many wood constructed plants, or half masonry and half wood. Heavy wood constructed plants are usually termed mill construction. The roof of such a building should have three inch planks nailed to heavy roof cross beams and covered with a good grade five ply tar and gravel. If a good coating of gravel is missing, this should be done immediately to protect the roof from burning embers carried by wind from another building.

Check your elevator pent house to see that all window lights are in and screened so birds cannot build nests and create fire hazards. Pent house door must be kept closed and locked. Check all sky lights. The glass in sky lights should be a light type glass with screen above to protect it from falling articles.

You should have scuppers on your roof to carry off surplus water quickly, especially snow water, and the roof should slope towards scuppers. If any high voltage wires cross your building roof check that wires and supports are in good condition. Also check the condition of parapets and chimneys.

Inside the building support posts and cross beams of wood should be as heavy as possible. A cross beam 8"x8" will withstand a fire better than a 6"x10". Check for dry rot. The cross beams of this construction should rest on cast iron plates or beam boxes.

Provide a 4"x4" drain scupper for each 1,000 feet of floor space. If you have a fire, a lot of water will be used and your drain scupper will drain this off and reduce damage to stock.

VERTICAL FIRE SPREADS

There should be no *unenclosed openings* from floor to floor. Your biggest concern must be the vertical spread of fire. When heat gets up to 1,000 degrees or more everything starts to burn. Fires in large areas are worse to control than in smaller areas. If an area is larger than 10,000 square feet, put in a cut off. Make sure all stairways, beltways, elevator shafts and other openings are enclosed. Any floor opening makes the construction deficient and aids to the vertical spread of fire.

Even in fire resistive buildings, you must be concerned with these things. In addition, if support posts and cross beams are steel "I" beams and unprotected, coat them with two to four inches of gypsum plaster—good insulation against fire.

Steel beams and other iron supports must be protected since Steel "I" beams weaken at 600 degrees Fahrenheit. The numerous buildings going up today without sprinkler protection or steel beam protection are potential hazards.

You must know the exposure to your plant, the types of buildings and their occupancy that surround or adjacent to your plant. Fire hazards come from other plants in your neighborhood. If there is a serious threat of conflagration from buildings near you discuss the situation with your city fire department. Or, go directly to the people who occupy the building and discuss the need for changes.

One thing you can do is close all openings next to the bad exposure. Check that you have an adequate water supply and good equipment to fight any roof fire that might occur. Water pipes to the roof are very important and be sure these connections are the same as fire department connections.

HOUSEKEEPING! MAINTENANCE!

Fire prevention engineers agree that many fires are caused because of poor housekeeping and poor maintenance. *With* good housekeeping and good maintenance, fire insurance rates would be much lower.

On an inspection tour housekeeping and maintenance should top the list.

Some plants do all their own maintenance work. Others do part and sublet the larger jobs, and still others hire everything done.

Plant fire protection engineers must be vitally concerned, especially with people who do your plants repair work, remodel or change your production lines.

In many cases, welding is performed when repair work or remodeling is done. This constitutes a serious hazard. It is your job to discuss with contractors how they will do the work and what protection they will provide.

When checking your plant for possible repairs, you are doing preventive maintenance. Preventive maintenance goes hand in hand with fire prevention. Preventive maintenance establishes means to reduce maintenance costs through necessary repairs. Therefore, the real instrument to meet this condition is inspection.

Your responsibility is great; you must know and understand all the machines in your plant, how they operate, and their potential hazards.

You must know all the electrical installations and whether or not they are overloaded. You must understand ventilating systems or blower and exhaust systems which extract dust and vapor. You must check for dust, grease residue in hoods, ducts or fans and provide a safe method for removal.

Feed mills or flour mills have special hazards such as dust explosions. These inspectors must understand driers, and there are many on the market. As the plant fire protection engineer, make certain the employees know how to operate driers. Be

sure employees will not create a hazard if a drier does not start.

Operators should know where the main valve manual shut off on the gas line is. One operator ran to the gas tank 300 feet and climbed over a cyclone fence to shut off the main valve by the tank. The result was 370 feet of three inch pipe filled with liquid gas went uncontrolled into the burner and burned out 300 tubes in a new boiler, burner and all. The plant was closed for several days.

Do you know and understand whether your milling grinders have good magnets?

Do you understand your heating plant? This is important because heating plant failures cause many fires. Can you enclose your heating plant with a masonry wall without too much expense? It pays off!!

Do you understand the boiler and all its controls? Check the controls every six months to see that they operate. The heating plant may be all automatic but it still needs attention.

Be sure your boiler burners are properly installed. Boiler operators should check water glasses, safety valves and burner combustion regularly, and clean the boilers when needed. High pressure boilers should have two ways of getting water into such a boiler. This is all a part of a plant fire prevention inspection.

FIRE CONTROL AND EMPLOYEE SAFETY

Two primary concerns when inspecting your plant are protection of life and fire control. Your sprinkler system must be in good order and working properly. Sprinkler systems cut insurance costs and give good protection if the main valve is not closed. The main valve when open looks like it is closed. Be sure to have a "DO NOT TOUCH" tag on the main valve.

The same is true with the automatic alarm system. A good plant inspection includes checking the automatic alarm system. If out of order, lose no time in calling the serviceman. Most plants have automatic service. However, you must know if that service is being performed properly. If you have time, go with the serviceman and learn all you can about the alarm system. Also make certain all fire extinguishers are in good operating condition and the right type for the fire to be put out.

The plant fire protection engineer must also be concerned with flammable liquids. If you are using gasoline, propane gas, butane gas, hexane or other volatile products of nature, you must know and understand their characteristics, and be sure the people using them do also.

Obeying the safe handling rules of volatile liquids is a must! If you do not understand the proper use of volatile liquids before a fire, it is too late afterwards. A lot of property is lost all because people do not know how to fight and control volatile liquid fires.

On many occasions when checking a plant, I find that fire doors do not operate properly. They are out of order, off their track, blocked by materials, fusible links are broken or the door does not close properly with the weights provided. Get your campaign going now and see that all fire doors are in good operating condition.

GUARD LIFE OF EMPLOYEES

The most important part of our jobs is safe guarding the lives in your plant. You are responsible for employees—old and new, visitors, and salesmen, who come into your plant.

The first protective device is good, visible EXIT signs. Arrows should point the way out of building and to fire escapes. Exit stairways which lead to outside doors must be so marked. Mark blind hallways and doors with no outside exit. This can cause the needless loss of life. Do your exit doors open out or in? Are your exit doors provided with panic hardware?

Check for overcrowded floors and provisions for orderly evacuation of employees on each floor. Be sure each floor has provisions of what to do in case of fire.

How about knowing that the fire alarm will be given and done so in understandable language? Is the switchboard operator in your plant designated to do this? When fire is discovered in your plant is the whole group trying to extinguish it and forgetting to call the fire department? Delayed fire calls are a sad story.

Even if you are organized there will be confusion if a fire begins with a flash or explosion.

In one plant when a drill took place some superintendents and management personnel

were usually too busy to take part. They told their personnel to leave the plant but they kept right on with their work. This is a very dangerous situation.

After one of these drills was completed, I spoke over the loud speaker system for three or four minutes. I commented on the excellent job everyone did and said I regreted there were some who felt too busy to take part in the drill. I stated that they have been orientated to a fire drill and know what to do. Therefore, I said, there will be no more fire drills in the organization. Hereafter when and if the alarm should sound—it's a fire! I hasten to say, let's get away from the fire drill idea as much as possible. There is no such thing in my book as a fire drill. All fire alarms are the real McCoy!

Let's assume you have made the plant inspection. When should you repeat the performance? Only as often as you deem it necessary. But I warn you do not inspect on a certain day of the month and a certain time of the day. Checking your plant for fire prevention and fire control should vary. Come when no one expects you.

After inspecting, write a report of the results of your work in good clear understandable language and not too technical.

Report to top management, outlining how the corrective measure can be put into effect. This is very important and you must also be a public relations man in many respects. This particular one is on security for your community. The symbols of security against fires are water systems, fire alarm systems and fire departments.

Whenever a bond issue is needed to get new fire department equipment or extension of present water mains, it is your duty as a fire prevention engineer to take an active lead and help obtain better fire protection for your city and community.

Fire protection engineering is one of the biggest jobs in all engineering phases. The challenge is yours!

CAN YOU WAIT FOR THE FIRE DEPARTMENT?

by JAMES H. SNYDER

manager, Safety & Plant Protection, Hiram Walker & Sons, Inc., Peoria, Ill.

The topic is in the form of a question, entitled, Can you wait for the Fire Department? One good question deserves many others, and to justify posing these questions, I would first tell you that there is more than one good reason why safety men should be concerned with fire.

Fire is an accident, an unexpected occurrence usually occasioned by loss and often accompanied by personal injury.

Of major concern to all in preventive work is, of course, preservation of human life. Of equal concern is the ability of our employers to continue their business. The preservation of property, physical assets and work places of the employees follows as an obvious necessity.

Because of the multiplicities of kinds of businesses represented by this group, I can only hope to stimulate your thinking by asking questions and hope as you think about it, you may be able to do for fire prevention and protection what you have been doing these many years for accident prevention.

FIRE DEPARTMENT SERVICES

What are the availabilities of your fire department? How fast can they come to your plant? What can you do with them assuming that they come when called? There may be a multiple fire situation, for example, attendance at a school or hotel fire to the detriment of the preservation of your property. Accordingly, what can you do without them?

What have you in your plant, already established by the way of sound procedures and good relationship?

Please have in mind that your fire department will not of necessity be familiar with:

Plant layout

Plant processes
Properties of products
Properties of raw materials
Built-in fire system
Its location
Effectiveness
Limitation

It is therefore necessary to establish an in-plant guidance group to work with public fire officials.

To switch over to the positive, you know what to do when a fire starts, and these topics will refresh your thinking:

EVACUATION
Building on fire
Nearby buildings

DIRECTION OF FIRE DEPARTMENT
To proper building
Nearness to scene for preservation of fire department's apparatus

PATHS OF EVACUATION
For safety of personnel
To minimize confusion of arriving fire dept.

USE OF VOLUNTEER FIRE DEPARTMENT
Lights
Portable intercommunication system
Proper rescue apparatus—masks, etc.,

USE OF SEARCH PARTIES
Rest rooms
Isolated offices
Showers and lockers
Janitor closets

COMMUNICATIONS
Call in volunteer fire department
Call in key personnel
Call in executives
Call in public press, radio & TV

TELEPHONE SERVICES
Incoming calls block switchboard
Coins for public telephone
Private wire

NEED FOR SPECIALISTS SERVICES
Craftmen
Doctors
Nurses
Ambulance
Engineers

NEED FOR SALVAGE
Vital records, formulae, cash, tax stamps

From the above you have possibly concluded that pre-planning for prevention is equally as vital as knowing what to do when trouble strikes.

What do you know about properties of raw materials and products:
When subjected to heat?
When subjected to burning?
When subjected to water?

What is the condition of sewers and drains:
Where ultimately exhausted?
Interconnected
Possibility of siphoning?

How about your fire pump:
Standards for starting?

What is the result of possible diversion:
Boilers
Process coaling—possible vacuum and implosion situations.

You have considered the results of interruptions in electrical services, for example: What else will it effect? Where is immediate location? What is ultimate location?
Does it effect:
Sump pumps
Other lines
Well pumps connected to fire system
Desirable ventilation
Elevators

How about movement of freight cars or trucks:
Containing flammable liquids or combustible materials.

What about pumping procedures:
Between buildings
To tanks—inside, outside
To and from tank cars

What is the effect of natural draft:
Favorable
Unfavorable

Are you aided by floors serving as fire stops:
Processes, piping or equipment passing through floors

Scuppered areas:
Piping and openings caulked
Capacity sufficient

Do you have container hazards:
Full, partially full, empty tanks and drums
Need to cool

Do you know about your illuminating gas lines:
Where terminated?
How shut off?

Consider airveyors and vacuum systems:
Transmission of burning material.
Shut off or operate.

How about windows, doors and monitors:
Open
Shut
Desirability
Undesirability

What about the operation of fire curtains:
Where?
What effect?

Do you have obstructed access:
Bridges
Railroad tracks
locked gates
locked buildings (Particularly bonded premises)

No safety man has been so thoughtless in his reasoning as to fail in the planning so necessary in actual fire or explosion. But the definition of pre-planning should take us in our thinking so far back in the basics of prevention to force us to conclude that if proper and productive pre-planning has been done, you may never need the assistance of the fire department.

The odds are all favorable, that if you are ready, and do need assistance, the occurrence will be small; it will be easy to control; and the loss will be at a minimum.

WHY INDUSTRIAL PLANTS BURN

REMARKS OF CHIEF EDWARD E. NEWELL, JR.

Chicago Fire Department, Chicago

Fire! ! Fire—one of the most thrilling words of our American vocabulary; thrilling to the kids who chase red fire engines down the street—but tragic to the home owner or business man who stands in front of his home or place of business, watching the savings of a life time being consumed in a few minutes.

Fire is only of general interest to the average person. He reads of fires in the daily papers, hears of them on radio and television. This is a natural condition, as the average person may live his allotted time with never an actual fire experience. The average man or woman has little knowledge of fire, or fire causes.

There is no doubt that management, responsible for protecting its company's assets, is concerned over the mounting, staggering losses in industrial fires. Recent disasters point up the need for constant vigilance and planning to minimize the results of destructive fires.

We preach fire prevention and fire protection almost constantly; yet fires continue to start.

DON'T DELAY ALARM

However if "Pre-Emergency" planning such as fire brigade training, monitoring of the area involved and the areas immediately adjacent is sufficiently active, automatic detection, either of local or central station

design will improve the program by minimizing the possibility of delayed alarms.

Automatic sprinklers are the best protection against delayed alarms; and to be equipped with local or central station alarms greatly improves their efficiency.

However, not all buildings are sprinklered so we find the need for proper instruction and training of fire brigade members. Employees should be thoroughly instructed and impressed that their first duty, upon discovering a fire, is to sound an alarm and then try to control the fire, using the proper type fire extinguisher.

There have been many instances where first aid fire appliances were used until the supply was exhausted and then the fire burned uncontrolled while someone called for help and larger equipment arrived.

Fire extinguishers should be considered as first aid appliances. They are important and when used properly extinguish many fires but we should understand the limits of their effectiveness and back them up by having the fire department on the way.

It has often been said, with relation to fire control, that the "first five minutes" after a fire starts is more important than the next five hours.

All fires start small but with sufficient fuel to feed on they grow rapidly and many require hours of labor and tons of water to control and finally extinguish. Each of the varied industries have their own specific fire problems. You must understand the hazards of your industry, and to reiterate, practice fire prevention and step up your Pre-Emergency planning.

Practice fire prevention always but also be prepared.▲

REMARKS OF CHIEF RAYMOND KOLZE

Fire Department, Des Plaines, Ill.

Why do industrial plants burn?

There are many reasons: first consider the construction of a modern industrial plant. In most cases it will cover from 25,000 square feet to six to ten acres. It is built of unprotected steel with a metal deck and a tar and gravel roofing. Unprotected steel stands up poorly under fire conditions. Firemen are thankful that larger plants have sprinkler systems if not in total area at least in part. There is a minimum of doors, few if any windows and sometimes a few skylights. This is what a fireman sees when he views this building from the outside.

Inside the building stock is piled to the legal limit in shipping and receiving areas. As if this were not enough the shipping and receiving platforms are inside the main building so all work can be done with a minimum of effort even if it means backing six or seven freight cars in the building.

Further examination of the building may reveal few fire walls or cut off walls. The reason for this, a supervisor said, was a plant cannot operate efficiently with division walls in the building because they interfere with production lines. In one plant nine fire doors had been removed to accommodate these lines. You can well imagine the danger when firemen have to drag 1000 to 1500 feet of hose into a building before they can reach the fire.

WORK OF FIRE BRIGADES

Training of fire brigades in any plant is a very important job. It makes all the men fire conscious and in this way always on the lookout for fire hazards and careless fellow workers. In the event of a small fire they usually have it under control before the local fire department arrives. In a major fire they certainly are a big help to the local department.

The city of Des Plaines has an industrial school each year to which industry sends men. The morning session is devoted to movies and talks on fire prevention with the afternoon session on fighting actual fires by the plant fire brigades. These fires are built of materials used in the various manufacturing plants. We find when they know what their products will do under adverse conditions and the limitations of the extinguishing agent they are using, they lose their fear of fires and really do a good job.

Once a plant superintendent called me and said "Chief I want you to see how well we have our men trained. We will go over to M section and I will turn in the alarm." My reply to him was I would rather go to section D with the dip tanks and see the response in that area. "Well, Chief," he said, "the boys don't know the fire is supposed to be there."

Many times it's hard to sell management on the idea of training fire brigades because of the additional cost for non-productive work. But I believe with the right approach it can be done and it must be done.

In most cases a watchman is an elderly man who walks about punching a time clock at various stations in the plant. He also has knowledge of how to operate a fire extinguisher. He should know how to contact the local fire department and should do this immediately when discovering a fire, not after it is out of control because he tried to extinguish it first.

Just remember, a lifetime of effort has gone into establishing your plant and certainly no one wants to burn it down in a few hours because someone neglected to do the right thing at the right time.▲

REMARKS OF E. K. CROSBY

fire prevention engineer, Pabst Brewing co., Milwaukee

A large loss fire is one that results in a quarter of a million or more dollars in damage. In 1956, there were 430 in the United States and Canada. Only one out of every 1,860 fires could be classified as a large loss one, but these fires accounted for 24 per cent of all property damage.

Hardest hit of any type of building was the industrial plant. Industrial fire damage was 50 per cent higher than in 1955. This fact contributes substantially to the over-all rising trend in fire losses. Half of all large loss fires go undetected or unreported until they grow to uncontrollable proportions. This is because most industrial fires occur when a plant is closed. About 83 per cent of fire damage occurs in idle hours.

Reports by the National Fire Protection association show that in many cases there is little or no watchman service. That is why I believe that all food industries should have good guard training at all times so that they are familiar with every phase of the industry. They should cooperate with the local fire and police departments and have full knowledge of sprinkler valves and water supply. Since many food industries have refrigeration systems, it is good to know where all ammonia shut-offs are. This applies to gas and flammable liquid storage.

One of the things I'd like to mention is welding and cutting. Many large industrial fires were caused by careless handling of torches. In my own experience I have encountered several large industrial fires where dust explosions were set off because of this careless act.

Poor housekeeping and failure to thoroughly " change-over" the facilities resulted in a large food warehouse fire where $960,000 of food were damaged by fire. No one paid much attention to the fact that the warehouse was formerly used to store nitrates, and a cutting torch did the rest. Watchman service in this case was also poor.

Management of course must stand behind a good program of fire prevention, such as a well-trained fire brigade. Why install expensive explosion-proof equipment in grain elevators, and flammable liquid storage vaults if a mechanic carries an ordinary light cord and naked light bulb and uses portable electric drills in a location where such equipment might cause an explosion?

Instead of using non-sparking tools around starches, grain dust and flammable liquids, regular steel tools are often used. They should be made of aluminum, bronze, brass and beryllium copper.

Fires in warehouse storage with and without sprinkler service resulted in 50 "large loss" fires during 1956. In 43 fires, there was a delay in detection with serious consequences. A further problem is lack of division walls. Fire damage might have been minimized in one where a back-fire from a truck caused a $265,000 fire. In many cases temporary wiring is used in a

factory and warehouse but forgotten in a short time—this too is dangerous.

Using an open flame near a vacuum system which sucked sparks into cyclone and set it afire is another example of the need for a thorough fire prevention program in every industrial location. Another example is stealing a smoke in warehouses loaded with combustibles. This indicates a complete lack of discipline in that organization.

I personally believe in the silent watchman i.e. automatic detection and sprinkler systems, maintained in working condition at all times. Here are some of the various fires around the nation that reflect the tremendous costs to industry in failing to develop an effective fire prevention program:

Montreal, Quebec, Canada (Brewery) $1,250,000. One killed on May 18th, 1957 in a fire caused by an ammonia explosion. Possible ignition sources were an ordinary light bulb at ceiling or static discharge generated by rapid escape of ammonia, no explosion venting.

OTHER BIG FIRE LOSSES

A cannery fire on April 29th, in Portland, Oregon resulted in $1,286,500 damage. Green beans and strawberries, spontaneous ignition. Plant was not sprinklered and no watchman was on duty over week-end.

A Super market fire in East Paterson, New York left $500,000 damage. No sprinklers were in the building. The fire started in the basement and was discovered at 2 P.M. Eight extinguishers were used but the fire could not be controlled due to congested stock piling. There was a delay in calling fire department.

Another fire—a grain elevator on March 28th, in Philadelphia, Pa. had $2,593,000 damage. Three people were killed. Cause of explosion was undetermined.

A food and grocery warehouse burned on October 21st, 1957 with $1,065,000 damage. Poor stock piling hindered the fire department. A watchman saw smoke at ceiling level at 8:30 A.M. and after determining that it was not coming from the coal furnace telephoned the fire department. As he was giving the alarm the flames shot through the ceiling.

There are many more major fires and disasters. However we can prevent all this by being on guard at all times.

WHY A FOOD PLANT BURNS

Here are some causes for fires in breweries, grain elevators, cereal processors, bakeries, distilleries, canneries, dairies and confectioners:

1. Ammonia—many have refrigeration
2. Poor housekeeping
3. Dust
4. Welding and cutting
5. Flammable liquids
6. Powdered milk and yeast—explosion hazards
7. Garage fire hazards
8. No sprinklers—fire extinguishing equipment inadequate or improperly used—watchmen service lacking
9. Vacuum systems—inadequate, or lack emergency cut-off to reduce spread of fire
10. Electrical hazards

Many plant managers don't give enough attention to fire prevention. They don't realize that fires can be prevented by adequate watchmen service—an alert fire prevention engineer whose only duty is to eliminate fire hazards. They don't have adequate sprinkler lines, fire extinguishers, or hose lines which are essential for any fire prevention program.

REMARKS OF C. F. MAROTZKE

Summit Volunteer Fire Department, Summit, Ill.

On the question: "Why Industrial Plants Burn," my answer is Carelessness. You will find that most plant owners or executives know little about first aid fire fighting equipment. They in turn appoint a man in charge of Plant Protection, but they also tie his hands and if his suggestions cost much they are turned down. In other words they are afraid to spend a buck for fear some moths will get out of the purse.

The average small business man will spend thousands of dollars for a new building, put in up-to-date fixtures and merchandise, but when it comes to first aid fire fighting equipment, he becomes penny-wise and dollar foolish, so he either installs inadequate equipment or no equipment at all.

If fire equipment is installed, it is not a question of how much protection I get, but how much will I save on my insurance premium?

The Volunteer Fire departments are interested in, and usually have some kind of fire prevention program. This naturally involves a lot of time and effort, with no pay. After the statement is made, "you fellows must be crazy to spend all that time and effort for nothing," I in turn ask if they realized how much fun we have being crazy. We look for no glory, but it is indeed gratifying to see the fruit of your efforts as in these examples:

The scout troop was meeting in a school house and one of the boys coming in late noticed a fire in a container near the basement door. He notified the scoutmaster and while he called the fire department, one of the boys took an extinguisher and put out the fire. He was asked, how did you know what to do and he stated, "that is what the Firemen teach us in school."

In another case a young boy came home from school and contrary to instructions started to get his own dinner. While doing this his hair caught fire and he suffered 2nd and 3rd degree burns. When his mother arrived she found him with a large towel wrapped around his head and she asked how he knew what to do. He said, "That is one of the things the Firemen teach us at school."

The Volunteer Fire departments realize that fire prevention goes hand in hand with fire fighting. They have accepted the challenge and are doing their share.

BRAINSTORMING FOR SAFETY

by A. C. STUDT

manager, Training & Education, The Hotpoint co., Chicago

Let's take a look at what thinking really is.

Thinking is a considering of alternatives—a rejection of many, and a choice, at last, of one.

Thinking is the exact opposite of routine action. If ideas which pass through our mind influence our actions, we are thinking. If our actions are not influenced by these ideas, we are daydreaming.

Thinking is invention. When a way of action has been blocked, when a routine has broken down, some other means must be discovered. Animals can be trained to follow routine, but humans must think—they must consider. For animals adjustment means conforming. For humans adjustment means readiness and ability to meet and cope with problems. Human adjustment must be logical and creative. We, therefore, have two kinds of thinking:

1. Logical.
2. Creative.

The ability to think creatively is not a gift—it's not something that some people have and others do not have and cannot get. Creative thinking can be taught. We are going to explore methods we can use to help us think about problems creatively.

Before we talk about how we're going to learn creative thinking, however, let's see just what creative thinking is and how it differs from logical thinking. Logical thinking starts at a given point and moves step by step to an incontestable solution. Creative thinking, on the other hand, has many possible starting points—imagination rules over logic—we may reach a conclusion on a problem without knowing how it was reached, and we may reach a conclusion on an idea or a problem which actually had no connection with the original problem.

BRAINSTORMING SESSION

We call this type of meeting a "Group Brainstorming Session" and it is based on the principle that one thought leads to another.

This is commonly called "chain thinking." In order to show how one thought leads to another or how one idea grows out of another idea, one can try a little experiment.

You whisper a word to one man in the room who in turn will whisper to the second man the first thing he thinks of after hearing the word you whispered to him. The third man carries on to the fourth and so on until you have gone all around the room. Then you mention aloud the word you started with, the second man tells what idea he got from it and why he stated the word he did and so on around the room until everyone has stated aloud the words they thought of originally and why they thought of them.

This is done to show how one thought leads to another and how, when a person mentions a certain idea or thought or word, we get an idea from it that may seem to have no connection with the first word, but which does have a connection when we hear the explanation.

We have now seen how, when we hear a word or idea, it reminds us of something which actually has a connection with the word we heard. This is the basis for what we call the "that reminds me" principle.

ORIGINS OF IDEAS

There are four basic reasons for getting an idea from what we hear:

1. *NEARNESS*—Something is near you which you feel or see or hear that reminds you of something which is not near you. For example, you see a baby's shoe and it reminds you of an infant—maybe your own child or a niece or nephew who may be miles and miles away. The fact that you saw the shoe which was near you reminded you of someone who was not near you.

2. *SIMILARITY*—Something you see or hear reminds you of something which is similar to it, although they are not the same. A picture of a lion reminds you of a cat, because there is a similarity between the two.

3. *CONTRAST*—Something you see or hear which reminds you of the exact opposite. For example, we see a midget and are reminded of a giant.

4. *CAUSE AND EFFECT*—Something happens which reminds us of an action to be taken or something to be done. For example, there were two men in a creative thinking class not so long ago who were standing in the hall discussing some of the ideas and a third man named Ted happened to walk by. One of the men said, Gosh, Ted, you seem to be in a hurry." Ted turned around and said, "Oh, that reminds me, I left my hat in the restaurant." Now, apparently there was no connection between being in a hurry and leaving a hat in a restaurant, but off Ted went to get his hat.

Later in the afternoon the two men checked with Ted to see just what it was that had reminded him of leaving his hat in the restaurant and he explained that he had gone to lunch with three other men that noon and while he was at lunch remembered an important appointment he should have kept. He dashed off to keep the appointment, explaining to the men that he would see them later in the day.

He kept his appointment and was walking down the corridor when one of these men happened to say, "You seem to be in a hurry." When he heard "being in a hurry" he was reminded of the last time he was in a hurry, which was in the restaurant, and he then remembered he had left the restaurant so quickly that he had forgotten his hat. All very simple and very clear when the whole story is known.

These ideas we get from other ideas can either happen by accident or they can happen on purpose. If they happen by accident, as in the case of Ted and his hat, we can get some good results from them. However, we can't just hope these accidents will happen; therefore, we make them happen. We make them happen on purpose in a "Group Brainstorming Meeting" by making people come up with ideas and talk of ideas and bring out many ideas. This is the only time, by the way, when we wish to make accidents happen.

There are certain ground rules for a "Group Brainstorming Session" that are best to follow. One is that logical judgment is more or less ruled out, at least at the beginning. Wildness of ideas is wanted because in that way we get many ideas. And even though your idea may sound very silly when you mention it and not practical or logical, that doesn't matter. The more ideas we get, the more ideas someone else will get from what we say.

MOTIVATION FOR THOUGHT

We must remember one thought leads to another. We can never tell when one man will get a good idea even though the idea that gave it to him may have sounded rather silly. When we do hear an idea that begins to make sense, and even though it may leave us up on "Cloud Nine," if it has a glimmer of sense to it, we then begin to engineer it down to earth and make it practical.

Now, while beginning this you will find that automatically our minds are going to go through certain stages of thinking. The first stage is motivation. An impetus of some kind is needed because old concepts have started to conflict with data and the conditions have changed to such an extent that our logical thinking has failed us—our backs are to the wall and we now realize that we are going to have to do some creative thinking to solve the problem.

The second step is: define the problem to find out just exactly what the problem really is. We had a case one time where we were working on the problem of: Eliminate poor morale. We had worked on the problem for some time and hadn't gotten very far.

We finally discovered that the reason we hadn't made much progress was because we had not defined our problem properly. We had men in the room who disagreed on just exactly what morale really is and we had several men in the room who thought that the morale in that department was not poor. Therefore, we had disagreement on the word "poor" and we had disagreement on the word "morale."

Naturally we couldn't solve the problem of how to eliminate poor morale until we could define the problem and agree on what we were trying to solve. Then we were prepared to collect information and really become immersed in that problem.

The third step: the collecting of all the information is what we call preparation—just getting ready to solve it. We must learn all we can about it. We must live with it. We sleep with it and eat with it and when we have collected all possible information we are ready to brainstorm the idea, which is step four.

In a brainstorming session we forget convention. We go wild; we let our imaginations run loose, mentioning many ideas which we hope will give someone else an idea as to the solution of our problem. If we do not come up with an answer to our problem, we're very likely to run into the next step which is frustration.

The only thing we can say about frustration is that it is at this point that we must learn the greatest of all virtues—patience. If we recognize that feeling of frustration as being natural, we will be able to go along to the next step and purposely divert our attention from the problem. In other words, forget it. Put it out of your mind; don't even think about it.

CAN'T STOP THINKING

The only reason we can say that, is because actually it's impossible to do, because our mind will unconsciously continue to operate on that subject. In the back of our mind we will be thinking about it whether we realize it or not. And then all of a sudden we will hear a word, we will see something or get an idea from someone and the next step of insight (Step Seven) will take place.

The sudden illumination will come and we will realize then that we have begun to

solve our problem just as Archimedes did when he stepped into the bathtub one day and solved a problem he had been working on for years. All of a sudden, after putting this idea out of his mind, that moment of insight came and he had solved his problem. It's happened to you—it's happened to me—it's happened many times, and it will happen many more times in the future.

Then, comes an important step: that of verification. (Step Eight). Now our idea must be engineered down to earth. This is where the creative thinker distinguishes himself from the crackpot. The crackpot leaves the idea on "Cloud Nine," the creative thinker engineers the idea down to earth and makes it practical and usable.

He assesses the idea, he evaluates it, and then analyzes the idea in the light of the problem and comes up with a solution. It may be in many cases that modification will have to take place. (Step Nine). There may be details of the idea which have to be worked out and they may involve some creative thinking too.

AWAKENING IMAGINATIONS

"Group Brainstorming Sessions" are based almost entirely on imagination. Now, that isn't quite as easy as it sounds because in most cases our imaginations have been stifled. In most cases we haven't deliberately used our imaginations for many years.

So we have to revive these imaginations. The first thing we are going to do is to reawaken our imaginations and as we start, the first thing I'll do is tell you a story—a story about an old friend of mine Pete Smith.

Pete Smith is driving down a road on Long Island and he's in a battered, worn out, 1937 model automobile that is chugging along as though each mile will be the last mile. Pete is wearing a suit that must have cost $300 new, but now it is dirty and has many grease spots and a few holes in it. As we get a little closer to Pete and take a look at him we discover that he has a very strange expression on his face.

The first time we look at it, we think it is a rather grim expression, but then as we look at him a little more, we decide that maybe he's smiling and we're a little puzzled as to just what's going through his mind. Just about that time, Pete turns into a driveway of a beautiful house, practically a mansion.

He drives the car to the front door, gets out of the car and stands and looks over the house for 30 seconds, and then with what we think could be a chuckle, walks up the front stairs and rings the bell. There is a short pause, the door is opened by a butler who is about to tell Pete Smith to go away, when he takes a second look at him, claps his hand to his forehead and says, "Oh, my God . . ."

UNFINISHED STORY

Now—we could finish the story. If time would permit, we would stop and write a conclusion to that story. In finishing the story one would begin to use the imagination. It doesn't matter what the answer is or what is written. The only reason for having this story completed is to get the group back into the habit of using their imaginations.

After your brainstorming group has worked on this story, give them an actual problem.

The problem we are going to describe is one we use at Hotpoint and probably could not be used any place else. We distribute to each participant a small paper tube, approximately one inch long and a half inch in diameter, sealed at one end. We explain that we have 13,000 of these paper tubes which are thrown out every week. We have decided to form a company and sell them. Our product is already made for us: it doesn't cost us anything.

All we have to do is to sell it. But before we can do that we must find a use for the paper tube. So, who has an idea as to what this paper tube can be used for? The ideas are listed. Even though they might sound silly in some cases, that's perfectly all right because even though it's a silly idea, it may give someone a good idea. After we have exhausted the possibilities of what this paper tube can be used for, we close the meeting by introducing another idea which will help reawaken their imaginations.

You might find that the group occasionally has reached the stage of frustration. The instructor should then have them forget the problem until someone in the group brings it up again because he thinks he has reached the next step of insight.

However, for these practice sessions it is suggested that the problems presented be simple ones. It is better to solve a simple problem than to confuse the issue by presenting a complicated one. The tougher, more complicated problems can be brought up later when the group has had some practice and is more familiar with brainstorming.

I'd like to tell you a story—a story about a friend of mine, John Jones. John Jones was a fairly good salesman making a fair average living. There was, however, one man John Jones wanted to sell. If he could get this one account, he knew that it could put him on top of the heap.

The man he called on, Mr. Brown, was always nice to him. He had never definitely said, "I will never give you an order." On the other hand, he had never yet given John any business. On the day when we come into contact with John, he's sitting at his desk in his office and the phone rings. Mr. Brown is on the other end of the wire and he says to him, "John, I was wondering if you could have lunch with me because there is something I'd like to talk to you about."

Naturally, John gets down to the hotel as fast as he can. He meets Mr. Brown in the lobby and they go into the restaurant to have lunch. Mr. Brown says, "John, before we start to talk, let's order. I think I'll have some roast beef, mashed potatoes and gravy," and John says, "That's fine. I'll have the same thing." The waitress brings the order. Mr. Brown puts a little salt on his roast beef, mashed potatoes and gravy, and hands the salt shaker to John.

COMPLICATIONS ARISE

John begins to put some salt on his potatoes when Mr. Brown starts to talk to him. As Mr. Brown is talking, John doesn't realize it but the salt keeps pouring out of the salt shaker, and quite a little mound gathers in the gravy. John, thinking it is a little mound of mashed potatoes with gravy, picks up this mound of salt and places it in his mouth just as Mr. Brown says to him, "Well, John, what do you think of that idea? . . . That's right. You finish the story.

However, before you finish that story, let me tell you of a little experiment I conducted. I went home, got a little gravy, poured a mound of salt into it, placed it in my mouth and I found that I could not get rid of the salt using a napkin. I found that I could not wash it down with a glass of water because it made me sick and I found that I could not say, "Pardon me, I'm going to rinse out my mouth," because I couldn't talk. Now, finish the story.

You will note that we have tried to eliminate the obvious ways of getting John out of his trouble so that the group will have to do a little more thinking to finish this story. You will also note that we do not tell what Mr. Brown said to John. He did not necessarily talk business. This is the big loophole for the group. If they ask you what Mr. Brown said, or ask if he discussed business your answer should be, "It doesn't say in the book. You'll just have to use your imagination."

BRAINSTORMING RULES

Now, let's add some ground rules for "brainstorming."

Appoint someone to record your ideas. Preferably someone capable of speed-writing or shorthand. Record all ideas. Any ideas are acceptable but—no logical thinking allowed! Review and analyze,—establishing a difference between creative thinking and day-dreaming. If it leads to action of some kind, it's creative thinking, otherwise—just day-dreaming.

Ten people sit around a table and the problem is posed. Write all the answers as rapidly as they are given. You can't say, "I don't think it will work!"

There are many people who claim they are logical thinkers and that creative thinking is not for them. Too many times, however, you will find that their logic is something like the Eskimo's thinking when he says, "A lighthouse is no good. The light shines—the bell rings—the whistle blows—but the fog comes in just the same." Or, like the Burmese who were astonished to find that Americans made sidewalks out of water. All they did was add a little sand and cement.

It is obvious that anyone who reasons along any of these lines needs help, and it is the duty of the training man to give it to him. Should you encounter anyone as described above, the following may be useful.

Often a person has trouble getting an original idea. It may be that he can expand

on an idea he has heard. He may be able to improve an idea, but the start is what stymies him. In those cases, this formula has been found successful. It is the method of solving the problem first. In this method of teaching creative thinking, we present the problem to a group and immediately produce a solution to the problem.

However, in spite of the fact that our solution is actually a solution to the problem, it is so ridiculous and far-fetched that improvements are obvious. With this method, however, we get their thinking started and get them over the first hurdle, although we are not doing their thinking for them.

IMPROVING A ROOM

Now suppose I tell you that I think a group should have a room in which to rest and relax during the day. I have decided that this very room would serve our purpose. However, it would be improved considerably if it was cleaned up a bit, so I'm going to have it painted. I think the west wall should be a bright yellow—the ceiling, Chinese Red—the east wall, light green with purple polka dots. How does that sound to you?

Your group will undoubtedly agree that a "relaxation room" is a fine idea. They will also agree that it should be painted, but they certainly cannot agree with the color scheme you have outlined for a room in which to relax.

Our solution, however, meets the requirements of the method. It is a solution to the problem, but the improvements to be made in color selection are obvious.

REMOVING A POST

Now here's another example. This meeting room is convenient for all participants of these sessions and comfortable. We have in this room everything we need to conduct a successful conference. The room, however, has one serious drawback. As you can see, there is a post about four feet in front of the door.

Now, this post does not interfere with coming in or going out of the door, but it is inconvenient, and we would be better off if the post was not there. Now, I'm smart enough to know we just can't remove the post and let it go at that, because the ceiling would fall down. The post now holds it up. However, I'm not too concerned about this problem because I have a solution to it.

What I purpose is to measure up from the floor seven feet and cut through the post at that point. Then we will remove the bottom seven feet, allowing us to pass in and out of the door and not be bothered by the post. The three feet of the post above the seven foot mark we will leave there because that is the part that supports the ceiling in the first place.

So my solution is to remove the bottom part of the post, which is in our way, and leave the top part where it is, to support the ceiling. What do you think of my idea? Can you think of any improvements on it? Again the improvements are obvious and the group will undoubtedly have many suggestions.

You can now introduce a real company problem, and at the same time a solution to the problem. Just be sure your solution is really a solution to the problem and can be improved upon easily. In other words, be sure you have a solution that the group must agree with in principle but must disagree with in detail.

THREE WAYS TO CREATE IDEAS

There are several other techniques that can be effective if your group is confronted by an inability to continue the process of creating thinking. There are three which should be considered:

The Tear-Down Method in which a product, part of a product, or a method of operation is selected for discussion by two men. One man takes the attitude that everything about the product or method is wrong and suggests a different, and not necessarily a better way of doing or making it. The other cannot agree with him and suggests another way of doing it.

The first disagrees and suggests another way, and so on. When one man makes a suggestion that makes sense both men get together and engineer it down to earth, making it practical and useable.

A second approach is called the *"And-Also Method."* Again two men work together and make suggestions but do not disagree. One suggests a different method and the other says "That's good, and also we could . . ." and he adds to the idea. This elicits additional ideas and thinking. Again, eventually a good idea is worked out.

Finally there is the *37 Solutions Method.* All interested parties are told about a problem and asked to write down 37 solutions to the problem. A week later they attend a meeting and their ticket of admission is their list of 37 solutions. After duplicates and the obviously impossible solutions are eliminated you may have only five or six good ideas left. But you are in the position of starting a meeting to solve a problem to which you already have five or six good solutions.

BRAINSTORMING ANSWERS

You confront many problems in your safety responsibilities. In finding some answers to the question, "How to get supervisors to accept their safety responsibilities," the following list of unedited replies were given as a possible answer to this problem.

Sell idea of safety as part of production.
Fire all and get new ones.
Make them give detailed reports with recommendation on all accidents.
Let supervisors know that they have 100 per cent management support.
Make foremen act out accident.
Get supervisor into every safety activity.
Add accident costs to supervisor's report or take out of his pay.
Send to NSC school.
Penalize foreman by shift to night work or to more disagreeable job.
Integrate safety record with annual merit rating.
Have all reports routed through immediate and "top" boss.
Make supervisor announce and explain accident to family of worker.
Hold them responsible for reporting and requesting correction on unsafe conditions.
If an accident occurs, the foreman must treat safety director to a dinner.
Awards and recognition.
Management must demand it.
Sell safety to management.
Charge back of compensation costs to the department.
Publicity for bad performance.
Educate them.
Include supervisors on safety committees.
Dramatize the problem.
Have supervisors investigate and explain accidents to their bosses.
Get tough.
Bonus system to supervisors with good safety records.
Promote employee suggestion system. Pay for suggestions that are adopted.
Have supervisors accompany inspection committee.
Publicize workers' safety suggestions.
Write safety into job specifications.
Enforce safety as written into job specifications.
Emphasize safety on staff meetings agenda, and in actual session. Introduce at all staff meetings—supervisory, middle and top management.
Get managers "off their duffs" and out in the plant to check the job that is being done.
Be sure that management is properly advised by adequate reports as to what is going on.
Proper selection of safety personnel—man in charge must have know-how, personality and dedication to the job. He must be able to win the cooperation of the line organization.
Understandable rules.
Explain "why" to supervisor.
Annual dinners for no lost time injuries.
Supervisors investigate safety suggestions.
Supervisors in charge of safety suggestions.
Hold responsible for accidents.
Threaten.
Discipline.
Promise a trip to Sputnik.
Evening meetings on overtime.
De-merits—counts against bonus.
Give him your job, and you take his.
Make out all necessary reports.
Department competition.
Incentive awards.
Pride in plant safety achievement.
Badge.
Put in pillory.

Put on first aid for a time.
Visit hospital injuries.
Consciousness of safety.
Impress him that safety is part of his job.
Have supervisor explain to top management why the accident occurred and what he is doing to prevent accidents in the future.
Have superintendents grade each foreman.
Give S&H stamps.
Demote foremen to assistant.
Discuss safety responsibilties with foreman's wife and family.
Have top management get foremen together weekly — rotate chairmanship among foremen.
Joint safety and health meetings with union personnel represented.
Penalize foreman by putting red sign on his back, "I goofed."
Use National Safety Council material.
Think safety and make it a habit.
Completely train them.
Have program where supervisor is directly involved—like contact system.
Accident cost budget.
Accident cost budget with savings on estimated costs returned to the department.
Pay sufficiently to insure acceptance of responsibility.
Fire them—set examples.
Interview with top management.
House organ on safety—supervisory level.
Supervisor as "Safety Man of the Month."
Have vice presidents visit with all levels of supervision on safety.
Have supervisors investigate all accidents, serious or minor, actual or potential.
Safety Director take problem to top management.
Make safety a line function instead of staff.
Negotiate so that labor contract does not hamper foremen's position with respect to safety.
Hypnotize him so he will accept responsibility.
Organize good supervisors' safety training program.
Use them as assistant safety supervisors for a time.
Send top supervisor to NSC Congress as a reward.
Select winner (as in above) through departmental contest.
Have him address next safety meeting if his safety record is poor.
Let him defend safety record before his boss.
Safety scoreboard by departments.
Invite supervisor's wife to visit his job area during working hours.
Break down supervisor's work—see if he has time to do safety. Review his "red tape."
Supervisor analyze each job with his men. Offer supervisor help from the safety and engineering department for four weeks.
Place white elephant in department of supervisor with poorest safety record. Also, award department with the best standing.
List uncompleted recommendations in a department and dates on which they were made.
Take photographs of conditions in need of correction and submit to company officials.
Bring all supervisors to NSC Congress.
Take supervisor to supper.
Extra incentive wage for accident free year.
Films.▲

HOW I TRAIN MY EMPLOYEES FOR JOB SAFETY

INTRODUCTORY REMARKS

by E. G. HUTZLEY
senior safety engineer, Campbell Soup co., Camden, N. J.

Next to the backing of plant management, a supervisor's understanding of why accident prevention is a part of their daily duties is, without a doubt, the most important.

Without such understanding and knowledge of how consistent use of understandable techniques will reduce accidents and costs, the incentive to take active part in accident prevention educational training of people they supervise is entirely lacking.

Sincere supervision of every degree will use his powers of observation, administration and human relations knowledge to have people he directs do their work with the least hazard possible.

Everyone has their own pet theory concerning the best way of putting a story across. The five gentlemen we have here on our panel can provide us all with down to earth information, methods and procedures which we can take back and use in our own plants. Each panel member will present his method of training employees in job safety.▲

REMARKS OF LEO D. BAUER

maintenance foreman, Brown-Forman Distillers corp., Louisville, Ky.

Since my work is confined mostly to the main plant, my remarks will pertain chiefly to that operation. Of a total of 1,650 people employed by Brown-Forman 1,140 are located at the main plant, called the Old Forester Plant, 300 in the general and sales offices and 830 in production, working in the distillery, warehouses, bottling house, shipping department, maintenance and power plant.

My job as general maintenance foreman involves the supervision of 45 men whose duties are to maintain buildings, grounds and all equipment, except bottling machinery. Bottling machinery is maintained by a separate group. We also maintain all heating and air conditioning equipment.

Most of our work is done on the day shift, although there are two maintenance men on duty during each production shift. Our present schedule consists of 24 hour operation, five days in the distillery, and eight hours, five days in bottling.

The maintenance crew is made up of electricians, pipefitters, mechanics, carpenters, painters, gardeners, a brick mason, apprentices, helpers and laborers. All except electricians are members of Local #39 of the Distillery and Wine Workers Union. Electricians are members of International Brotherhood of Electrical Workers. During the day shift, there is a trained nurse on duty in a well-equipped dispensary.

WHISKY PROCESSES

Bourbon whiskey is made by grinding grain, consisting of corn, rye, and barley malt into meal. The corn meal is added to water in a cooker. Here the starch in the corn is broken down by a process called Pastification. The pastified meal is then pumped into mash tubs where rye and malt are added. The malt converts the grain starches into fermentable sugars.

The finished wash is pumped through coolers into fermenter vats where yeast is added to convert the grain sugars into whisky. The fermented "beer," as it is now called, is then pumped into the "beer still" where the whisky is removed by distillation. The new whisky is then put in new white oak barrels and stored in warehouses for at least four years before it is bottled.

The by-products of the beer still are called spirit stillage. It is processed in driers and evaporators to produce distillers light grains and solubles, which are used as feed supplements in the feeding of poultry, cattle and swine. Our bottling house consists of 10 bottling lines capable of bottling 90 bottles per minute each.

HAZARDS IN DISTILLERIES

In a distillery, hazards are created by the handling, storage and milling of grain, the distillation of alcohol, and the handling and storage of alcohol in tanks, vessels, and barrels.

The principal equipment used in the production of whisky are mills, conveyors, pumps, stills, and various types of heat exchanger equipment. The major hazards in the distilling industry are fire and explosion from grain or meal dust, and from vapors of volatile liquids.

The danger from fire and explosion are probably the easiest to recognize, and, therefore, are the ones which we guard against the most. As in all distilleries, we have definite rules and precautions which must be observed in the routine production and maintenance jobs connected with these hazards.

In addition to the fire and explosion hazards, we have the hazards found around power transmission equipment, materials handling equipment, tools, electrical apparatus, steam and gas lines. Perhaps, we are less aware of these hazards because they are aids to the production of the product, and do not necessarily involve the product or any raw material. It is in this field that we must be most cautious.

ALL AID SAFETY PROGRAM

At Brown-Forman, the safety program is under the direction of Joe Redelberger, the Director of Safety. Redelberger organizes the program and it is carried out by the department heads, foremen, and the men and women on the job. He maintains the records and provides all the material and help necessary for a good safety program, but he depends on the foremen and workers to carry it out. Each foreman is responsible for the safety program in his department. All contacts from the safety department are made through the foremen and not through the safety department itself.

There is an annual company-wide safety contest. The division which wins each contest is treated to an open house, where the families of the workers are invited to witness the presentation of awards and enjoy a buffet lunch.

In the maintenance department, we have *many men who are quite skilled at their* trades, and who have learned that a good job is one which has been done safely. These men believe in safety and are a great influence in teaching safety to the younger men.

When a new man reports to the maintenance department, he is made familiar with the safety rules of the department. The rules are posted conspicuously, and are reviewed frequently. The new man is assigned to work with older employees if this is at all possible, and the older employee, as well as the foreman, is expected to see to it that the new man learns what is expected of him from a safety standpoint.

TRAINING, SAFETY MEETINGS

We also have an apprentice program, consisting of on-the-job training, and off-the-job class work. Safe working practices are an important part of this program. Monthly safety meetings are held. These *meetings are carefully planned so that the* workers take part in them and so that they will be of interest to the maintenance men. We discuss accidents and near accidents and the ways and means by which they were, or may have been avoided. We discuss hazards *and request safety suggestions. We try to* limit these meetings to 45 minutes and we've found that they're well received. At these safety meetings, typical distillery jobs are reviewed and safe methods for carrying out the jobs are discussed.

There are several rules which apply to hazardous work and jobs which involve welding, cutting, or sprinkler tests and repair. We try to make these rules as ironclad as possible. The rules involve the use of Welding & Cutting Permits, and Sprinkler Maintenance Permits. When these permits are issued, permission is received from the department head, the safety department, and the maintenance foreman in writing. Fire watches are assigned and explosion meter readings made, if necessary.

When a fire watch is assigned, he is a member of the Guard Force. He is not interested in the maintenance job, itself, but only in seeing that a fire does not start. He maintains his watch for one hour after the job is completed. The proper handling of these permits insures the worker that the area or equipment he is to work on is reasonably safe. We've found that the *maintenance* men are enthusiastic about the permit system. They try to make it work, and that's the item which determines the success or failure of a program.

Other rules involve locking out power equipment, methods of purging tanks, use of ladders, blocking off areas where work is going on overhead. We try to remind the men of these regulations constantly.

Formal training programs, regular meetings, safety rules and regulations—these are important and necessary parts of a foreman's safety program. The most important part of the foreman's safety job, however, is the person to person contact on the job. While we must learn to deal with a group—be impartial—award jobs and overtime by seniority, we must not forget that every human being is a different person. A foreman must learn to know each man. He must learn to know what to expect from each. He must be where he can help if help is needed. He must be diplomatic and inspire cooperation. The success of a safety program depends on people wanting to work safely.

REMARKS OF DEAN McCLURE

Albers Milling Div. of Carnation co., Kansas City, Mo.

I have a safety story I'd like to relate. It is a letter written as a gripe to the insurance company, and reads as follows:

"Gentlemen:

The soullessness of corporations such as yours is astounding. Let me review my case. I carry an accident policy DX 567843 in your company, by the terms of which you agreed to pay me $25.00 a week during such time as I was prevented from working because of an accident.

"A week ago I was inspecting a new apartment house that is being built for me. I climbed the stairs, or rather the ladder, now located where the stairs will be when the house is finished, and on the top floor I located a pile of bricks which were not needed there. Feeling industrious I decided to remove the bricks. In the elevator shaft was a rope and pulley and on one end of the rope was a barrel. I pulled the barrel up to the top and fastened the rope firmly to the bottom of the shaft. Then I climbed the ladder again, and filled the barrel with bricks.

"Down the ladder I want again-five stories, mind you—and untied the rope to let the barrel down. The barrel was heavier than I, *and before I had time to* study the proposition I was going up the shaft with my speed increasing every second. I thought of letting go of the rope, but before I had decided to do so, I was so high up that it seemed more dangerous to let go than to hang on. So, I held on.

"Half way up the elevator shaft I met the barrel of bricks coming down. The encounter was brief but spirited. I got the worst of it and continued on my way upward toward the roof. I struck the roof at the same time that the barrel struck the cellar. The shock knocked the breath out of me and the bottom out of the barrel. I was heavier than the empty barrel, and I started down the shaft while the barrel started up. We met in the middle of our journey and the barrel pounded my solar plexus, barked my *shins, bruised my body, and skinned my* face.

"When we became disentangled, I resumed my journey downward, and the barrel went higher. When I hit the bottom, I stopped so suddenly I lost my remarkable presence of mind and let go of the rope. This released the barrel which had reached the top of the shaft, and it fell five stories landing squarely on top of me.

"Consider the heartlessness of your company. I sustained five separate and distinct accidents within one minute. One,

on my journey up the shaft; two, when I struck the roof; three, when I met the empty barrel; four, when I struck the bottom; five, when the barrel struck me. Now, your agent states that it was only one accident, not five, and instead of receiving $125.00, I am only entitled to one accident settlement at the rate of $25.00."

SOME ACCIDENT FACTS

To me, while the story is comical at first, it also points out several things from a safety standpoint.

1. How quickly accidents can happen.
2. How a chain reaction of events can come about before you have had time to reason out or evaluate the situation.
3. Accidents may be caused by someone doing something he should not have been doing.
4. The logic of some people concerning an accident after it has happened.

Certainly, we all realize a company cannot suddenly decide that all of their employees will work safely and make their wishes come true. It requires a good safety educational program to develop good teamwork between management, supervisors, and employees. A positive attitude by all concerned toward working safely is very desirable.

MUST STRESS SAFETY

This safety consciousness can be greatly stressed if management and supervisors practice safety themselves; remind others of safety practices while they work, give credit where credit is due; and always be willing to supply and maintain any safety equipment needed.

At our Kansas City plant, we like to introduce new employees to our plant safety program by letting them know how proud we are of our safety record at the plant, and explaining some of the reasons for safety. For instance:

- From the employee's point of view, if he is injured:
  - (a) He must suffer.
  - (b) He stands a chance to lose his life or limb.
  - (c) He and his family may have financial hardships due to partial or permanent loss of pay.
  - (d) He must stand partial medical expenses even though covered by insurance.
- From the company's point of view:
  - (a) A safe worker is an alert worker.
  - (b) Employee's attitude to the company is better when they know the company is concerned with their family's welfare.
  - (c) It is costly to replace a trained man while he is temporarily or permanently disabled.

Next we like to discuss our safety committee, its functions and the authority of the committee members. We also explain that he should not take offense if someone points out his unsafe practices, but to accept these suggestions as a personal favor to himself and his family.

SAFETY COMMITTEE'S DUTIES

To me it is gratifying to overhear an employee—committee man or not—remind a fellow employee when he sees something he considers unsafe. Teamwork such as this is desirable and necessary to help maintain interest and alertness toward plant safety at all times.

Our safety committee meets monthly. It is composed of management, all of the supervisors, and at least one man from each division of the plant. We try to select key men from each group who rotate each year. Eventually, we hope to have every employee serve on the committee at least one year or more.

SAFETY MEETING AGENDA

A typical safety meeting program is as follows:

—Since our plant safety contest standing is comparable in interest to a football or baseball score, we discuss it first.

—Then we discuss safety posters and any other safety material presented by the members.

—Members make mechanical and non-mechanical recommendations which are noted in our minutes of the meeting. These recommendations are all logical and well planned and we always try to have them completed by the next meeting. Thus, the individual feels it is worthwhile to watch for things that need attention.

—Selection is made by the committee of the "Safety Man of the Month." The men are divided into groups that are exposed to similar risks. Each month we pick a different group, and from that group is chosen the most outstanding, safety-minded individual according to his attitude, past record, etc. This employee receives a $5.00 award, and his name goes on our "Safety Man of the Month" board. Also, a nice letter is sent to his family to tell them of the honors bestowed on him.

Our meetings are generally closed with a film on safety, or a talk concerning industrial or home safety.

REMARKS OF HENRY NUTI

foreman, Mars, Inc., Chicago

The successful training of employees for job safety depends on many things. Primarily it is necessary that the fundamental principles of a safety program be backed by the owners and executives of the company. Their sincerity is demonstrated by the employment of a safety director, the installation of a medical department complete with doctor, registered nurses, and full equipment for handling minor accidents. In many other ways they must set the example by safe practices.

When a new employee is placed in the hands of the foreman he has already received some general instructions on safety. From that point, after the preliminary introduction, we try to find out what qualifications the employee has for the task to be undertaken. To the best of our ability we try to determine if the employee is suited physically and temperamentally for the work.

Although it is difficult to determine much from the initial interview it does sometimes save us from unwittingly exposing a workman to hazards which may aggravate a pre-existing condition or place him at work which he cannot be expected to perform efficiently.

For example, we have jobs on our roll wrappers which require a rather tall girl because she must reach up and guide pieces into the wrapper. Five feet, four inches is a minimum. To put anyone shorter on the job would require supplying her with a platform to stand on. This would aggravate a pre-existing condition by putting her in a job which she cannot perform efficiently. If we feel the employees qualify then we instruct them in the safe methods of a specific task.

From there on he is watched frequently until he has demonstrated his aptitude for the work and has formed safe and efficient habits. Older employees also must be reminded of safe performance because they often form unsafe habits without realizing it.

FOLLOW-UP INSTRUCTION

Any instance of non-compliance with safety regulation and practice is dealt with firmly and positively just as it would be with poor workmanship. Here is where we foremen sometimes fail. In the interests of expediency and continuity of live performance we are perforce to look toward the ceiling while the unsafe act is being performed.

We excuse ourselves by saying we will take care of it when the right time comes. This is tantamount to approving the action and the employee feels assured that it is alright until he is hurt; then he condemns you for not stopping him.

Since it is physically impossible for any foreman to be in enough places at the right time to verify safe conditions and behavior, each employee is required to verify the proper condition of his workplace and equipment. He is also required to keep equipment and workplace in first class condition. Obviously this is necessary in a food plant for more reasons than one. Here of course he is supplemented by an adequate maintenance force.

Every accident, no matter how minor must be reported to the medical department

for attention. The report is turned back to the foreman who investigates and corrects the cause to prevent recurrence. Sometimes it is difficult to get quick response to some necessary action to remove or guard a hazard.

If this occurs, the foreman's responsibility does not end by merely requestioning. He cannot be relieved until the correction has been made. Moreover the cooperation of the employees is discouraged when correction is delayed.

EDUCATING EMPLOYEES

To assist us to determine the effectiveness of our program we receive monthly, semi-annually and annual reports from the safety department as to the number and types of accidents that occur in ours and other departments. This information assists us by focusing attention and corrective action upon the more urgent situations. Long operating periods without lost time injuries are recognized by publication on a bulletin board. So is the injury which stopped the period.

No one person or small group of persons can carry on safety work alone. All employees must feel they are essential partners in the program. To accomplish this it is necessary to create a guard in each employee so he will habitually think and look before acting. Only through sustained education can this guard be created and maintained. Ours is a never ending task because each accident is evidence of failure and therefore a signal for prompt remedial action. Persistent supervising, patient but firm and positive handling in cases of non-compliance with safety regulation, instilling a feeling of partnership in the employees because the job is too big to do alone and most important, sustained education to make it a habit to think and look before acting are our complete responsibility. This is our part in halting the widespread human misery and economic waste that follow accidents. ▲

REMARKS OF GEORGE E. SHUMAN

assistant plant superintendent, Libby, McNeill & Libby, Janesville, Wis.

Being in the seasonal canning industry, I often train a great number of seasonal employees in a short time. In addition, I continuously train new employees at a rapid rate because of the high turnover of labor. To do the job adequately, it takes the combined effort of all departments and all supervisory personnel.

In order to do this, we must approach safety training from many directions. I start this training when the employee first reports to work. Even before he reports on the job the personnel office spends from 20 to 30 minutes with the employee, explaining how the company feels about safety and what it is attempting to do. Second, the employee gets another reminder of safety precautions and has explained to him the particular safety precautions and hazards of his job.

This training is not adequate, however, and we go to even greater extents to keep every employee constantly aware of safety. Once each week, during brief pauses in production, my foremen and supervisors take the employees aside in small groups and remind them of safety. During this time, they ask for suggestions on improvements that could be made or criticism on our present safety precautions.

Each week, I hold a meeting of the safety committee to discuss these suggestions and recommendations. Several employees from different departments and different jobs attend and participate in the discussions. In this way, I obtain a different point of view which often brings up things that I had overlooked completely myself.

Finally, I conduct a continual safety campaign with posters, contests, and awards to keep safety foremost in the mind of all. ▲

Meat Packing, Tanning and Leather Products Section

WHAT'S MY LINE IN SAFETY

REMARKS OF A NURSE

by BERNICE McDERMOTT, R. N.*
I. Miller & Sons co., Long Island City, N. Y.

The working basis of an accident prevention program includes:

a. A statement of policy by top management which emphasizes the importance of safety and assures enthusiastic support of all responsible for reducing accidents and occupational illness.
b. Safety education of all supervisors and workers.
c. The discovery of all hazards by point of operation guarding.
d. Physical safeguards for all hazards discovered by regular inspection and reports.
e. First aid facilities to minimize the severity of the accidents.
f. Assignment of responsibility for safety to line organization with the co-ordinating leadership specifically designated.
g. Assembly of data for control purposes.

CONTROL OF SAFE WORKING CONDITIONS

A monthly inspection of the plant is made by a team composed of: the maintenance superintendent, a personnel representative, the department chairmen (usually two), a nurse and the foreman of the department.

The monthly safety meeting includes the inspecting team plus a plant superintendent who conducts and moderates, employee representatives, one from each department, chairmen, from each department, foremen, (usually four), and an insurance representative.

Employees, chairmen and foremen who attend the safety meetings serve for three months. They are replaced by other members from the same groups thereby rotating active participation.

Before the safety meeting, the inspection team submits a report of its findings which includes the action taken from recommendations made at the preceding safety meeting. Additional reports, by specifically designated persons, are submitted for discussion and prevention control.

SELECTION, PLACEMENT AND TRAINING

Weekly conferences of supervisors are conducted by the plant superintendent. During these meetings accident control is considered from a viewpoint of cause and effect. The discussion material is provided in a summarized report of all injuries which occurred.

The selection and placement of employees is made by the personnel department. The experience and special skill of the applicant are the determining factors. Applicants are referred through agencies, however, some new employees are obtained through classified advertisement.

There is no question of the importance of pre-employment evaluation from a medical viewpoint. However, because of a union situation, there is no pre-placement program.

The training of all new employees is assigned to the supervisor of the respective department. The trainee learns first by observation with gradual participation in the immediate area of operation. The training

*Bernice McDermott was unable to attend the Congress. This manuscript was submitted previously for use in the transactions.

of the new employee may be delegated, by the supervisor, to an experienced, reliable and well skilled member of his department. Evaluation of the trainee's performance is made by the supervisor exclusively.

In promoting safety and maintaining interest the following practices are exercised: safety committee meetings are held, safety inspection teams are organized with workers participating, and training courses for all supervisors including the nurse. Awards are given to individuals for ideas and improved methods of operation, and safety literature is enclosed in pay envelope.

Messages on safety are included in the monthly communication to individuals by top management. Posters dealing with safety, bulletin board reminders and health literature promote safety awareness. Talks by the nurse to supervisors and employee groups and day by day instruction, by the nurse, when caring for individual injuries or illnesses make employees more safety conscious.

PERSONAL PROTECTION

By Management:

Protective equipment is available for general need with allowances for special requirements, e.g. refracted lens where goggles are essential. Management also installs safe machinery and equipment and provides first aid facilities.

By Supervisors:

The supervisors conduct fruitful training with observation of new employees, and then give objective evaluations of their adaptability, judgment and performance. Correction and prevention of physical hazards in their respective departments are their responsibility. They also supervise light and noise control and recognize any changes in the continuity of production. They detect unsafe practices, e.g. repairing of machines by operators.

By nurse:

Early detection of sensitivity to materials required in operation is a most important responsibility of the company nurse. In addition, early detection of fatigue factors, e.g. off balance at work position and spotting failure to employ protective equipment are her duties.

She gives instructions in using protective facilities when issuing them and recognizes inadequate clothing as related to seasonal demands, continued standing or type of operation. Of course, her main duty is administering first aid and instructing in hygienic practices relating to health in general.

CARE OF INJURED AND HEALTH PROGRAM

With no plant physician, the care of the injured in all emergencies, becomes the responsibility of the nurse. As a guide in carrying out routines and procedures, she is governed by the well known "standing orders." These orders clearly outline her limitations when administering first aid in either occupational or non-occupational emergencies. The physician who has written and signed the prescribed procedures has been approved by top management.

Occupational emergencies which arise and their treatment are:

1. Minor injuries receive first aid and follow-up care by the nurse.
2. More severe injuries receive first aid only and are referred to a physician, the injured person having 'free choice.' In the event of an eye injury, the patient is referred directly to the care of an ophthalmologist.
3. Injuries of apparent extreme severity, or where doubt exists, are attended at the site of the accident. The attending physician then assumes the responsibility for follow-up medical care.

The line of distinction between minor and severe injuries depends upon 1) the extent of the injury 2) part of body involved 3) the general condition of the injured and 4) the history of the accident. However, the required information on the cause of the accident sometimes involves painstaking investigation which in delaying is inadvisable. Contributing factors may escape attention.

Two purposes of early investigation are to determine compensation benefits of the injured person and aid as a guide to preventive effort. The nurse has a responsibility to obtain the cause of injury for the victim, and for preventing recurrence.

All occupational injuries or illnesses that require medical care are reported to the Workmen's Compensation Board, Department of Labor. Standard accepted forms are used and reports are submitted at the earliest possible date after the injury. The report includes any loss of time from the injury. The nurse is responsible for all such reports. Employees who lose time because of injury, resume work when authorized by their attending physician. When treatment has terminated, the doctor so indicates on his final report, and also reports factors of disability, such as scars or partial impairment.

Our health program is limited and informal being conducted and guided by the nurse. The primary essential in assisting individuals with their problems is the nurse's ability to gain confidence in her advice and recommendations. Encouragement and understanding by the nurse develops a sense of security and feeling of being welcomed, plus the reaction that no problem is "too small" for discussion.

Through voluntary consultations the nurse develops an awareness of varied health problems, such as dietary deficiencies, weight control, adequate and proper clothing, fatigue factors, emotional disturbances, detecting irritability, economical problems and personal hygiene.

AIDS FOR THE NURSE

Making use of numerous community services, with which the nurse keeps in touch, provides her a most beneficial aid. Also, through the co-operation of the family physician, and the employee's consent, many specific services are rendered by the nurse "in the plant," such as a series of injections or daily renewal of a surgical dressing.

In this area, the co-operation and the response of employees is most gratifying. Their interest in health literature and pamphlets is most encouraging and stimulates interest heretofore unchallenged.

Exclusion of employees from work, because of illness, is done on the judgment of the nurse.

Disability benefits for non-occupational illness are provided through group insurance and are facilitated through the personnel department. The nurse reports all known illnesses to this department and benefits are instituted. Employees resuming work after an extended illness do so with written authorization by the attending physician.

The extent of medical equipment is dictated by the program in practice. All medical supplies are ordered by the nurse with the approval of the general plant manager.

One of the greatest responsibilities of the industrial nurse is records and reports. The daily log is a day by day record of all persons advised or treated by the nurse, and serves as a working basis for all reports and analysis.

ACCIDENT REPORTS AND ANALYSIS

The personal record card is maintained by the nurse confidentially. These records are beneficial in accident control from repetitive standpoint. Reports submitted by the nurse include:

1. Monthly dispensary report, clarifying care of all injuries as differentiated from non-injuries, each designated under a heading, e.g. abrasion; headaches.
2. Monthly accident summary, giving all essential details of injury; cause, lost time, return to work.
3. Day to day report on accidents, showing cause, result and disposition of medical care; recommendations; lost time.
4. Reports on illnesses are made to personnel.

The above reports go to division management and the following to the HOME office:

1. Listing of individual accidents showing lost time.
2. Listing of individual accidents showing no lost time other than time spent receiving medical care.
3. Report of each individual who has lost time on how accident occurred, cause of injury including all contributing factors, e.g. part of machine, nature and extent of injury with diagnosis, classification of disability and supervisor's recommendation in preventing recurrence.

The purpose of these reports is for analysis and classification done by the HOME office. They are considered from the viewpoint of: type of accidents, cause of accidents, disability resulting from injury, assembly of data, control purposes, prevention of recurrence, comparison on competitive effort and costs in relation to production.

REMARKS OF A SAFETY DIRECTOR

by JAMES N. RUSSO
safety director, Newcastle Div., Allied Kid co., Wilmington, Del.

My company has plants in New Hampshire, Main, and Delaware employing about 2,000 persons, working about two and one-half million hours a year. In this talk, I want to discuss two things:

1. How to sell management on safety.
2. How we maintain interest in safety through a program of education.

In selling safety to people you must be sincere; you must be willing to spend some time and devote some effort to it. This is true whether you're selling it to an employee in the shop or to top management. However, there's one thing I've learned about selling safety to management: the best approach is on the basis of saving money.

Saving money is a tough thing to do in these days of increasing high costs. When one of our plants last year received a 50 per cent refund amounting to $25,000, our president looked on it as a windfall.

Because the president is pretty far removed from the men in the shop, and because such a thing was unusual in our company, I asked him to write a letter to the employees complimenting them for a job well done. I pointed out the savings that our accident prevention program had made possible and mentioned the highlights of the program.

The president's letter was well received by the employees, who had worked two and one-half million man-hours without a disabling injury. This letter from the president might not work in your shop, but it was different enough to be effective for us.

We have used all the gimmicks we could find to promote safety. These included visual aids of all kinds, inside speakers, outside speakers, contests, and five-minute talks by foremen.

Convinced that the key man in promoting safety is the supervisor, we decided to try something new last year: a human relations training program. This was new to us and new to the industry. We got the cooperation of the local board of education, which offered to supply qualified instructors free of charge in a list of 70 subjects.

We chose 20 subjects and set up a course for a selected group of supervisors and foremen. The course ran 20 weeks, with one two-hour session a week, for a total of 40 hours—all on company time.

Some of the subjects covered were cooperation and teamwork, giving orders, good housekeeping, the qualifications of a good supervisor, what the foreman should expect of management, what management should expect of the foreman, how to reduce costs and how to handle grievances. Safety was included for at least 20 minutes in each two-hour session.

INDIVIDUAL ATTENTION

Some of the men who attended have worked for 30 to 40 years with the company and we discovered that it is indeed hard to teach an old dog new tricks. Some of them were quick to say they thought it was a lot of baloney. But we made the course informal and let each man blow off steam and talk himself out. We handled each man as an individual and answered all of his rebuttals. In this way we convinced the men of the value of the course. Each man completing the course was awarded a certificate.

About a month later we sent each of the "graduates" a short questionnaire with about eight or nine questions. We asked them to fill it out and return it without signing their names. Some of the questions were: Was the course helpful in self-development? Helpful in your job? Helpful in handling men?

We received 80 per cent returns on the questionnaire and 65 per cent of those answering said they were helped by the course. We would have been happy if only 40 per cent would have agreed that the course helped them.

Courses like this one can be provided by universities for fees of $120-$150 per employee. At this rate, an outside course would have cost us $4,000 to $5,000. But our system, which we are sure will pay off, cost us only the employees' time.

TRADES AND SERVICES SECTION

ROUND TABLE DISCUSSION REPORTS

FOOD RETAILERS DIVISION

ROGER J. BEAR—Chairman
safety director, The Kroger co., Cincinnati, Ohio

by R. B. Norman, Secretary

THE FOOD RETAILERS DIVISION ROUNDTABLE

Roger J. Bear, chairman, outlined the start and progress of a safety program. It was indicated that a safety program, like a well kept garden, should be cultivated, weeded, pruned, dusted, and flowers would be picked and enjoyed by both management and employees.

Bear indicated he would be glad to send a Kroger Booklet on request. He further noted that he has two safety inspectors who report directly to him. Copies of their report go to divisional vice presidents. These inspectors visit each store and warehouse about once every eight months.

Harry Cochran reports that Safeway company has safety promoters in stores appointed by store managers. He emphasizes that managers are never relieved of their responsibility for safety in their stores.

Louis Amann reported that Colonial Stores, Inc. has a quarterly report submitted by regions and divisions indicating cause of falls for both employees and customers.

The Food Fair Stores—Miami Division—has committees composed of top men in various departments. They submit monthly reports which are broken down by causes, in detail.

WIRE MESH GLOVES

Phil Gray reporting for Stevens company of Miami, and Cochran speaking for Safeway of Los Angeles, both reported successful use of left hand gloves in their meat operation. Safeway of Los Angeles first tried it in eight stores. Meat managers and meat cutters were required to use them.

Productivity increased 12 per cent. Safeway uses these gloves in large markets only. One of the major problems encountered is in training meat personnel to remove glove when operating power saw. Cost of gloves, which is considerable, was reported as offset by increased production and reduced number of knife cuts.

Some companies permit their store managers to settle property damage claims at store levels. Others insist on submitting all claims to the insurance carrier. M. G. Jackson reporting for J. Weingarten, Inc. stated that his office gets a report on all accidents. His company feels that these reports have a public relations value.

FALLING MERCHANDISE

Some of the delegates felt that settlement of minor claims at store level eliminates much costly paper work. The majority of the delegates indicated that there should be a financial limit placed on the managers' authority to make spot settlements. There must be adequate cost control.

A new problem, that of mass display in aisles and on end floats was reported by delegates. The consensus was that the additional hazards involved more than offset any benefit derived from these displays in the aisle. It was felt that present day sales aisles are only wide enough to permit unobstructed movements of shopping carts, and that any obstructions placed in the aisles tend to create new hazards and are often the basis for sales-resistance.

It was felt that some of the end displays are too narrow and too high. Delegates present felt that no end displays should

be above eye level not only for safety reasons; but the best merchandising practice dictates this policy.

M. G. Jackson reported that Weingartens of Texas sends a letter to each injured employee's home immediately after the injury, with copies of this letter going to the store manager and district manager. Emmett Porter reported that Fisher Food Stores of Cleveland requires all meat cutters to receive medical treatment in neighborhood clinics after every laceration. Robert B. Norman reports that the ACF-Wrigley Stores of Detroit follow substantially the same policy on meat department injuries.

Delegates representing the majority of chains reported that their companies do not make a trip to the doctor mandatory after each employee injury; but leave this decision to the store manager. Kroger company requires managers to report every employee injury including those requiring first aid treatment only.

Stevens company of Miami which also sells drugs and has a registered pharmacist on duty during business hours has assigned the responsibility to that pharmacist for deciding whether an employee should go to the doctor or receive first aid treatment in the pharmacy. Food Fair of Philadelphia permits the manager to use his discretion about sending employees to the doctor. The Red Cross now has a 10 hour first aid course available.

Many of the companies report the use of liquid antiseptic soap which has reduced infections from minor cuts. Food Fair of Philadelphia and ACF-Wrigley of Detroit make use of follow-up forms as a part of investigation of accidents.

MERCANTILE AND WAREHOUSING DIVISION DISCUSSION

J. DONALD PRINCE—CHAIRMAN

insurance manager, The Hecht co., Baltimore, Md.

Under the chairmanship of J. Donald Prince, insurance manager, The Hecht company, Baltimore, Md., an informative and idea-producing discussion was held from 2 to 5 p.m., October 21, 1957, in the Morrison Hotel, Chicago, Illinois. The subjects discussed were under the following headings:

● *FALLS CAMPAIGN*

After some opening remarks welcoming the delegates to the National Safety Congress, Prince reviewed the program of The Hecht company for the National Safety Council's Falls Campaign. In the discussion, it was indicated that beneficial results were obtained by using "Falls" as a theme to call attention of the employees to these problems.

Ed Kryszak of Montgomery Ward reviewed that company's program and outlined a plan of close follow-up on all falls reports so that the causes of such accidents were revealed and remedies developed to insure a minimum of problems on this score.

Other ideas developed included Bill Smith's (Bowman Department store, Harrisburg, Pa.) use of building floor plans to record accidents with concentration of accident locations plus photos helping to identify problem areas. The whole program was also given widespread publicity through store magazines.

PINPOINT ACCIDENT LOCATIONS

It was agreed that concentrated attention to the use of the "Falls Campaign" theme pays off, especially when special emphasis is placed on:

a) Better housekeeping and floor maintenance procedures.

b) Physical facilities meeting local building code requirements and A.S.A. standards: i.e., handrails on stairs.

c) Accident investigation.

The key problem areas discussed were those of stairs, with their attendant hazards and possible solutions of safety problems,

and safety controls for areas which have particular problems of their own.

Mr. Paul Colson, Liberty Mutual Insurance company, outlined the development and use of a new "slip tester" which may prove to be a useful device in loss prevention and defense of negligence suits.

● *ESCALATORS*

A discussion of the safety problems involved in store escalators and motorstairs was supplemented by comments of a representative of a leading elevator and escalator manufacturer. Participants in this conference:

1. Reported on how to introduce the public to the proper use of escalators through open house activities, special newspaper publicity, instructional signs, attendants during peak periods, and training of sales personnel adjacent to escalators.
2. Reported new developments in escalator safety through mechanical improvements and use of various emergency stop devices and micro-switches.
3. Discussed individual case problems in retail stores with special comments by Harvey Siegel of Macy's and Paul Colson of Liberty Mutual.

● *MATERIALS HANDLING AND WAREHOUSING*

This discussion was led jointly by A. M. Lownsbury, vice-president, Edgar's Warehouses, Inc., Detroit, Michigan, and A. D. Walters, secretary, American Warehousemen's Association-Merchandise Division.

FAVORS "FIRE-STOPPED" PALLETS

Particular attention was given to a recent article entitled "Palletized Storage Fire Problems" by M. H. Nickerson, assistant director, Factory Mutual Laboratories, that appeared in the National Fire Protection Association Quarterly for July, 1957. This article advocated the use of "fire-stopped" pallets, stressing purported advantages in fire safety that could be achieved through the use of this type pallet.

The "fire-stopped" pallet is one in which a wooden pallet is modified by closing one end of the stringers to minimize air circulation. The ensuing discussion developed a considerable number of problems in the use of this type of pallet as against its purported advantages.

(1) The tests were limited in scope and do not reflect the great variety of storage conditions that might be found in general storage warehouses.

(2) In many instances it is essential that air circulation be allowed through and around stored goods. This is an absolute necessity in refrigerated storage.

(3) A sprinklered building was used in conducting the tests. There is no indication as to the results in unsprinklered buildings equipped with Aero Detection Alarm Systems connected with a central office. In such buildings the "fire-stopped" pallet might hinder fire fighting by stopping the flow of water from fire hose attempting to reach the source of combustion.

(4) In may instances the height of goods stored on pallets varies so that pallets in adjacent stacks would not line up, thus providing the "fire-stopped" effect without any change in existing practice.

(5) Fire-stopping allows only one entry, which is a serious disadvantage from an operating viewpoint. This is particularly true when using pallet jacks, since often the forks of this equipment of necessity protrude. Similar problems would be encountered in the present widespread use of four-way pallets, which can not be fire-stopped in any way.

(6) The "fire-stopped" pallet would be much more costly and involve higher maintenance.

(7) The "fire-stopped" pallet studies over-emphasize the degree of fire hazard in palletized storage, particularly when the same reasoning that characterized the Factory Mutual study is applied to the thousands of rack and open-shift storage installations throughout the country.

In general, it was agreed that the whole problem warranted a most careful and seri-

ous study *before* any recommendations could be made regarding the efficacy of the suggested "fire-stopped" pallet.

● *FORMS*

Mr. Walters discussed a warehouse safety *inspection form that had* been developed in cooperation with the safety committee of the American Warehousemen's Association-Merchandise division and the Trades and Services section of National Safety Council. This form is unusual in that it is divided into separate check lists for those factors that require monthly inspection, semi-annual inspection, and annual inspection.

It has found considerable acceptance in the public merchandise warehousing industry, particularly where the warehouseman *must conduct his* own safety program, since it provides a practical and useful guide for the warehouse superintendent. Copies of the form were distributed to participants in the conference, and are included at the end of *this report.*

● *"SAFETY AND THE RETAIL SUPERVISOR"*

Copies of the retail safety manual were *distributed* for review and comment. The National Safety Council will decide upon the proper presentation of *this material as a finished booklet with illustrations or in* some other form.

● *REPORTING CUSTOMER ACCIDENTS*

Copies of the accident report forms and *system* used by The Hecht company were distributed to those present for their information. (*Additional* copies are available by writing the Trades and Services Section, National Safety Council, 425 N. Michigan, Chicago, Ill.)

(*The following is the* information on the warehouse safety inspection form.)

CUSTOMER ACCIDENT REPORTING PROCEDURES

When a customer is injured in our stores, the following procedure will be *observed:*

DUTIES OF ALL CO-WORKERS: Immediately call the section manager or your supervisor. Assist the customer if *necessary.*

DUTIES OF THE SECTION MANAGER OR SUPERVISOR:

1. Instruct your co-workers in the necessity for promptly calling you in the event of a customer accident.
2. Call the store nurse to the scene of the accident. Do not ask the customer if she wants medical attention. You may have a co-worker telephone for you.
3. Assist the customer until the nurse arrives, and if necessary, assist the customer to the First Aid Room.
4. *Obtain the names & addresses of* one or two *customers who witnessed* accident.
5. Have at least two employees observe *the scene of the accident,* and have them fill out the employee section of the Report of Accident.
6. Fill in a Report of Accident, making one original and one carbon copy.
7. The section manager or supervisor is responsible for turning in to the nurse, as soon as possible and not later than store closing time of the date of the accident, his original and carbon *copy of* the Report of Accident.

DUTIES OF THE STORE NURSE:

1. After treating or attending to the needs of the injured customer, the nurse is to fill out the "Nurse's Report." A carbon copy may be made for file.
2. In the event of a customer "fall" accident, the nurse (or section manager) will call the person in charge of *maintenance* and have a Maintenance Report filled in.
3. The nurse is to mail to the insurance company the following reports:
   Original copy of the section manager's Report of Accident
   Original copy of Nurse's Report
   Two original copies of the Employees' Report of Accident (if separate forms)
   Original copy of the Maintenance Report if a customer fall accident is reported
4. In the event of a severe customer injury, the nurse is to notify immediately the Public Liability Claims Supervisor of *the insurance carrier by telephone, and to send the written reports later.*

NOTIFICATION OF THE STORE EXECUTIVES OF A CUSTOMER ACCIDENT:

1. Typewritten copies of the Report of Accident only, may be made from the carbon copy of the Section Manager's Report and distributed through store mail.

ALL BODILY INJURY CUSTOMER ACCIDENTS MUST BE REPORTED TO INSURANCE CARRIER

GET THE FACTS—GET WITNESSES—REPORT PROMPTLY

WAREHOUSE CHECK LISTS

For Annual Use

It is recommended that you include the following items on a regularly scheduled annual inspection of your warehouse property. Note those conditions where items are satisfactory and make special note where corrections should be made. If conditions on the check list do not apply to your particular unit, place an "O" in the "Good" column so as to indicate that it does not apply.

1. "No smoking" signs over doors into sections from loading and receiving docks and passenger elevators, and other designated smoking areas?
2. All electric circuits conform with National Electrical Code? All connections and insulation *in good repair?*
3. Appliance cords free of defects? Keep resisting cords on heating appliances?
4. Electrical outlets or heating devices provided with pilot lights?
5. Lighting arrestors on lead-ins from all outside aerials. Grounded?
6. Fire and exit doors in good repair and operating freely?
7. Ceiling high partitions bisect sprinkler lines?
8. Adequate supply of spare sprinkler heads on hand?
9. Fire extinguishers hung approximately five feet from floor to top of extinguisher?
10. Pressure vessels approved under local code before installation?

Comments:

For Semi-annual Inspection

It is suggested that you make a regular semi-annual inspection with this form as your guide. Note those conditions where items are satisfactory and make special note where corrections should be made. If conditions on the check list do not apply to your particular unit, place an "O" in the "Good" column so as to indicate that it does not apply.

1. Fuses exceed wire capacity? 15 amps. on no. 14 wire, 20 amps. on no. 12 wire?
2. Extension cords heavy rubber covered?
3. Interior of fuse and switch cabinets clean? Doors kept closed and in good repair?
4. Parts of wet sprinkler system exposed to low temperatures drained during freezing weather? Returned to service in spring? (Are adequate facilities available for fire protection during winter months?)
5. Stock on slatted pit racks more than six feet wide piled openly so water from sprinklers will reach stock piled below?
6. Sprinkler heads in good repair and free of paint or corrosion?
7. Sprinkler tanks in good repair?
8. Fire extinguisher for each 5,000 square feet of area? (Non-sprinklered outside warehouses each 2,500 feet?)
9. Home type extinguisher where open liquid volatiles are used?
10. Calcium chloride fire extinguishers in areas exposed to freezing temperature?
11. Fire hose free from defects and folded *in racks?*
12. Elevator pits clean?
13. Rip-saws provided with spreader fastened securely at rear? Automatic guard in place?
14. Swing-saws encased on both sides and equipped with limits chain or a positive stop?
15. Band-saw, band wheels completely encased and *blade enclosed* or guarded except portion between guide and table?
16. Gears and friction drives guarded?
17. Friction clutches less than six feet from floor guarded?
18. Sprockets and chains less than six feet from floor guarded?

19. Power transmission belts, chains and ropes less than eight feet from floor, guarded?
20. Vertical and incline shafts less than six feet from floor guarded?
21. Horizontal shafting less than eight feet from floor guarded?
22. Exposed shaft ends less than six feet from floor cut off or guarded?
23. Projections on shafting such as keys, bolts, pinions, etc. removed or guarded?
24. Sign reading "High Voltage" on all high voltage equipment?
25. Coping, building facing, and outdoor signs in good repair?
26. Gutters and down spouting in good repair?

Comments:

For Monthly Inspection

It is suggested that you make a regular monthly inspection with this form as a guide. Note those conditions where items are satisfactory and make special note where corrections should be made. If conditions on the check list do not apply to your particular unit, place an "O" in the "Good" column so as to indicate that it does not apply.

ACCIDENT PREVENTION STANDARDS

Pressure Appliances

1. Gasoline stoves and other equipment with fuel pressure tanks have pressure on tank released?

Miscellaneous

2. Elevator car top, door guides and guide rails cleaned?
3. Boiler, engine, pump, transformer and switchboard rooms clean and orderly? Metal receptacles provided for oily waste and rags? Receptacles properly covered?
4. Air compressors and adjacent area free of oil and cleaned at least weekly?
5. Elevator machinery free of greasy lint, oil, etc.? Penthouse or machine room clean?
6. Rubbish chutes cleared of materials frequently?
7. Chute doors in good repair; fused for automatic closing in event of fire; provided with stops and closed when not in use?
8. Paint spray booths conform with standards?
9. Exit lights lighted at all times?
10. Fire escapes in good repair?
11. Fire-brigade organized? Drilled during past month? Response to drill call satisfactory?

Stairways

12. Stair treads and nosings in safe condition?
13. Handrail provided on one side of enclosed stairways under 48 inches wide? Both sides at over 48 inches wide? Both sides of open stairways? In good repair?
14. Center handrail provided on stairs over eight feet wide?

Floors

15. Floors level, free of holes, cracks, and other defects?
16. Standard floor materials used and floors properly maintained?
17. Floor or deck loads not in excess of maximum posted capacity?
18. Openings in floors protected with railing or covers?
19. Structural floor or wall openings not made without review for compliance with local codes?
20. Pipe shafts with platforms at each floor and doors locked?
21. Certain floor openings equipped with toe boards?
22. All elevated runways and platforms (except one deck racks) more than six feet above floor, provided with railing?

Elevators

23. Hand cable control elevators have cable locks at each flood?
24. All interlocks, electric contacts and latches in good operating condition?
25. All shaftway gates and doors close and latch automatically when car leaves landing or have latches and electric contacts and interlocks?
26. Metal bi-parting doors equipped with pull-strap? Extra straps available?
27. Gates 66 inches high? If lower, warning chains attached?

28. Open car gates and elevator floor in contact if clearance between car floor and shaft wall is sub-standard? (through hinged plates if necessary)
29. Hinged car top where required? Closed except when moving long objects?
30. Gates and doors not blocked open? Latches, contacts and interlocks not blocked?
31. Elevator cars and landing areas adequately lighted?
32. Maximum capacity posted in each car?
33. Current state or city inspection certificates posted in cars?
34. "Safety Rules" posted in all freight and passenger cars?
35. No one less than 18 years old (or older if local law requires) operates elevators?
36. Only trained employees operating elevators and only authorized persons ride on freight elevators? (Cars posted to this effect?)
37. All elevator operators trained and provided with Operator's Cards?
38. Shear plates at shear hazards?
39. Defective elevator equipment reported immediately and prompt repairs made?
40. Elevator cables in safe condition?
41. Emergency release provided? Break glass cover in place?
42. Emergency elevator door keys kept under break glass?
43. Guards on car and gate counter weights kept in place and in good repair?
44. Car safeties inspected at least once each month and any necessary repairs made?

Entrances and Outside Areas

45. Swinging entrance doors stop swing at four inches past closed position?
46. Sidewalks, vestibules, docks, etc. free of holes, cracks, or other defects?
47. Entrance vestibules safe guarded against slipperiness during inclement weather?
48. Parking lots free of hazards, and lighted?

Boiler Rooms

49. Pressure gauges and water level columns well lighted?
50. Pressure gauges, water level columns and safety valves in good repair?
51. All safeguards for safe operation of power and heating plant in good repair?
52. Electric fans mounted seven feet above floor or guarded?
53. Racks for roll wrapping paper or cord properly assembled? Spindle ends securely clamped into place?
54. Proper ladders provided where needed, in safe conditions; and inspected; straight ladders have safety shoes?
55. Hand tools (hammers, wrenches, bars, etc.) free from dangerous defects (mushroomed heads, loose or defective handles, etc.)?
56. Grinding wheels in safe condition?
57. Compressed air receiver tank drained of oil and water weekly?
58. Safety valve on compressed air tank correctly set?
59. Cut-off air compressor correctly set?

Power Machinery

60. Power machinery and power supply guarded according to local or state codes?
61. Cross cut saws properly guarded?
62. Guards in good condition and used? Machinery stopped for repairs?
63. Signs posted and source of power locked off when machinery is repaired, adjusted or cleaned?
64. Generators, motors, switchboards, transformers, live wires, connections, starting boxes, etc. protected if within seven feet of floor?
65. Employees less than 18 years of age not permitted to operate power tractors?

Miscellaneous

66. Lugs and safety belts in good repair if outside window washing done?
67. Contract for window washing by outside cistern or individual approved by management or legal department in large organization?
68. Icicles, ice, snow, removed from window ledges, roofs, eaves, other parts of building?
69. Only trained electricians make electrical repairs?
70. Hand trucks and flat trucks in good repair?
71. Piling machines in good repair?

Property Damage and Burglary Prevention Standards

72. Basements, roofs and skylights leaky?
73. Waste water disposal pump in good repair?
74. Sewer check valves in good repair?
75. All windows, doors, skylights, roof fan exhausts or other means of ingress locked at closing time?
76. Windows guarded if not supervised by watch service and accessible from ground or adjoining roofs?
77. Merchandise stored outside building in open, unprotected areas?

Comments:

HOTEL DIVISION

by ROBERT C. NORDHAUSEN—Chairman
assistant to the director, Employer-Employee Relations Dept., American Hotel Assn., New York City

The hotel division round table discussion concerned itself with, "What Can We Do About Public Liability Claims?" Members of hotel organizations and insurance companies participated in this session. Those present questioned some of the methods and procedures used in handling public liability claims. Some of the hotel people felt that insurance carriers were settling too many claims under the classification of nuisance claims.

It was felt that this led to the creation of a claims-minded guest who takes advantage of the apparent tendency to handle claims on a basis. In reply to this charge the insurance representatives indicated that the reason for the increase in public liability claims and their treatment as nuisance claims is frequently related to lack of proper investigation and reporting on the part of hotels.

As a result of these discussions the following conclusions were made:

1. It is a pre-requisite that the hotels have a good sound safety program which affects the employees, and in turn, will reflect in the employees' dealings with the guests. The safety program should have a system whereby periodic investigations are made of the hotel property to ascertain the various existing physical hazards and also the improper safety habits exhibited by the employees. Immediate proper action should be initiated to correct either physical hazards or unsafe practices of employees. These solutions should receive support from top management.

IMMEDIATE INVESTIGATION

2. Investigation of an accident should be immediately conducted, determining the immediate cause of the accident, witnesses, etc. Pictures of accident areas should be obtained if at all possible.
3. If possible, obtain a signed statement from the guest as to his injury and as to how the accident occurred.
4. Supply the aforementioned information to the insurance carrier so that they, in turn, will be in a good position to handle and defend the claim on behalf of the hotel.
5. Work closely with the insurance carrier and discuss the case so as to decide together on the proper way of handling the case.
6. Keep in mind the cost of handling the case to its conclusion by either settling it immediately or permitting it to go to a court trial. All factors must be considered.

THE HOW OF ORGANIZING A SAFETY PROGRAM

FOOD RETAILERS DIVISION—SAFETY TO SELL

by EMMETT T. PORTER
safety engineer, The Fisher Bros. co., Cleveland, Ohio

In our business, as in all others, we have a product to sell. The measure of our success in the field of safety engineering is recorded in the profit and loss columns of the company which employs us.

The Fisher Foods Company of Northern Ohio has maintained an enviable safety record during the past five years. This record results from the cooperation of 3,000 employees in 92 stores, two warehouses, a bakery and 84 trucking units. This cooperation begins in the offices of the President, Chairman of the Board and Board of Directors, and terminates in the stock and service areas of the individual stores. No safety policy or safety measure can be effective without such large scale cooperation.

In order to enlist the personnel of the company in the safety campaign, the safety engineer must sell his product to every member of the company. He must convince management and labor that safety is good business, relatively as important to the welfare of the Fisher organization as selling itself. This, in my opinion, is the most important function of the safety engineer—to sell his company on the idea that time, energy and money spent on safety is well worth the expenditure. In short, safety is good business.

Fire and Accident Loss go into the debit column of the company's books. Merchandise, customers and a good location are the stuff from which profits are made. Fire consumes merchandise, often vacates location with consequent loss of trade.

Accidents mean dissatisfied customers, insurance settlements and altercations at law. Insurance protection covers some of this damage, the rest must be taken from sales profits. A chain like Fishers which operates on a small margin of profit, must increase sales to cover the difference.

This waste can be laid to the door of carelessness. Fire and accidents *don't just happen; they are caused!* Safety makes sense—business sense—and it is the job of the safety engineer to call attention to this cold fact. Watch for all the short cuts. We have them in the food business.

THE BIG FIRE

Fire destroys profit in volume. No company can afford to take chances with fire. For example, on February 19, 1949, The Fisher Bros. Master Market on Shaker Boulevard in Cleveland, Ohio, was burned to the ground from a fire in a bowling alley underneath. The merchandise stock worth $100,000 was lost, potential customers for that merchandise were lost, the employees had to be relocated, and finally, Fishers lost the location. This last loss is a continuing one which does not show on the books. Customers who patronized that store now take their purchasing dollars elsewhere. Fishers has not yet (8 years later) reclaimed that location or vicinity.

A picture of this fire-damaged site is posted in the service areas of 92 Fisher stores and throughout warehouses as a constant reminder that a little carelessness can burn up stock, store, job, and money.

THE SMALL ACCIDENT

The fire hazard makes a striking selling point. Everyone is impressed by the burning building and the consequent loss of business. The small accident has not the power to shock and therefore requires more emphasis from the safety engineer. The accident record at Fishers shows that for 1956 and 10 per cent of 1957, the accident average was one customer accident per store per year. Here is a small but constant loss to the company.

One of every three accidents is a fall and two-thirds of these are in the sales aisles. Mrs. Brown drops lettuce leaves, grapes, or beans on the floor. Mrs. Jones slips and

falls, breaking a hip. She has a grievance against the company, good will is lost, and money paid out.

Careless work habits can cause mishaps. Tommy, the stock boy, is setting up a display during customer hours. While wheeling his merchandise up the aisle, he runs over Mrs. White's foot. Her toenail is torn off: the company pays $750.00 damages.

Inadequate facilities aid and abet carelessness. Joe, the carryout boy, loads a car in a poorly lighted parking lot. His last contact with the customer is a severe shock. He slams the car door on her child's hand. This accident cost the company $1,000 in reparation.

Vegetable matter on the floor in the sales area, baskets and boxes in the aisle, stacking displays during customer hours, icy entrance and exit ways, slippery ramps—these conditions set the stage for accidents. The store must sell a lot of hamburger and potatoes to pay for the broken hip, the torn nail, the child's crushed hand. Thoughtlessness on the part of supervisors and employees cost the company profit and good will. Safety costs only a little time and effort.

STEPS TO SAFETY

The Fisher Bros. company recognizes that safety is good business. At Fishers, we have two safety committees. One represents the warehouse, office, meat commissary and transportation employees. The other represents store and operations personnel. Each committee meets regularly once each month, with two joint meetings annually—in May and October. These committees screen complaints and take measures against the big fire and the small accident.

Some of the steps towards safety we have taken are as follows:

EQUIPMENT & PERSONNEL:

In the field of fire and accident prevention, first aid kits, and fire extinguishers have been installed at key points in all sales, stock and service areas. Since many of our stores are located in outlying and rural districts where water and water pressure is often a problem and are protected by volunteer fire-fighting units, we have installed standpipe equipment within our service area.

Dome-top metal self-closing containers are supplied for floor sweepings and rubbish disposal. All excess cardboard is transported to a central disposal point. "No Smoking" signs are posted throughout service and restricted areas. Smoking areas are designated and adequate ashtrays and metal containers supplied. Bulletins are issued and posted during the holiday and high hazard shopping seasons.

Merely to have fire equipment on hand, of course, is not enough. Unless the personnel can operate it effectively, the fire extinguishers and hose will burn with the building. Very few people, on their own, will take the time to learn the proper operation of this equipment. It is the duty of the safety engineer to make sure they take the time.

Acquaintance and know-how with the different types of fire equipment reduces the chance of panic. At Fishers, we instruct the store and warehouse employees personally. Supervisors, superintendents, managers, assistant managers, cashiers, salesgirls, stock boys, directed by the safety engineer, fight an imaginary fire in a back alley.

If and when the fire crisis does occur, they will call the fire department, and calmly go about saving their store with reasonable effort until the fire department arrives. This sort of instruction takes time and effort, but the result may well be a store open for business tomorrow. Lack of instruction may well mean a gutted shell today.

A LITTLE FORETHOUGHT

Accident prevention means attention to details and a consciousness of small hazards. Many causes of action can be eliminated by focusing attention on safe practice. At Fishers, we are trying to insist on such "incidentals." To avoid vegetable matter falls, we move packaged goods to the outside of display racks with unpackaged fruits and vegetables placed on the inside. The product then can be handled without danger of excessive matter falling to the floor.

Scales should be placed near the unpackaged displays to prevent loose pieces dropping on the floor during transport. Stocking of display shelves should be done after store hours and avoided during high shopping periods. Then boxes and cartons will not clutter customer-choked aisles and collisions with stock trucks and carts avoided.

Parking lots should be well maintained, free of holes, well marked and lighted, and serviced with adequate permanent ramps.

I submit written safety reports of these details to the general superintendents responsible for store and warehouse operations. They process them to the supervisors, superintendents, and store managers. When the complaint is abated, it is signed by all supervisors and returned to the safety engineer within a 60-day period. This gives maintenance an adequate time to complete structural repairs, if necessary. These safety details make the difference. Their observance eliminates many accidents.

A semi-annual 12-page general safety questionnaire is sent to the stores and warehouses to be filled out within a two-week period by the store managers and warehouse superintendents and returned to the safety engineer under the general superintendent's signature.

BURDEN OF RESPONSIBILITY

As our record indicates, the supervisors and employees at Fishers have been very cooperative. Their response to the publicity campaigns conducted by the company, their newspaper, "The Champion," the safety bulletins, signs and pictures posted in the stores, and warehouses, have been very marked.

Once I was shown an ordinary box of paper napkins, charred on one side. The box was burned in the stock area of a Fishers store by a 60-watt electric light bulb. The superintendent in charge of that store called me and asked that I look at it. The manager, on my arrival, said "Look what nearly happened to me!" He did not want it to happen to anyone else. He showed me the excessively high stock pile where he had found the box smoldering at 2:30 in the afternoon. Had this occurred at closing time, the store would have been a heap of black rubble by morning. We would have had another Shaker Market on our hands.

What impressed me was that he accepted the burden of responsibility for the safety of his store and the stores of others. He did not shrug off the incident or destroy the box. He was interested enough to contact his superintendent and point out the hazard of high stacking. That manager is sold on safety and realizes he has a part to play in safe practices.

THE REST OF THE BATTLE

We still have a lot of selling to do. The old ways hang on. It was a struggle to install the covered metal trash containers. For years, cardboard boxes had been good enough. So why shouldn't they continue to be? For years, "No Smoking" signs had not been posted or had been utterly ignored. Now employees have to change their working habits. However, the record shows we have made progress at Fishers. Cooperation continues to increase under the stimulus of repetition and reminders.

Remember, you can never relax in supervision and, with the continued encouragement of the company officials, we can approach our ultimate objective—one hundred per cent observance of safety policy and practice!

Safety is as important to the welfare of the company as selling itself.

The officials at Fishers have recognized this fact and have cooperated with the safety engineer in selling their employees on safety.

Logic demands safe practices. When people think, they are bound to be safety-minded. The job of the safety engineer is to make them think, to put the facts before them and insist on safety measures, for the protection of stock, store, employee, and company.

Fires and accidents eat up profit and benefit no-one. This is the lesson the safety engineer must sell to every member of his company. Safety is as important as selling and safety must be sold!▲

HOTEL DIVISION

by ROBERT C. PETRIE
safety & training director, Hotel DuPont, Wilmington, Del.

Accident prevention is a major task of management. "The creation of a safe working shop and the creation of a safety minded, earnest, competent organization is our economic and social duty," stated a vice president of the Bethlehem Steel company recently.

Walter Carpenter, chairman of the board, briefly expressed this basic thinking: "We in the du Pont company long ago concluded that the safety of employees is of the greatest interest to management, ranking in importance with production, quality of product, and costs. We have found that maintenance of safe operating procedures in our plants is of benefit far beyond any resulting dollar savings, the human values involved being of greater importance to both employer and community. Also, the acceptance and practice of fundamental safety principles by management and men, with the reduction of personal injuries to a minimum, injects an element of team play which does much to foster a spirit of friendly cooperation throughout our company."

The successful application of a safety or accident prevention program is dependent on the following principles:

1. *All* personal injuries can be prevented.
2. Management, which includes all levels through the foreman, has the responsibility to prevent personal injuries.
3. It is reasonably possible to safeguard all operating exposures which may result in occupational personal injuries.
4. *It* is necessary to train all employees to work *safely* and to understand that it is to their advantage, as well as to the hotel's to work *safely*, and that they are expected to cooperate in doing so.
5. It is good business from the standpoint of both efficiency and economy to prevent personal injuries on the job and off the job.

Now how do you go about "organizing" a safety program? Actually, whether we are in a hotel or restaurant, or steel mill, or aircraft factory, the same basic principles apply.

Top management must be absolutely sold on safety. A considerable part of the work of a safety director should be slanted so that executives and employees find it to their interest to correct unsafe conditions and follow safe practices. You should submit evidence regularly to justify the program. A safety program is implemented largely through the efforts of foremen and supervisors.

MANAGEMENT'S RESPONSIBILITY

Therefore, it is essential that foremen find themselves in a position where their full cooperation will redound to their credit. They must see that safety measures will increase all-round efficiency rather than increase the cost and drag the production. They need to have safety continually brought to their attention and routines set up so that their part of the program will be a normal regular operation.

Presidents of some major corporations have found a good safety performance useful public relations material. We are constantly bringing it to the public's attention because our vital on-the-job and off-the-job programs are excellent "quality" advertising.

ORGANIZING FOR SAFETY

Top management should make clear to various department heads or staff specialists reporting to him their areas of responsibility in regard to accident prevention. He should appoint a safety coordinator, director, supervisor or whatever name is decided to act as his representative. A definite established allocation of time that is to be spent wholly on accident prevention is necessary.

A separate safety department established as a staff function and reporting directly to top management indicates the nature of its administrative position. It cuts across departmental lines and the direct channel to top management makes it clear to everyone that the safety program is a top-priority program with the authority of management behind it.

Now what authority should your safety specialist have? Generally speaking, as a staff function he has little of his own and must rely on education and persuasion. The most successful safety directors are "good fellows" who are greeted cheerily or good-humoredly around the hotel. If one is frequently engaged in a contest of authority, he is not likely to get the sincere cooperation he must have.

We have only power, including making initial recommendations. Before equipment is bought in the Hotel, particularly kitchen equipment, bread slicers and fat strainers, they ask for inspection and approval before purchase. Oftentimes, the seller will make modest changes for added safety features.

The requisites for a safety director should first be personal characteristics and then knowledge and experience. You must have:

1. *Ability to get along with people.* Good human relations are more important than dogmatic theories.
2. *Enthusiasm, drive, perseverance.* The results are so easy to see and so clearly of benefit to all, that the safety worker feels his is a humanitarian work. The safety man must, however, have the energy and push to keep continually after things. When he sees something wrong, he may have to give suggestions, write a report for so ..one, present the idea again in committee, and only eventually win the key people around to his thinking.
3. *Readiness for new ideas and approaches.* He should be a stimulator.

SAFETY COMMITTEE STRUCTURE

Committees are often an effective means of interesting or educating a large number of people in an activity. They are a good method for securing cooperation, coordination, and an exchange of ideas among people not otherwise thrown together. Basically, there are three main types of committees or functions they may serve on different levels. We use all three at our hotel with very good results.

Central Safety—This meets monthly and is basically a policy committee. The manager is the chairman, with department heads, the safety supervisor and physician as members. It periodically reviews the accident experience of the separate departments as reported by the safety supervisor. It investigates or acts upon reports of investigation of serious accidents or unusually hazardous conditions.

It makes safety regulations regarding wearing apparel, smoking, use of machine guards, maintenance, process design and layout of remodeling. It makes expenditures for major items for safety, approves employee training programs. It formulates incentive programs and allocates expenditures for prizes.

The second type of committee we use is one for inspection. This committee meets monthly on a one-hour inspection tour of the hotel with partial responsibility for correcting unsafe conditions or unsafe practices. The committee is made up of the safety supervisor and with four to six people rotating of wage-roll personnel—bellmen, maids, cooks, cafeteria.

This is extremely effective from one point of morale, in that it shows that management is interested in the brains as well as the brawn. The errors found are typed and the committee sends the report directly to the manager with copies to all departments for correction. We have had splendid results.

EDUCATION COMMITTEE

The third major type of committee is that for education. This committee promotes interest in and compliance with the safety program and develops a good safety attitude on the part of all employees. Oftentimes, the executive or employee who has "poohpoohed" safety becomes a strong backer after being on this committee. ..We have used this type of committee this year exclusively to get the same safety message to all of our employees.

A committee comprised of four supervisors from each of the areas or departments were appointed on a rotating basis in January. The monthly topics for the year were decided upon by the central safety supervisor. The topics this year are generally on off-the-job subjects, and include management's review and 1957 goals, on-

the-job hazards, falls-off and housekeeping. Six weeks in advance of the meeting date the committee begins work on the topic for a program including script, visual aids, handouts and giveaways.

This meeting is conducted by one of the committee members to all the supervision and the meeting leaders the first Wednesday of each month under the chairmanship of the manager and co-chairmanship of the safety supervisor.

This same meeting format or script is then given in each of the operating areas by the appointed meeting leaders and, in our case, the wage-roll employees, monthly. The length of these meetings are from 20 to 30 minutes. This type of program of actually using employees to do the instructing, has been very rewarding. Some of the instruction has been poor, by instruction or public speaking standards, but we made a lot of converts! !

One other auxiliary committee working partly on safety, is the suggestion system committees. This, of course, functions in all operative areas.

EFFICIENCY AND MORALE

I often hear other hotelmen complain of the poor class of help, high turnover, little interest in the job, and indifference of their employees. You might add all this up and call it morale. I certainly won't be so presumptuous as to say that a safety program is the Lydia Pinkham remedy.

But a high injury rate has a depressing effect on employee morale. Unsafe hotel conditions, poor housekeeping and poor supervision lead to dissatisfaction and poor job performance. Nobody can be proud to work in a place where mistakes are the order of the day and accidents are the usual thing.

On the other hand, real pride and enthusiasm for the job exist in hotels and departments which have outstanding safety records. Employees have a feeling of loyalty for the company and a sense of security on their jobs.

In further developing this "how" of organizing a safety program for hotels, might I also recommend orientation of new employees. We do this with a safety booklet containing general safety rules throughout the hotel. This is covered the first day of employment. (1) The foreman explains the hotel's philosophy of safety, both off-the-job as well as on-the-job. (2) He also discusses the importance of promptly reporting all injuries to the supervisor. (3) The new employee is given specific instructions in the area he will work—area safety rules, fire protective equipment, and a job breakdown for safety. (4) Lastly, constant follow up is taken for reviewing his safety performance, participation in the safety program and his knowledge of safety work procedures.

Just like a well-built house, a well-built safety program must have a framework, walls and a roof. Too many safety programs, and that term is often used loosely, begin and end with putting up signs in dark halls or on dirty bulletin boards.

REPORTING FROM DATA

One last recommendation on this "how to" angle is to have a well defined and developed reporting procedure form. I can't recommend this too highly. A foreman who accepts his full responsibility for safety has some things to learn and some things to do. He must learn work habits; he needs to see that every worker gets good safety job instruction; he must have their confidence and he also needs to investigate every accident whether or not personal injury results.

By making all injuries reportable and designing a form which makes the foreman investigate the accident, the effectiveness of your program will be improved immeasurably. These reports should be posted regularly and a friendly rivalry among departments maintained. A reporting form should include:

1. *Type of equipment* involved in accident
2. *Type of accident*—or the way person was injured
3. *Unsafe condition* of the tool, material or machine
4. *Unsafe act* or unsafe practice of person
5. *Reason*—lack of knowledge, disregard of instructions

I might add, however, merely filling in a form should not absolve the foreman of his responsibility. The safety supervisor should make sure the accident is well investigated, thoroughly investigated, and promptly investigated.

There are many, many points I haven't covered, such as publicity, promotion, costs and fire protection and I certainly am not minimizing any of these by leaving them out.

Accident prevention, like many other changes, has to be sold and we must be good salesmen to close the sale. I suppose our most important job is to show our customer, the employee, his need for safety.

MERCANTILE AND WAREHOUSING DIVISION

by PAUL M. COLSON
assistant division manager, Loss Prevention Dept.,
Liberty Mutual Insurance co., New York City

ORGANIZING EFFECTIVE SAFETY PROGRAMS IN DEPARTMENT STORES

Many safety programs are like good intentions; they are well meant but ineffectual. Considerable experience with safety committees in stores indicates a number of reasons for this situation:

1. Lack of management motivation (understanding of the urgency of store accident prevention problems and the importance of safety work in reducing losses).
2. Lack of qualified, authoritative direction of safety program
3. Lack of definite program for safety committee to carry out
4. Failure to assign specific responsibilities.
5. Lack of effective safety communication

The basic department store safety program I will outline eliminates these undesirable features and provides management with an effective safety organization with an effective program.

MANAGEMENT AND SAFETY

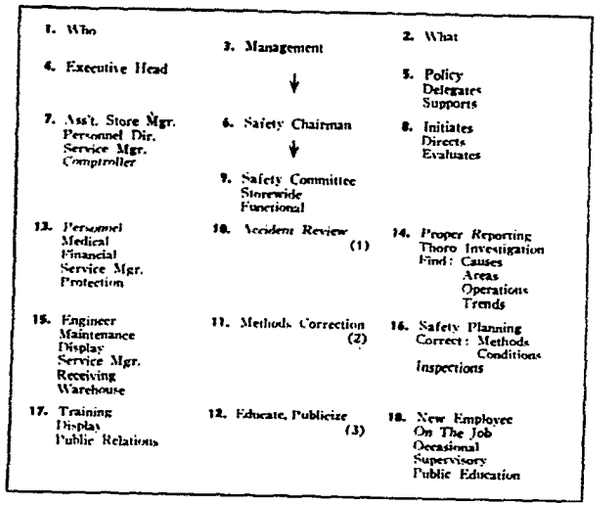
By means of the Flannel board display I will outline first the safety program. Note that I will consider only the problem of the stores that are not jumbo sized and do not have safety directors. The pressing problem lies in the large group of stores having no full time safety director. In the center panel I will build the program. On the left I will indicate who in the store organization should carry out the specific responsibilities outlined and on the right I will summarize what these people should accomplish (see table on next page).

The numbers refer to the individual box numbers on the diagram accompanying this article. The first and most important element in the entire program is (3) management—support and participation. Lacking this element you might just as well not have a safety program. Don't waste your time unless top management knows what the accident prevention problem amounts to, and gives positive indications of support through effective participation. By management I mean the (6) executive head of the store.

STORE SAFETY CHAIRMAN

In general he accomplishes the following (5) Sets safety policy—which indicates that management expects everyone in the store to cooperate to make the safety program work. He delegates by appointing an executive to act as (6) safety chairman and he provides support by giving the chairman and his safety committee authority to get things done, by attending occasional meetings, and by periodically reviewing results, to determine if executive action is required to expedite the work of the safety committee.

A safety program without a qualified coordinator is a ship without a rudder—it's aimless and powerless. Who should do the job? An executive—(7) such as an assistant store manager, comptroller, personnel director, service manager—someone important enough to command respect and attention. He need do little detail work, as you shall see.



His basic job which is (8) to initiate safety activity, direct the proper committee members to carry it out, coordinate their activities and evaluate their results to ascertain how effective they are and decide if added or modified activity is required.

SAFETY COMMITTEE

Part of management's function of delegation and support is to appoint a (9) safety committee to assist the safety chairman by actually carrying out the safety program throughout the store on a day to day basis at all levels.

To be effective, the committee must be store wide in its representation (without being unwieldy), and it must be functional i.e. assignment of specific safety activities should be made to members whose normal responsibilities fit them for such work. By "store wide" we mean that all operations will be represented so all basic operating hazards will thereby receive attention.

The membership of the committee is dictated by the nature of its work. Any safety committee has three major functions:

1. (10) Accident Review—to find accident causes.
2. (11) Correction of Methods—involved in accidents.
3. (12) Education & Publicity—to train and stimulate people to work safely.

Let's examine each of these functions more closely and see what is accomplished and who is best qualified to discharge these safety functions. In doing so, we'll outline a program and automatically define membership. Each of the three functions mentioned above could be the work of a subcommittee

composed of a number of persons whose normal store functions qualify them for the work involved.

These sub-committees should operate each as a unit but should meet monthly to form the store safety committee.

ACCIDENT REVIEW

Let's consider Accident Review. This group sees to it that:

1. Proper and effective employee and customer accident reporting and investigative procedures are set up and carried out.
2. Causes of all accidents are identified as to
   (a) Area
   (b) Causes
   (c) Operations involved, and
   (d) Frequency trends developing.

It is their function to gather this information, summarize and interpret it and, put it into writing and present it to the chairman for use in committee meetings so that specific action can be initiated to eliminate the accident causes defined. Obviously, the store people most qualified for this job are (13) personnel, medical, financial, protection, and service.

The very nature of this work brings them into contact with the accident at its inception and throughout the duration of the case. The nurse keeps many accident records. Store protection frequently is at the scene of the accident. The controller's office has statistical facilities essential to accident studies. The integration of these efforts produces the monthly accident report which tells where, why, and what kinds of accidents are happening, and, by extension, what corrective action is required.

METHODS CORRECTION

The next sub-committee to swing into action is the one responsible for the elimination of unsafe methods and conditions as indicated in the report prepared by the Accident Review group. This second group (11) Methods Correction has as its basic responsibilities the following major activities:

1. (14) Safety Planning i. e.: seeing that safety is built into new stores, plans for promotions or renovations or for special events, that safety is specified in the purchase of new operating equipment of all types.
2. Correction of unsafe operating methods or conditions that are revealed by the Accident Review committee or through
3. Periodic scheduled store wide safety surveys made by committee members, or through,
4. Safety recommendations submitted by insurance carrier engineers.

The very nature of these activities necessitates the following membership (15) store engineer maintenance, display, work rooms, receiving, warehouse and service management.

EDUCATION AND PUBLICITY

As the result of the efforts of these two sub-committees (10) Accident Review and (11) Methods Correction the work of the final sub-committee (12) Education is obvious to educate employees to avoid the hazards revealed by the work of those two committees.

The educational committee does the following educational work:

—(16) New employee safety orientation
—On the job safety education
—Supervisory safety training
—Customer safety stimulation

The wide variety of methods it uses are:

1. Safety bulletins or posters
2. Safety messages on P.A. system
3. Safety section in employee booklets
4. Store wide safety campaigns and contents etc.
5. Sound slide films
6. Floor or departmental meetings

Here again the sub-committee membership is dictated by the nature of the functions performed. In most stores the following departments are represented: training, display and public relations.

Each of these units can make a unique contribution to the sum total of safety education and propaganda throughout the store.

One aspect of safety activity remains uncovered by this safety program outlined,

namely, area safety efforts. However this gap is easily closed in an effective manner by the individual safety activities of committee members in their own areas of jurisdiction. They can hold brief scheduled periodic employee safety meetings, provide for limited area safety inspections and conduct other safety activities as the nature of their accident prevention problems dictate.

AREA SAFETY ACTIVITIES

Now let's see if this Organization and Program satisfies the five requirements mentioned in the beginning of my talk.

- Management motivation to support safety: The Accident Review committee keeps him informed of the costs of accidents and of its effect upon his merchandising activities; the Methods Correction Committee sees to it that he knows about the serious hazards that exist, and, finally, he too is subjected to the constant safety propaganda prepared by the Educational Group.
- Authoritative direction is implicit in the selection of a junior executive to serve as head of the safety committee, where in cooperation with the personnel director and the store engineer and service manager he can wield great safety influence, on a planned basis.
- A definite program is assured by the creation of the three sub-committees, each charged with an important function which lies well within their competence and the scope of their normal store activities.
- Specific responsibilities assigned—this characterizes each of the sub-committees outlined for us completely.
- Effective safety communication—you can readily see that effective safety communication is fully provided for by the operation of a sub-committee whose whole function is one of communication with employees at all levels, at all times, and through a great variety of media.

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Transactions of the

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE GLASS AND CERAMICS, AND RUBBER SECTIONS

This volume is a record of sessions held at the 1957 National Safety Congress by the Glass and Ceramics section and the Rubber Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which these sections carry on in behalf of their members, and for the benefit of accident prevention work in these industries generally. These sections give guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of glass and ceramics, and rubber companies.

The activities of these sections are under the direction of their executive committees, the members of which are listed at the close of this volume.

GLASS AND CERAMICS SECTION

INVENTORY OF OCCUPATIONAL ACCIDENT PREVENTION ACTIVITIES

by J. EDWIN CROUSHORE
staff representative, National Safety Council, Chicago, Ill.

One of the functions of the National Safety Council is to serve as a clearing house for the exchange of information on industrial safety practices and techniques among Council members. This Inventory is designed to facilitate this function.

The object of this Inventory is to determine what types of accident prevention techniques are commonly used among the members of the Glass and Ceramics section. This information is provided for Council members to evaluate their own safety activities by comparing them with safety activities of others in their own field.

Experience shows that many managements in the small plant group are interested in learning of safety practices and policies of other plants. The Council feels that the material developed will be useful to small plant management in regard to their activities.

Because of the different types of accident prevention activities applicable in small and large plants, the information gathered is classified as to whether it originates in a small or large plant. Large plants are those with 1,000 or more employees, and small plants are those with less than 1,000 employees. One thousand was chosen as the dividing point because it is approximately the plant size at which there is a tendency towards designating the safety responsibility to a specific individual, and in beginning to think in terms of a formal safety program and organization.

Replies were received from 79 of the 164 questionnaires sent out to the key members and executive committee of the section. By size, the number of plants who returned completed questionnaires is as follows: Under 1,000 employees, 63 were returned; 1,000 or more employees, 15 were returned; one company sent back a questionnaire which represents 36 city area plants.

The Council appreciates cooperation shown by the 79 plants who completed and returned their questionnaires, and thereby made this report possible.

Due to the limited time, only those sections of the Inventory will be covered that are deemed to be of most importance to members of the section. All members will receive the completed report on or about January 1, 1958.

DEGREE OF SUPERVISION

Many phases of industry have been criticized from time to time because of spreading supervision too thin and not maintaining safe work practices. This spread of supervision has been especially prevalent on second and third shifts. However, from all the plants reporting this information for the section, the supervisory load does not appear to be unduly heavy on any other shifts. In this survey the average number employees per supervisor on each shift is as follows: on the first shift for large plants 20 employees, small plants 15 employees, the average number of employees covered on the second and third shifts are identical with those of the first.

It is contended that the supervisor will usually engage in greater safety activity if his employees' accident records are tied into his departmental operation cost. This is being done in four of the large plants, and in six of the small plants reporting. Another industrial section in which this inventory is being conducted reports 52 per cent of the large plants and 33 per cent of the small plants provide this safety incentive to their supervisory person.

In many operations it is important from the standpoint of safety and efficiency that the workers' experience, aptitude, skills, and their mental and physical makeup be matched

to requirements of the job. Failure to give this point the attention it deserves can result in serious work injuries.

Many organizations have developed job specifications which are used as a standard for hiring and placing workers according to the requirements of the job to accomplish this matching of the individual to the job.

JOB DESCRIPTION AND SPECIFICATION

Job descriptions are developed to specify the standard method of the job performance for individual jobs. These are used to guide foremen, supervisors, and workers in carrying out their work safely, and in accordance with approved standard methods.

Many plants recognize the importance of safety as an inherent factor in efficient production, and have their safety department review and check these job specifications and descriptions. This check insures that the job specification specifies the required characteristics of the individuals assigned to the work, and that the job description incorporates safe work methods and necessary safeguards and safety protective equipment for the workers' protection against injury.

CONSULTING SAFETY DEPARTMENTS

Reports indicate almost three-quarters of the large plants and more than half of the small plants consult the safety department when job requirements are developed. This means that safety considerations are incorporated in job specifications in the majority of the plants reporting. Plants that have the safety department check job requirements give the department an opportunity to recommend the use of proper safeguards, clothing, and equipment, as a part of the standard method of performing the job. The safety department can then point out the dangers, toxic, flammable materials, and hazards peculiar to each particular job, and recommend ways to correct these injury exposures in accordance with recognized safety practices.

The majority of reporting plants in the section realize the importance of written specifications and take advantage of their usefulness. But there still remains the good portion of the section who does not use written specifications. In many plants the institution of these practices may be beyond the control of the safety director, but where this is not true it seemed desirable to consider them as a standard procedure.

Once jobs have been studied and job specifications and descriptions written, it is important that they are reviewed from time to time. Further revisions or safeguards may be necessary, or new developments may have to be placed in effect on jobs and operations where they are applicable.

Many organizations hire and place new employees without first consulting the employees' foreman or supervisor. In such organizations the foreman sometimes complains about the quality of his workers. Foremen usually indicate they feel they could make a better selection of personnel if they had an opportunity to pass final judgment before applicants are put to work under their supervision.

Complaining foremen say the workers are not cooperative, that they are difficult to get along with, that they are not reliable, and that even when instructed properly they still fail to carry out their jobs in the manner desired. Although some of these may be an excuse for the supervisor's own failure to give adequate job instruction, or to follow through with adequate supervision, there is often some justification for such complaints.

Many plants try to eliminate this situation by sending job applicants to the foreman for an interview, and leaving final acceptances or rejections in his hands. Where the foreman exercises his prerogative of rejecting the applicant, the latter is often returned to the personnel or employment division for possible placement on another job in some other department.

A large proportion of both large and small plants do have job applicants interviewed by foremen. This is a good showing for the section as a whole, but there are still many plants who do not take advantage of the foreman interview.

APPLICANT'S ATTITUDE

Experience shows that work injuries sometimes result from the worker's not being properly machined to the requirements of the job, in terms of his personal attributes. The employee's attitude is perhaps the most important to the personal attributes he brings to his job. Foremen know that there is a great difference in the way a worker with a constructive attitude accepts and follows safety precautions and practices, and the way a person with an indifferent attitude accepts the same precautions and follows the same practices.

The foreman's interview gives him an opportunity to evaluate the applicant's experience, skill, physical qualifications, and especially his attitude. If a foreman feels that the man would not make a good and safe worker, the foreman can reject the man before he injures himself, decreases production in the department.

The fact that such a substantial portion of both large and small plants are following this policy indicates that they find it definitely worthwhile. In view of the advantages that can be gained from a safety standpoint, as well as from a standpoint of production, this is a practice which would seem to recommend itself to those plants not presently following it.

When a man is first hired, what he thinks and feels about the work he is doing, his company, his foreman, and the importance of safety in his new job, crystallize into his attitude toward his work. Since these attitudes influence his actions on the job, and are a basic factor in his cooperation and desire to follow the safe work procedures and safety rules, the time to start selling a man on safety is when he is hired.

SAFETY INDOCTRINATION

Because new employees are especially impressionable many companies include a general, but pointed emphasis on safety in their indoctrination of new men. One common means of doing this is to provide the new employee with the safety rule book at the time he is hired, and inform him that compliance with the safety rules, and participation in plant safety programs is an important part of his new job. Usually the new employee is told to read and become familiar with the safety rules, and told that the foreman will review some of the rules with him.

If the worker is to wear goggles, safety shoes, and other protective equipment, he is told about it at the indoctrination, and arrangements are made to draw this equipment. He is told that the supervisor will give him job instructions, will instruct him in the safe practices and safety precautions he is expected to follow on the job. He learns during indoctrination that his supervisor will teach him safety, and will expect him to follow the safety precautoins as a regular part of his day to day work.

The fact that only seven out of the 63 reporting plants do not have a safety indoctrination program indicates that this is one phase of our safety program that the seven plants should, if possible, include in their program. As might be expected, the proportion of plants giving indoctrination singularly is much greater for small plants than for large ones.

HANDLING ORIENTATION

Single employee indoctrination in the small plant is usually handled by the man's foreman or supervisor without any other assistance. A few plants report having the safety division handle single employee indoctrinations, and others have both the foreman and the safety department handle indoctrinations.

Small plants usually give employees their indoctrination program at the time of hiring, or during the first day on the job.

In the large plants single employee indoctrination is handled primarily by the man's foreman or supervisor, and in a few cases by the employment or personnel department. Group indoctrination, in the main, is handled by the safety department, the personnel department, and in a few instances by specially set up safety training programs for new employees.

Where the indoctrination combines single and group instruction, the man's foreman or supervisor usually is assisted by the safety department, or by the training or personnel department. The large plants give indoctrination either before hire, or within 30 days after the man starts on his job. In many cases the initial safety indoctrination is followed up at a later time. Follow-up on this phase is from one week to six months after hire.

An example of an indoctrination program is a large plant that gives new employees indoctrination singularly and in groups. Before starting work, a group of new employees meets with a member of the safety division, or a district safety coordinator, for basic instructions on safety and other procedures. When the new employee reports to work his foreman gives him single indoctrination showing him the particular hazards,

and ways of avoiding these hazards. At the group meeting a copy of the safety practices handbook is presented to each employee. The foreman then explains various rules to the employee who can question his foreman as they go along.

Some examples of plant safety rule books which are used in indoctrination in some plants have been provided by a number of large and small plant members. In those cases the booklets are devoted exclusively to safety rules and precautions, but sometimes the book incorporates safety and organizational material, personnel policies, and a brief company history. Usually such booklets are issued permanently to new employees who are expected to become fairly familiar with the safety rules, and to give the personnel department a written statement that they have done so. During the indoctrination attention is called to the booklet's importance, and its principal provisions are reviewed orally with the new employee.

Failure to carry out job instruction and good supervisory follow-up has been a causative factor in innumerable work injuries. Workers who are not well trained are apt to make mistakes or fail to follow correct safe practices, with the result that accidents occur. Good job safety instruction will point out to the worker what his specific job hazards are, and show him safe work practices that will help him avoid these hazards.

JOB INSTRUCTION, TRAINING

Job safety instruction is usually most effective when given to the employee on the job by his foreman, or by the supervisor who gives him his work assignments. The supervisor can evaluate the employee's attitude toward his job, his aptitude to absorb instruction correctly, and the extent to which he is familiar with the correct method of job performance when the instruction is completed. Since the supervisor is the one who gives him his work assignments, the supervisor's knowledge of the employee's job competence and know-how assists him in exercising good judgment in giving work assignments to the new employee.

A good method of job safety instruction is for the foreman to give individual instruction to new employees, and then have the personnel or safety department follow-up to check on the extent to which the new employee has absorbed the safety aspects of his instructions. If the employee is not adequately familiar with and currently following safe work methods and precautions, he will be given further instructions and follow-up by his supervisor. Such follow-up will disclose any deficiencies in the instruction given, or in the employee's absorbtion of the instruction.

Many plants in industry give workers instruction in production procedures, but no instructions on the hazards inherent in their operations, and the safe work methods and safety precautions for avoiding them. Lacking this specific knowledge, workers often commit acts which result in severe accidents.

USE CHECK LISTS

Poor job instruction, in many cases, has been traced directly to the instructor's failing to organize all the important points of the job clearly in his mind before giving the instruction. Consequently, the instructor overlooks certain safety features or other important points about the job. When this happens the employee being instructed fails to learn all the safe work methods and other safety precautions needed for his job. Training specialists recognize the importance of a checklist of safety items to be covered, or the use of a job instruction breakdown which incorporates all the safety features and precautions to be observed in connection with the job. In the latter case the safety instruction is an integral part of the regular job instruction.

Before job breakdown for instruction purposes is prepared, the job must first be reviewed and instructions listed according to safe procedure and standard work methods. The safe work method and safety precautions must be determined and these points entered into the breakdown. The result is a written breakdown which incorporates all the safe work methods and precautions which the worker should understand in order to avoid injury in performance of his job.

The breakdown provides the supervisor with a standard method of safe job performance. When this breakdown is followed each time a man is instructed in performance of his job, it insures that all men are uniformly instructed in the one best safe method of job performance. It also insures that the supervisor does not overlook any of the safety features of the job at the time of instruction.

The Inventory shows that the precautions of preparing job breakdown or lists the safety items to be covered during job instruction are ignored by a majority of the plants in the section. It seems apparent that this point deserves consideration from a number of plants in this section to make their job safety instruction more effective.

The usual practice in general industry is for the supervisor who actually gives job safety instruction to make his own breakdown on the jobs involved, and to use these as a reminder of the various points to be covered when he gives instruction. To be sure that the breakdowns, or list of safety items which should be covered are complete and effective, it is a good practice to review them with a representative of the safety department. Although many supervisors are qualified to do a good job in this respect, with the assistance of the safety department they can do an even better job.

The fact that slightly less than 50 per cent of all plants have the safety department check instruction breakdowns and safety checklists indicates that this checking is an important part of preparing job breakdowns. Any plants who adopt this policy in the future should adopt both parts of the procedure for maximum effectiveness.

TRAINING SUPERVISORS

The method of presentation is as important in job safety instruction as are job breakdowns or checklists. An effective instruction technique, such as the "J.I.T." for method of presentation should be used when giving instructions. The instructors should be taught a special technique that is easily understood and effective for the type of instruction they are to give.

One small plant indicates the use of outside help. It states that it sends its supervisors to a university extension course training. The large plants rely mainly on in-plant training, conducted by a training department, personnel department, or the safety department.

More important than who conducts the training is that the person doing it is well qualified to give the plant instructors a practical, useable knowledge of an effective instruction technique that can be applied to job instruction training.

Fifteen small plants and four large plants imply, or state definitely that instruction in job hazards and safe work practices is not adequately emphasized. In practically all of these plants all supervisors are not given special training in job safety instruction methods, nor are job breakdowns or checklists of safety items to be covered prepared.

Since good job safety instruction is an important factor in preventing work injuries it would appear that this is an area in which these 19 plants can make an important improvement, and add emphasis to their accident prevention efforts.

FIRE EQUIPMENT AND TRAINING

The fact that 78 per cent of the small and 95 per cent of the large plants reporting recognize the importance of having a well-organized fire prevention program, is very encouraging. Fire in the plant concerns everyone since it affects not only production but job security and steady income.

Among plants reporting, the method of training was almost identical, except that scheduled training periods vary from regularly scheduled meetings to periodic or as needed. Training in the larger plants is assigned almost exclusively to either the safety director or plant fire chief, augmented with assistance from the city fire chief or college extension service instructors. Small plants rely almost exclusively upon outside assistance.

The personnel instructed varied with the size of the plant, some plants using one department exclusively, others using personnel from all departments, while a few plants used only foremen and supervisors.

No attempt has been made to consider large or small plants individually in determining the use of employee publications for publicizing accident prevention material.

Sixty-six per cent or two-thirds of the plants reporting have some type of employee publication, however, only 48 per cent of the plants having publications devote space for safety items. This would indicate that many plants are not taking advantage of an excellent medium to publicize its activities, reaching not only the worker but his family as well.

Companies devoting space to safety vary space allocations to suit their needs on the

subject covered. Space varies from one inch to 20 inches per month.

In this section of the report we encountered a wide variation of opinions on the most effective types of employee material.

The largest percentage favored: written instructions, blackboard talks, films, posters and booklets from outside sources and their own publications. Publications for family distribution were also reported as being advantageous. However, in this category only a small percentage is using family contacts to improve accident prevention activities.

Reports all indicated that few plants are taking advantage of off-the-job safety material available through the National Safety Council.

Since companies not having safety awards or award limits are in a vast majority, large and small plants have been considered together in interpreting this section of the report.

Occasionally some type of personal award is given employees working on safety committees as a matter of recognition for a good report.

SAFETY AWARDS—LIMITS

Many companies feel that good performance in safety cannot be bought. However, the vast majority did agree that if awards were made they should be small, inexpensive personal items so the company could cover many more employees.

Only four per cent of the large and 16 per cent of the small plants include families of their employees in their safety promotion campaigns.

Companies using this family participation report good results and feel that the additional effort required for this type of promotional activity is worthwhile.

Mediums used are: house organs, special mailings of material and personal letters and payroll stuffers with safety slogans. A few companies make periodic calls to families, requesting the safety slogan, if known, and giving a small reward. Of the companies not having family participation, less than two per cent anticipate setting up any type of incentive award plan in the future.

Since only 12 per cent of the large plants and eight per cent of the small plants include any type of supervisory bonus or awards this indicates that such a practice is not general within the industry. Where it is a practice, bonuses are worked into and are a part of the regular department production bonus plan.

SUGGESTION PLANS

In this category 80 per cent of the large plants and 62 per cent of the small plants reported that they had a suggestion system in effect or just starting. This would indicate that a vast majority of companies favor this type of employee relations. The number of suggestions received during the period covered by this report varied from zero to 3,000 with 50 per cent being adopted.

Methods of compensation for suggestions adopted varied extensively, the most predominant being cash awards. Such awards in some instances were made arbitrarily, while others pay a set figure upon committee approval and then pay an additional award or bonus after the suggestion has been used for a set period of time. This additional bonus is based upon the elimination of the hazard and reduced production costs. In all instances a management committee passes judgment on all suggestions. In some cases the suggestor is requested to present additional facts to clarify his suggestion.

Compensation for suggestions ranged from merchandise to $100, with the majority of companies basing awards on the percentage of savings over a period of time, usually a the necessary training to alert employees period of one year.

GLASS FURNACE REPAIRS

by CLINTON BALLINGER
safety director, Owens-Illinois Glass co., Gas City, Ind.

A glass melting furnace is made of refractory and steel in different shapes. The area where the melting process takes place is shaped like a huge cave. The walls and floor are made of blocks of various refractory material, each block being 18 inches to 60 inches long and 12 inches thick. The roof is also brick.

On each side of the melting area and connected to it are the checkers which serve as the passage way for the various types of fuel to flow to the tank to melt the batch to make glass. The inside of the checkers are of brick laid to form a honey comb pattern. The checkers may be 30 feet high, 12 feet wide, and 25 feet long.

The plans to repair a tank evolve when the tank is built. The first step to repair a tank is to drain the tank of several hundred tons of molten glass. A special block is built in the tank for this purpose. A hole is knocked in this block and the molten glass runs into a stream of cold water which carries it several feet outside the building to a prepared bin for storage.

While the draining of the tank, the heat on the glass is about 2700° which insures a free flow of glass. About 12 hours are needed to drain a tank of 250 ton capacity. When empty all fires are turned off; the following day dismounting starts. But even then the tank proper is still very hot.

When a tank is out of operation for repairs, several men are out of their regular jobs. In our plant this means 20 to 30 men have to be placed on other jobs or laid off. Of course, these men have the least seniority and therefore are considered green help when put on a tank repair.

REASSIGNING CREWS

About one week before taking the tank out of operation, the plant engineer asks for 30 or 36 men to work with the regular maintenance crew. About three days before beginning work, we call a meeting to assign them to a shift and introduce their crew leader. Every type of safety equipment is shown, and when and where to wear it. They are also told if they can't wear this safety equipment someone will take their place.

One man of the group is designated as the safety and good housekeeping coordinator and reports directly to the plant engineer. This man has played a very important roll in our safety record for the past several years by making it an important job to himself. He has the responsibility of checking out all safety equipment and also seeing that it is used properly.

When the time comes for dismantling the furnace, the checkers have been opened up. They have had time to cool off but are still pretty warm. The first step is to throw out bricks by passing from one man to another. The first few hours result in a lot of horse play as the bricks are hot and a man only holds a brick long enough to toss it to the next man. Since this can result in cracked shins and broken toes, it is one feature that must be watched—for the first day—until the checkers are cleared out or the bricks have cooled down.

EARLY DISMANTLING JOBS

After about three days of dismantling in which the work is hot, dirty and dangerous, the brick masons are called in and the building up process begins. There is still much dismantling done, but enough is completed for construction to start.

While this work is going on (on the tank proper), there are several other crews working, such as the electricians, plumbers, steel workers, tinners and machine repair men. Although these craftsmen's work may be in different spots around the tank, they must know of the other work going on above them, below them and on either side of them. We are not too alarmed that a man throwing bricks will hurt himself but that someone else will catch the full force of a hastily tossed brick.

One of the big items on any repair is this thing called housekeeping. In every plant today it is stressed in many different ways to the employees. Many supervisors feel a

good housekeeping program is lots of janitors and lots of brooms. But it's not. It is pride in the worker who wants to work in a clean place, and will do his part to keep his work area clean. This is a job for the supervisor and only the supervisor.

GOOD HOUSEKEEPING ESSENTIAL

Many accidents are caused by poor housekeeping and little or nothing is done to correct the condition. When 50 to 75 men work in an area not much larger than a basketball floor, with many types of material and equipment, good housekeeping is a must. If you have a good housekeeping program you will likewise have a good safety program. Our last lost time accident on a tank repair was caused by poor housekeeping—a small piece of brick was lying on the floor (probably had been there for two or three days), a bricklayer stepped on it and broke his ankle.

To make safety more real to the average man, several methods or approaches can be used. Posters are the largest medium to preach safety. Supplementing the posters we have been using the give-away gimmick. After one full week of work on a tank repair, the names of all men working on the tank are put in a box. At the 3:00 p.m. coffee break, while the men are congregated in one area, one name is drawn out and this individual wins a small prize such as a jacket, pair of safety shoes or one of several items costing from $3 to $10 dollars. This gimmick has done more to promote safety on tank repairs in our plant than any other. Since the use of the give-away idea, we have not had a single serious accident.

Proper scaffolds are always a must and should be inspected before being used and very often after that. The use of high lift trucks to transport and elevate tank blocks certainly cuts the danger of smashed toes, fingers and back injuries. The payloader is a real asset in loading trucks of bricks torn out of the furnace.

Every safety device and gimmick available should be used on one of the toughest jobs in the glass industry.▲

HOW TO CONTROL OFF-THE-JOB ACCIDENTS IN THE GLASS AND CERAMICS INDUSTRIES (A Symposium)

OFF-THE-JOB ACCIDENT CONTROL IN A SINGLE LOCATION COMPANY

by JOHN NANFELDT
safety director, Harding Glass co., Fort Smith, Ark.

With the increased cost of group insurance plans and the increased specialization among employees, this is one field of accident prevention that is important to all industries regardless of what they manufacture, whether they are large or small, located in one city or spread over the entire nation.

I do not propose that we, at Harding Glass company, have the complete answer for controlling off-the-job accidents, but I do feel that our record indicates that we have made some progress in controlling this type accident during the past several years.

Before actually considering the features of our program, it might be well for us to describe our company. As you are probably aware, we manufacture flat drawn sheet glass. We are a member of the Fourco Glass company and are located in Fort Smith, Ark. a city of approximately 60,000.

During full production, we employ between 600 and 700 people. Our employees and their families number approximately 3,000 or close to five per cent of the city's population; therefore, it is easy to see the importance of an off-the-job safety program to our company.

Strictly speaking, the off-the-job accident control program at Harding Glass company may be divided into three sub-divisions. First are the activities of our Safety Council, composed of management, all supervisory personnel and foremen, and elected employee representatives from each department. This group meets once each month to discuss safety problems that affect the plant in its entirety.

Guest speakers are invited to discuss safety subjects of various types. The overall program for each month in a given year is set up by a program committee. It has been a policy of this program committee to include three or four monthly meetings of this group dealing with off-the-job accident control. For example, we have had meetings on such subjects as highway safety, at which time, a member of the Arkansas State Highway Patrol was our guest speaker.

COMPANY SAFETY COUNCIL

The members of the Safety Council are called upon in their regular monthly departmental meetings to report on the subjects discussed at the previous Safety Council meeting. In this way, this information is passed along to all the employees in the factory.

The second major division of our safety program that deals with off-the-job accident control is our departmental safety meetings. In my capacity as safety director, I meet once a month with every department in our plant. In these meetings, subjects pertaining to the safety of that particular department are discussed, along with an overall subject discussed in the meetings with all departments.

For the past few years, it has been a policy to devote three or four of these monthly meetings each year to subjects dealing with off-the-job safety. For example, subjects such as "Water and Boating Safety," "Home Fire Prevention" and others of this type have been discussed. Through these meetings and the discussion of subjects dealing with home safety, we feel that we can accomplish two things: (1) Impress upon the employees the company's genuine concern for their safety away from the job as well as on the job. (2) Educate all employees to recognize and correct hazards around their own home.

FAMILY NIGHT PROGRAM

The last feature of our program is what we call our Family Night Program. This is a program sponsored by the plant Safety Council for all of our employees, their families and guests. This is an idea which started seven or eight years ago to promote interest in the plant Safety Council. During the ensuing years, it has come to be one of the most looked forward to events in our safety program. This Family Night Program is primarily a chance for all employees and their families to get together for an evening of entertainment and safety education.

We have found that early in the spring, February or March, is the best time for a program of this type. In our part of the country, most of the bad weather is over and it is too early for any vacations to have started. We have used the auditorium of a grade school located near our plant to hold this event.

Since most of the employees will bring their children, we start our program at 6:30 p.m. and try to limit the entire program to about an hour and a half. We have also found it better to complete the safety educational portion of the program at the first of the program and not make this part any longer than absolutely necessary.

By doing this, we are able to get the safety message across and get into entertainment features of the program before the children get too noisy or restless. Another way we maintain the interest of the children is by using games or contests involving the children. For example, one year, we had the children pat on a prescribed amount of safety equipment and blow up a balloon. The first one finished in each age group won a prize.

The entertainment we have used in this program has been a variety of local talent, such as singing groups, dancing and instrumental groups. To stimulate interest and promote attendance, we award door prizes. We feel that our Family Night Program produces desirable results. It provides a

social contact for all employees and their families while pointing out to our employees' families the company's genuine desire to provide a safe place for the members of their families to work.

Through the brief educational portion of this program, we are able to get ideas across pertaining to the safety, not only of our employees while on the job, but also all the employees and members of their families while they are off the job.

These, then, are the three important features of our off-the-job accident program. The acid test of any program is "does it work and what results has it produced?"

We feel that our program is beneficial not only in a reducing the number of accidental injuries, but also in producing a savings in the company's group insurance program costs. To illustrate this, I have compiled the sickness and accident payments for accidental off-the-job injuries for the years of 1955, 1956 and through September, 1957.

COSTS OF ACCIDENTS

In 1955, employees of Harding Glass company suffered 13 injuries which caused loss of time from work and one accidental death. These injuries include lacerations, back injuries and fractures. The accidental death was caused by drowning. The lost time caused by these injuries amounted to 78 weeks and two days in the amount of $2,348.00 in S&A benefits.

In 1956, 11 employees lost time from their jobs. The total lost time was 20 weeks and three days for which $612.00 was paid in S&A benefits. For the first nine months of 1957, three employees have lost a total of 22 weeks and three days from their jobs and have been paid $672.00 in sickness and accident benefits.

The life insurance premium rate for our employees since 1948 has shown a decrease of .03c per thousand dollars while the average employee age has gone up. This does not represent a great drop, however, considering the relatively large number of employees involved and the period of time, this decrease represents a considerable saving to the company.

Similarly, the sickness and accident premium rate has remained constant since 1952, the amount of benefits has increased at no increase in premium rates. No summary of hospitalization costs have been used since there have been a number of benefit increases and changes of insurance carriers so that no accurate picture could be drawn.

In view of the results that have been reflected in the reduction of accidental off-the-job injuries and the reduction in group insurance costs, we feel that our program has been successful.

ALCOA'S APPROACH

To the Off-The-Job Safety Problem

by W. R. GILLILAND

assistant safety director, Aluminum Co. of America, Pittsburgh, Pa.

Alcoa has been concerned over this problem of off-the-job injuries for several years. However, we lacked concrete facts concerning the true dimensions of the problem, and didn't know the best way to obtain the necessary information.

When the National Safety Council announced their standard reporting form for off-the-job injuries in the fall of 1955, we asked our plants to use this form not only for reporting to the National Safety Council but also to our home office. We do not use the formula for Frequency and Severity rates but complete all other items.

Our procedure is generally as follows: All employees are covered by non-occupational disability benefits, medical, and surgical insurance program. The Insurance Department at each location, therefore, serves as an ideal accumulation point for all insurance claims of off-the-job injuries. Claims for employees' dependents can be accumulated in a similar fashion by each plant and reported to us on the National Safety Council form.

This arrangement has simplified the problem considerably. We probably miss some minor cases which result only in one or two days' absence from work or other minor incidents for which claims may not be filed. However, such cases constitute only a very small percentage of the total. Considering the foreman's or supervisor's time required to investigate every single absence for complete data, we believe our procedure is quite adequate for all practical purposes.

The data obtained from this reporting procedure during 1956 were:

1219 off-the-job injuries. Of these, 18 were fatalities—17 in traffic accidents and one at home. This amounted to 4.18 injuries off-the-job for every one occurring on the job and 9 off-the-job fatalities for every industrial fatality.

There were 23,497 days lost as a result of these injuries. This does not include any standard time charges for permanent partial disabilities and fatalities. The time lost is 3,335 man-weeks or 64 man-years of productive working time lost in a company of 50 thousand employees.

In addition to the loss of manpower and skills, the weekly disability benefits paid to employees for lost time due to off-the-job injuries in 1956 was 133,400 dollars plus life insurance benefits of 90,000 dollars for families of 18 deceased employees. This amounts to approximately $4.40 per employee a year. Although the insurance carrier pays these costs, our company pays the insurance premiums and we benefit by any reductions in payments.

This represents a substantial incentive for the company without including hospital and surgical expenses or any indirect costs. Needless to say, the cost to employees in lost wages and suffering is a considerable item, and should serve as an excellent point for rallying employee interest and support for off-the-job safety programming.

As I mentioned before, we do not have a complete program. As in industrial safety, there are a variety of different approaches with no single answer as the exclusive remedy. Education of employees and their families will undoubtedly be the major approach since supervision and other controls in industrial safety are absent.

RALLY LOCAL SUPPORT

Our principal approach to date is through locally conceived and sponsored programs hitting one or more phases of the problem at any given time. One example is a traffic safety program sponsored by one of our plants early this year.

This plant is located on a stretch of highway with the worst accident rate in the state. A 30-day campaign was launched with the cooperation and assistance of all industries located on the highway. Comprehensive publicity through plant and community newspapers and radio stations was arranged. "Back the Attack" bumper stickers and other reminders were distributed to all employees. Poster programs were keyed to this theme. Supervisory, safety committee, and employee meetings were held to discuss the problem and show traffic safety films. State police troopers participated in the meetings and campaign to warn motorists of highway hazards. Letters were sent to employees' homes. This same topic is being plugged this year to keep the topic fresh in the minds of employees.

While it is still too early to prove that this effort reduced injuries, we believe it has had quite an effect.

Another example of this local approach is in a small community where Alcoa is the principal employer. Here we use the services of all community organizations while the company acts as sponsor furnishing materials, lending guidance and support. Gaining participation by as many people as possible is a major objective of a successful off-the-job safety program the same as it is for an in-plant program.

In regard to the program at the home office, we make available all types of materials and services to the various plants. All plants receive the off-the-job materials published by the National Safety Council. The *Alcoa News*, our company house organ sent

to all employees, features articles and items pertaining to the subject. Reading rack booklets on off-the-job safety constitute a large percentage of the materials approved by our home office.

In addition, we are considering certain company-wide programs such as the Safe Drivers League as a continuing effort to superimpose the current one-shot type of campaign devoted to a specific hazard.

We feel that by constantly hammering away through the proven techniques of industrial safety programs, we can reduce the terrible toll of suffering and expense to our people resulting from accidents at home and on the highways.

ARE OFF-THE-JOB SAFETY PROGRAMS NEEDED IN INDUSTRY TODAY?

by R. P. HAMILTON

superintendent of safety, St. Louis-San Francisco Railway co., St. Louis, Mo.

During the past few years we have been brought face-to-face with startling facts. There has been an increase in school enrollment, in political activity, in the merger of great industries, in wages, in speed, and, according to statistics from the National Safety Council an increase in the number of persons killed and injured. There was an increase of two per cent in the number of persons killed in 1956, or a total of 95,000 killed and 9,500,000 injured.

Considering that approximately 81,000 of those 95,000 fatalities during 1956 occurred in off-the-job accidents, we realize that we should have off-the-job safety programs.

Although the cost of accidents, injuries and deaths is secondary, it amounted to $11,200,000,000 in 1956. This expense for loss of life, injuries, and destruction of property, would have clothed every man, woman, and child in the nation in 1956. It would have built 1,000,000 single-family homes, or 300,000 school rooms which are badly needed. It would have provided all three shots of Salk vaccine for every person in the world. The cost exceeded the net income of the nation's 135 largest railroads, utilities, and corporations. How nice it would have been to be able to spend that $11,200,000,000 for construction rather than destruction.

We feel that safety should be a family affair because it reaches through each man's job to his home, his family, his clubs, his schools, and his community.

The basic principles of off-the-job safety programs of railroads can be used in any organization—*make safety a family affair.*

During the latter part of 1947 I felt that we were not making sufficient progress in safety on our railroad and we should try something new. It was decided to hold some family safety meetings. On a cold, wet night in December, 1947, we held our first family group safety meeting with an attendance of 84—not too many, but at least a start. During 1956 we had two such meetings with an attendance of over 1,100 at each meeting. Last year 53 family group safety meetings with more than 29,000 in attendance were held over.

During April of this year there were over 5,800 at our Springfield, Mo., meeting. We had to turn away more than 500 people unable to get inside the building because the doors were closed by the city firemen for safety's sake. This clearly demonstrates that there is an interest in safety. We have always felt that if you can show the employee you are interested in the safety of his family as well as himself, he will be more responsive to the on-the-job safety program. If an employee is safety-minded at home and on the highway, he will also be safety-minded on the job.

The highlights of our safety program as summarized by "Railway Age" are:

- "Its ubiquitous energy (because it comes largely from within rather than from the top).
- "Its active—rather than passive—character for most employees (i.e., it is widely participated in, not just looked at or listened to).
- "Its sincerity, as evidenced by its volume of non-railroad public safety work.
- "Its corner-stoning the basic Frisco policy of building management potential from within the organization through widespread employee activities.
- "Its hand-in-glove fitting into Mr. Hungerford's philosophy of building up the individual and respect for his dignity.
- "Its knitting together the Frisco 'family' of 17,000 scattered employees by providing fellowship and a common goal reached through common experiences.
- "Its immeasurable public relations benefits derived through selfless efforts in community and home safety.
- "Its appeal to even non-railroad families through the continuing work with school children and family groups.
- "Its ability to save lives and suffering while at the same time boosting morale and pride in the company.
- "That the program has won over the Frisco rank and file is no better illustrated than in the remarks of a recently retired locomotive engineer. Spotting Mr. Hamilton one recent afternoon, he said: 'I thought this safety thing would die out when you first started it. It always had before. But I wish now that the company had started your program 10 years sooner.'"

We are confident that our off-the-job safety program helped save many lives and much needless suffering, and we feel the same way about the various programs carried on by industry today. The managements of a large number of railroads and industries of America feel we do need off-the-job safety programs, and we are confident that each year will see an increase in those participating in this worthwhile cause.

RUBBER SECTION

REPORT OF THE STATISTICS COMMITTEE

by RAY HART

safety director, The Dayton Rubber co., Dayton, Ohio

The records say that three people will die and 270 will be injured, while I am talking for 15 minutes. Approximately 95,000 are killed each year, accidentally, one way or another. About 40,000 die in traffic, 28,000 in their homes, and 14,500 on their jobs.

When we say 14,500 people died on their jobs and 28,000 in their homes that sounds good, and we hear it said that industry has a good safety record. Personally, I can't agree with this, because the record is not good as long as 14,500 people are losing their lives annually. It only looks good when we compare it with other causes that have a worse record than we do.

We are specifically concerned with the rubber industry. You want to know where we are in the standings and how we compare.

(1) First of all let's look at the frequency and severity record for the rubber industry from January 1, 1950, to the end of 1956, as reported to the National Safety Council.

FREQUENCY AND SEVERITY FOR RUBBER INDUSTRY—NATIONAL SAFETY COUNCIL

Year	Units	Total Injuries	Fatal Injuries	Permanent Partial	Temporary Total	Hours Worked	Frequency	Severity
1950	66	1196	5	86	1104	380,382,400	3.07	700
1951	107	2105	4	129	1972	555,537,500	5.91	380
1952	121	1896	6	143	1847	632,962,700	2.15	420
1953	126	1891	12	147	1641	390,382,400	4.61	490
1954	125	1411	8	105	1298	256,637,500	5.97	390
1955	136	2228	14	198	2016	633,962,700	3.51	390
1956	116	879	2	90	787	267,657,000	2.28	338

(2) Now, let's look at the frequency and severity for all industry, as reported to the U. S. Department of Labor for the same period.

FREQUENCY AND SEVERITY FOR ALL INDUSTRY—U.S. DEPARTMENT OF LABOR

Year	Units	Total Disabling Injuries	Fatal Injuries	Permanent Partial	Temporary Total	Hours Worked	Days Charged	Frequency	Severity
1950	6395	113,273	1,005	6,398	105,870	12,176,502,600	11,502,928	9.30	940
1951	7134	127,889	1,210	7,417	118,262	14,096,081,800	12,889,215	9.06	970
1952	7930	136,381	1,178	7,915	117,288	15,044,278,460	12,371,226	8.40	880
1953	8139	117,448	1,148	7,952	108,348	15,794,164,900	12,084,230	7.44	830
1954	8456	107,081	1,170	6,846	98,065	14,830,430,100	11,836,940	7.22	808
1955	9315	111,429	1,302	7,404	102,723	16,612,022,300	12,046,327	6.96	815
1956	9805	98,380	1,082	6,179	91,119	18,430,720,860	11,307,232	6.38	725

(3) Now, we have the frequency and severity for all industry, as reported to the National Safety Council for 1956.

The 1956 Injury Rates as reported to National Safety Council

FREQUENCY		SEVERITY RATE	
Communication	.98	Communication	58
Aircraft Mfg.	1.51	Tobacco	82
Electrical Equip.	2.01	Leather	121
Automobile	2.14	Electrical Equip.	156
Cement	2.26	Aircraft Mfg.	227
Tobacco	2.27	Automobile	280
Rubber	3.28	Rubber	338
Steel	3.52	Sheet Metal	554
Ship Building	4.84	Railroad Equip.	536
Railroad Equip.	5.29	Ship Building	667
All Industry	6.38	All Industry	732
Pulp & Paper	7.34	Iron & Steel	770
Lumber	7.56	Wood Prod.	818
Meat Packing	8.00	Steel	850
Iron & Steel Prod.	8.72	Foundry	976
Wood Prod.	9.88	Cement	1388
Foundry	10.22	Construction	2378
Construction	19.10	Lumber	2436
Lumber	22.52	Quarry	3134
Coal Mining	23.07		

(4) Last of all, let's see how the small plants compare with the large plants, as far as safety is concerned.

Injury Frequency Rates by Size of Reporting Units for the Rubber Industry—U.S. Department of Labor—1955

Size	Tires & Tubes	Rubber Footwear	Misc. Rubber Products
Less Than 20 Employees	——	——	10.12
20 to 49 Employees	——	——	12.0
100 to 249 Employees	——	——	21.0
250 to 499 Employees	14.4	——	14.2
500 to 999 Employees	3.7	12.5	10.7
1000 to 2499 Employees	4.2	6.5	8.1
2500 and over	2.6	0.5	5.0

Injury Frequency for This Year

January Thru August	Frequency
Under 300 Employees	6.02
300 to 500 Employees	4.46
500 to 1000 Employees	2.62
1000 to 2000 Employees	2.37
Over 2000 Employees	2.10
All Divisions 7-31-57	2.88

We can break down the injuries in the rubber industry and count the toes, fingers and hands that were affected, also the ones that were caused by machines, but what will that tell us? We still must deal with them individually—first find the cause and then the cure.

It has been said that more than 95 per cent of our injuries are caused by unguarded minds, and less than five per cent due to unguarded machines. I wish I could tell you exactly how to establish a better safety record, but I am afraid I don't have a sure cure. I am convinced that it is a job for supervision and no one else can do it. I can make it sound rather simple, because our work boils down to this—how do you make a supervisor want a good safety record? The desire must be there first.

It is not too difficult to provide ideas that will get good results, once we get them in the right frame of mind. Safety work reminds me so much of church work. We are all striving to do the same thing, but we use different methods to get the job done.

Perhaps this is a good approach to the problem. We try one idea and it appeals to some; another idea appeals to others, and so we continue on, and some day perhaps we will get everyone safety minded, if we can come up with enough new ideas.

ACCIDENT—CAUSE, INVESTIGATION AND PREVENTION

(Round Table Discussion)

ED TURNER, Conference Leader

I should like to preface my brief introductory remarks by establishing two simple propositions:

1. Only by a realistic analysis of the accidents occurring in our plants will we ever be in position to assess what we have accomplished in accident prevention, and what we hope to accomplish.

2. The objective of accident analysis is to establish the real causative factor, to carry out a thorough fact finding investigation of all history surrounding the case to set up workable preventive measures.

The factors of cause and investigation are relative. So as to clear our thinking, we shall look at it this way.

ESTABLISHING CAUSE

CAUSE is the actual agent, causing the injury. In essence, this may be the briefest part of our discussion; we really seek to establish who and what with the object of establishing fact and dissipating baseless rumor and possible panic. In establishing accident cause, in its simplest terms, we merely want to know whether the agent is human or mechanical.

Cause should never be confused with blame. It is a human failing it seems, that as soon as a tragedy occurs, a sacrificial goat is looked for on whom to pin the blame.

This resolves nothing, and merely turns the factor of shock and grief into mistrust or bitter recrimination.

Until such time as all the facts are established, management must assume full responsibility to give a full and proper account of what has occurred, and endeavor to offer a measure of calm assurance and reality at a time tempers are delicately triggered.

In this section we should consider (1) who should investigate and (2) what to investigate.

A representative of management is the best person to carry out a thorough investigation of all accidents or accident producing conditions.

The main purpose of an investigation is to find the fundamental error which caused the accident and correct it whether the error falls into the human or the engineering category.

The investigation should be made as soon as possible after an accident—before the conditions or machine can be changed.

PREVENTION

So long as management assumes the responsibility to manage the plant, then it must be the prerogative of management to act as the sole enforcing agency to—

(a) Correct defective working conditions.

(b) Put a stop to improper work practices.

I was much impressed last year when listening to a labor discussion when several workmen were insistent that their bargaining representatives incorporate into their agreements specific safety regulations, only to be told in no uncertain terms, something to this effect:

"Just keep this one thing in mind; that while we mutually subscribe to the need of safety measures in our plants, our local agreements will only deal with the subject in a very general manner.

"The sole responsibility for the safe welfare of the man in the plant is management's. Labor does not share in this responsibility as a management function; if and when we do that, then we must also expect to share the blame for accidents."

I do feel, however, that the management member should promptly inform the union safety representative of the actual history of the accident and the measures recommended to prevent its recurrence, in order that the union may have confidence in the impartiality and thoroughness of management's investigation.

Let me illustrate by two actual case histories:

ACCIDENT NO. 1

Six weeks ago a telephoned report came to my desk of a man having his arm caught in the spreader rolls of a machine.

Now long since, I have learned this cardinal rule—In any serious accident, get on the job immediately to establish as soon as possible (and certainly before rumor gets busy) the accident cause and extent of the injury.

In reaching over the top of a chain drive, this operator's sweater sleeve was caught, and it pulled his arm up against, but not into, a small idler sprocket. From the workman, who was well enough able to talk, we ascertained that he had followed a standard procedure, and was using a knife to free some loose threads adhering to a smooth rool. In picking off the threads he had to reach in further than normally, and came into contact with the chain.

This operator suffered severe lacerations and contusions to the lower arm. There were no broken bones and he was off the job for six to eight weeks.

Thus we had established the cause and the *whom* and *what* of the accident.

The investigation in this case,—which is always slow and involved—was done carefully, and verbal statements were shaken down from the supervisor, the man's workmate and other parties involved.

The supervisor submitted that the man had violated safety regulations and gone into an enclosed area alone when the rules specifically stated that he was not to do so.

His workmate was somewhat truculant in saying "Ah, I knew someone would be caught there someday. I've told 'em a dozen times the job isn't safe. There should be another man on the job."

Our investigation showed up two or three rather obvious errors.

- In doing the operation, which was quite essential, the safety cable was out of reach of the operator in an emergency.

- The safety rules did not specifically exclude him from going into the area alone —merely "that on all such cases a man must be on the platform of the machine, within call."

- The practice was admittedly hazardous, but no real thought had been given to taking specific preventive measures to meet an emergency. The safety and engineering departments did not even know that such a practice was regularly done.

Some recommended prevention measures are:

1. The safety cable is to be extended so it will be well within reach from any position.
2. The request by the union to have a third man placed on the job was partially met. An air whistle was installed so as to summon the third man whenever entry into the enclosed cabinet was required.
3. The rules were changed to read "in a less ambiguous manner." In other words, no entry into the enclosure is permitted unless a standby operator is first summoned.
4. A platform for easier access to the rolls was installed.
5. We made up a combination high air velocity rod and knife to remove the strips, thus obviating the need of the operator to reach into the rolls.

There you have it. The cause—to establish the facts and frustrate rumor.

The investigation—to establish the weak points of our safety measures.

The prevention—to set up the proper measures to eliminate further accidents.

ACCIDENT No. 2

The ambulance had called at the front door to remove an unconscious workman to the emergency ward of the hospital.

Rumor had it he was killed by poison gas. To add horror to the rumor—he was only one of several who had been exposed to the gas. Quickly then we must establish the cause factor, and dispel wrong impressions. This man was in shock so we could get little help here. We understood the operator had spilled some aniline oil and in attempting to clean it up had used some burlap bags to soak it up and had wrung the material out in a drum. This obviously resulted in the inhalation of fumes and in critical skin contact. Therefore a serious case of poisoning resulted.

Since the actual incident occurred about two hours previously, he was in shock and

immediate remedial measures were imperative; thus his prompt dispatch to the hospital.

It was all of five days (after complete blood transfusions to save his life) before we could complete the investigations with his help, and he admitted that he was involved only because he had tried to cover up an error. He had left the room to secure a cup of coffee contrary to regulations and had left a small valve open to fill a drum.

CAUSE AND ERROR

Our measures for ventilation were faulty and since the material being handled was hazardous, the margin for human error was too obvious. Thus we had to admit that our policy was as much the cause, as the error of the employee.

PREVENTIVE MEASURES for this hazard were:

(a) The liquid transfer was made automatic, both by a measuring device and by an automatic float shut-off.

(b) A retraining on the handling hazard of the chemical was undertaken for all employees of that department.

In taking corrective action after an accident, a great deal of skill and sound judgment needs to be exercised. In accident investigation there is no room for hot heads and unbridled tongues.

Even if there is a patent violation of a state code the interpretation as to whether the scope of that code covers the particular situation needs careful deliberation.

RECOMMEND CORRECTIONS

As mentioned before, corrective action can only assume the status of a strongly worded recommendation. we cannot enact legislation nor can we relegate any such action to the bargaining unit as a subject for negotiation. Accident prevention after all, can never be negotiated, if the safe welfare of any workman is at stake.

A skilled investigator will instill confidence in the minds of both management and men if he suggests a course of action, which, while not necessarily acceptable to both parties, will in the final analysis present a realistic solution to the accident problem.

The conference recorder of our discussion group was Mr. G. A. Miller, safety director of The Gates Rubber company, Denver, Colo.

The round table discussion was attended by 40 representatives of management and labor. Two phases of the subject took all the time alloted for discussion, i.e., cause and investigation.

Q. Should the cause of an injury and results of the investigation be posted on bulletin boards?

A. It was generally agreed that it would not be best to publicize this plant-wide on bulletin boards. Workers in the department involved should be fully informed by the department head after the investigation was completed.

Q. How soon should investigation be made after the injury?

A. As much as possible of the investigation should be made immediately after the accident, especially of the machine or whatever other agent was the cause. The injured man may not be in a condition for an investigation, but definitely his side of the story should be taken as soon as possible.

FINDING GUILTY PERSON

Q. Should investigation be made to find individual at fault?

A. The primary purpose of an accident investigation is to ascertain the unsafe act or condition involved. The only purpose served to interrogate an individual would be to get information on these particular aspects of the case.

It would definitely never be within the jurisdiction of the investigating man or group to prescribe any course of action against any one.

Q. Is an investigation best undertaken by an individual or a group?

A. This would depend entirely upon circumstances. It would seem obvious that the findings of any large group would have to be submitted or presented by an individual in order to get an accurate estimate of the injury.

Q. Should a joint labor-management safety committee assume the status of the official investigating party?

A. Labor feels strongly that this should be the case, or if not the whole committee, certainly representatives from both sides should take part in the investigation.

As a matter of interest, a poll showed that 50 per cent of the companies represented have joint labor-management safety committees. Local differences of policy were evident as to whether the nominees for the Union should be appointed by management or by the Union.

It is to be noted that the whole object of our meetings is merely to observe and record our findings as to the generally accepted policies governing these situations.

Depending upon the communications within the separate plants, a wide variation of company policy is evident. However, we have one common object, and that is to prevent accidents and have a workable program for the safe welfare of the workmen on the job. His livelihood must never be jeopardized by what he feels to be reluctance of management to set up safe working procedures.

As one listens to these discussions, one thing is obvious—the sincerity of both labor and management to agree on a commonly acceptable basis of mutual trust for the well being of all concerned.

HEART DISEASE IN INDUSTRY

by W. A. McCAUSLAND, M. D.

medical director, The B. F. Goodrich Footwear & Flooring co., a division of the B. F. Goodrich co., Watertown, Mass.

It has become increasingly difficult in industry to find employment for people suffering from heart disease. There are 280,000 persons afflicted with some form of heart disease in Massachusetts alone. Some 60 to 70 per cent of these are employable. Many of these are young people with families. Realizing that many of our own employees who are now in good health will, as they grow older, develop some form of heart disease, we are compelled by loyalty to save our medical jobs for our own people.

There are various types of heart disease. First, we have the congenital anomalies due to embryonic defects in development during the period when the heart and great vessels are formed from the primitive vascular tube. Briefly by name they are the acyonotic group, the cyanotic group, the tetralogy of Fallot, Eisenmenger's complex, coarctation of the Aorta, Patent Ductus Arteriosus, ventricular septal defects, auricular septal defects and Valvular Pulmonic stenosis. For some of these congenital conditions we can do nothing; whereas many can be corrected by new forms of heart surgery.

We have another big group of heart diseases caused by arteriosclerosis, rheumatic fever, syphilis, thyroid disease, diptheria, certain types of anemia, certain vitamin diffciencies, bacterial infections, aneurysms, arterial hypertension. This group is the more common of the heart diseases and usually can be treated by the physician over a long period of years. These acute and chronic congestive heart failures occur at any time of life. They may be said to constitute the bulk of the every day run of the mill heart disease.

CORONARY ARTERY DISEASE

The most dramatic of the heart diseases is Coronary Artery Disease, which is a narrowing or occlusion of the coronary arteries usually due to arteriosclerosis with the resultant imbalance between blood supply and cardiac muscle demands giving rise to anemia or damage to the heart muscle. Arteriosclerosis is the most common cause of coronary artery disease.

The etiology of arteriosclerosis is unknown but is frequently associated with high blood pressure, sugar diabetes, thyroid disease, high blood cholesterol levels, overweight and old age. Arteriosclerosis may be localized to the coronary arteries or may be a part of generalized arteriosclerosis.

Coronary artery disease is essentially a disease of middle life and old age. It is four times as frequent in males as in females and has an occasional family tendency. Approximately 90 per cent of cases occur

in the 60 to 80 year age group. It has been found in infants and children.

Coronary artery disease may produce no clinical symptoms. Only when damage becomes severe enough to cause a critical deficit of blood supply in proportion to myocardial demand do symptoms occur. The clinical picture depends upon the size and location of the myocardial region inadequately supplied with blood, the severity of the deficiency, its rate of development and its duration.

Angina pectoris or chest pain results from a short period of relatively mild ischemia. Myocardial infarction results from severe and prolonged ischemia in a more localized portion of the heart muscle often from an occlusion of one of the larger coronary arteries.

With coronary insufficiency we try to dilate the blood vessels and make them carry more blood—these people may live for 20 years under proper treatment. Myocardial infarction may occur with coronary occlusion and coronary thrombosis or without them. Small vessels may become occluded without myocardial infarction, because of a good collateral circulation.

Myocardial infarction is usually produced by thrombotic occlusion of one of the larger branches of the coronary arteries. The thrombus usually occurs in the narrowed channel of a sclerosed vessel often in the bed of an atheromatus ulcer or calcified plaque. It may form slowly or rapidly producing a thrombus which cuts off the blood supply to the area of heart muscle supplied by that particular arterial branch.

INDUSTRY'S PROBLEM

This may result in sudden death or hospitalization and slow recovery having various complications. The physician in industry is primarily interested in coronary artery disease. The majority of heart conditions can be easily detected by the stethoscope and the electrocardiogram. With these people we know just how much of a work load their hearts can sustain.

With coronary artery disease, it is a different story—as yet there is no medical test which indicates a man has this type of disease with no apparent symptom. I can take a cardiogram of an apparently healthy individual, find a normal reading, have him walk out of my office, and drop dead from a coronary.

Coronary disease is a relative newcomer to the field of medicine. Autopsies done before 1910 do not reveal this type of disease of the coronary arteries. We can blame civilization with our higher standards of living. Our full refrigerators containing foods which raise our blood cholesterol play a part in the whole general picture.

Lack of exercise, since we tend to use our automobiles to go to the next block rather than walk, is also part of the picture. Smoking, drinking and worry don't seem to have any effect. Hard work does not play a part unless there is some previously existing disease. The real criminals seem to be diet and lack of exercise. One of the most interesting proofs of these facts is that among Detroit automobile workers coronary disease was almost unknown in earlier years.

PLAIN FOOD HEALTHIEST

With improved working conditions and better pay there has been a tremendous increase in coronary disease. Our plain foods of earlier times seemed to give us protection against coronary disease. A program for control in industry is rather difficult because we have no tests which will indicate whether arteries are diseased or not.

Thorough physical examination including an electrocardiogram should be periodically made. If an employee indicates an elevated blood pressure, we should make sure that he undergoes treatment. Any underlying disease should receive prompt attention. Overweight must be controlled. Plant jobs must be inspected to make sure that the work is not too hard for the individual.

Many individuals will keep on working at a job which may be too difficult because of age or some other underlying disease. The pay check is too good to pass for an easier job with probably less money. These people we never see until the damage is done.

The returning coronary patient is always a problem—his physician's note simply states the employee is ready to return to work and we must determine if the job is going to be satisfactory from a physical standpoint.

The industrial physician must rely on adequate physical examination to control coronary artery disease.

RADIATION EXPOSURE IN THE RUBBER INDUSTRY AND CONTROL MEASURES

by R. A. MANNING
The Goodyear Tire & Rubber co., Akron, Ohio

Man in his search for an ever increasing standard of living resorts to an expanding technology that often advances the boundaries of knowledge and productive capacity, but also generates potential problems and requires adjustment to additional stresses in our environment. One such tool, from which we have not yet realized the full impact or benefits, is nuclear energy.

One must not feel that man's exposure to nuclear radiation is a new innovation—commencing near the end of World War II or with the formation of the Atomic Energy Commission. Man's environment has included exposure since time began because wherever one goes, there is always a small amount of so-called "background" radiation. This "background" radiation arises from naturally radioactive substances; uranium and radium and others found in rocks and soils as well as the radon and thoron that are given off into the atmosphere.

In addition, cosmic radiation from space is present everywhere and of course, like the natural deposits of ores, the exposure varies from one location to another, depending on altitude. For 60 years, man has been exposed to man-made radiation in the form of medical and dental X-rays. In fact, many U. S. citizens, today receive approximately the same amount of whole body radiation from the average X-ray fluoroscopic examination as from natural background.

Therefore, it is obvious that the mechanism of radiation exposure is not new. Only the increase in use and subsequent increase in potential exposure is new. As an illustration, on May 31, 1957, the AEC had licensed a total of 4,041 employers to use radioactive isotopes, of which approximately 40 per cent of these licenses are industrial firms.

In hopes of dispensing with one of the more controversial issues, it can be stated that the average exposure to "fall-out" from weapons testing, if continued at the average rate of the past several years, would be only 1/40 of the genetically important exposure due to background alone.

With respect to weather there has been no evidence that nuclear energy or nuclear explosions have contributed to any changes in weather or climate. In fact, one comment heard recently probably explains the situation adequately; the early caveman felt sure that they had never had such strange weather until they started using the bow and arrow.

Medical X-ray facilities as used in industry today are familiar to all of us and everyone will agree that their diagnostic value far outweighs any detrimental effect that might possibly exist. The radiation received from a chest film is higher than any other exposure that might be received under normal operating conditions from other uses of radiation in industrial operations.

X-RAY INSPECTION TOOLS

Industrial X-ray facilities and fluoroscopes are generally of higher peak voltages and are utilized to examine or inspect equipment or manufactured items, such as belts or tires, for internal flaws or specification quality that cannot be determined visually or by other conventional inspection methods. Exposures with this equipment can be high unless adequate control procedures are employed.

Radiographic techniques are used for essentially the same purpose as industrial X-ray facilities, but are usually somewhat more mobile and are moved to the item under inspection rather than moving the item. These are high energy radioactive, gamma emitting, sources requiring no electrical power; radium and cobalt-60 being two of the more popular isotopes used. Care must be exercised with such usage to prevent exposure to operating personnel and others in adjacent areas. Distance factors and shielding are usually mandatory.

One of the outstanding applications currently in use in the rubber industry is beta gauges for determination of weight of films and thickness of items such as films, treads and calendared stock. Beta gauges usually use carbon-14 or strontium-90 as source materials with a measuring head that detects the scattered radiation and reads directly on a calibrated dial in the units in which interested.

Through proper circuitry this measurement may be electronicly coupled with the process to provide control and make necessary adjustments with better accuracy and less effort on the part of the operator. As customarily used, such devices while operating present no hazard to personnel in the area.

MAINTENANCE HAZARDS

During maintenance procedures on the gauge some consideration must be given to prevent unnecessary exposure. If an emergency arises, such as a fire, it might be possible for the source to be vaporized by the heat and contamination spread over a large area. It is recommended that periodic air samples and area surveys be conducted in the vicinity of such gauges to insure that the integrity of the source container is being maintained.

Tracer techniques are being used extensively in the research laboratories to study the physical and chemical reactions in rubber chemistry, particularly with regard to accelerators and anti-oxidants. "Tagged" compounds are made up containing various radioisotopes of carbon, sulphur and zinc.

These materials are handled in laboratory quantities and have contributed a great deal to understanding some of the basic processes involved in rubber compounding and technology. Their use is confined to individual laboratories where stringent cleanliness standards are maintained to prevent the spread of contamination. Waste disposal is monitored carefully so that radioactive materials are not released into public sewage or water systems.

IRRADIATION FACILITIES

Various irradiation facilities for research and development purposes are used in some companies and projects in conjunction with governmental reactors are popular. These facilities are used for testing properties of materials under the stress of high radiation density. Another promising application is to promote polymerization of various monomers and tires have even been cured by this method.

Sources range from multi-currier cobolt-60 sources to fission products from reactors. Extreme operating precautions are necessary for experimental work of this type including heavy structural shielding, safety interlocks and a full complement of personnel protective devices.

Anti-static bars employing alpha particle emitters such as prolomium are commercially available, and although not used extensively in the Rubber Industry, may have applications in some of the diversified operations conducted by rubber companies.

Future applications are numerous and undoubtedly many still beyond our present comprehension. Subsequent applications will necessitate that sufficient thought and planning be given during process development, engineering design and production use.

In order to receive radioactive materials legally in sufficient quantities to be potentially hazardous, it is necessary to be licensed by the AEC and meet the health and safety standards as outlined by Federal regulation. Furthermore, nine states at the present time have additional state registration requirements as a further safeguard. This means that an original installation then is a safe installation for the employee.

FEDERAL, STATE REGULATIONS

By the use of design criteria and operating procedures, audited by AEC inspection teams, the installation or use is kept safe. Personnel protective devices are utilized extensively, where needed, and include film badges, monitoring chambers, and dosimeters. Area surveys and air samples are performed by regulation to maintain the license, and at other intervals as indicated by operating difficulties.

Radiation exposure to personnel in the rubber industry is not a new environmental condition. The application of nuclear techniques to product development and process control can be adequately controlled so as not to present a hazard to personnel. The employee in this industry is not receiving significant radiation exposures at this time and the knowledge for prevention of undue exposure is available so that emergency planning can reduce or alleviate potential exposures that might arise from catastrophes such as fires or explosions.

The benefits to be derived from the use of nuclear energy techniques are tremendously greater than the risk of occupational injury with our present standards.▲

OFF-THE-JOB SAFETY

(Round Table Discussion)

EARLE R. GARDNER, Conference Chairman

We are having a lot of off the job injuries via the power lawn mower, hunting and home workshop. Statistics have proven we are losing a lot more production and causing human suffering by off the job injuries than we are by on the job injuries.

It is recommended that those of you who are not keeping records regarding off the job injuries should do so for you will be amazed at the amount of time your employees are losing due to off the job injuries.

One question asked was: What civic organizations as safety men or representatives of your local unions can you obtain help from?

Answer:

1. PTA
2. American Automobile Association (AAA)
3. Automobile traffic associations.
4. The garage associations.
5. The mayor's traffic committees.
6. Church groups.
7. From the ladies.
8. House organs.
9. Newspapers.
10. State Departments of Safety and Hygiene.
11. Union locals

Following is one of the suggestions on how to start an effective off the job safety campaign.

—An analysis of your experiences for one year.

—Disseminate information through your regular line of communications as you do on the job safety campaigns.

—Form on off-the-job safety committee.

—Form a family safety committee consisting of the wives and children of your employees.

—Hold a family safety month in your community and ask all the civic organizations to participate.

It was brought out that the automobile manufacturers are now putting the emphasis on safety and comfort in their products, rather than on horsepower.

The formula for measuring the frequency and severity was the subject of considerable discussion and it was found that there was a wide difference of opinion as to how this should be figured. However, it was generally agreed that the National Safety Council's formula was at least basic.

Suggestions of ways to reach the home with safety messages were:

1. Post the answers to safety questions on the bulletin boards in the shop and make phone calls to the homes with a cash incentive for the wife having the correct answers.
2. Mail the house organ direct to the homes.
3. Draw a comparison for the employees between plant safety and off the job safety, such as in plant trucking and traffic safety, machine shop safety, to the home workshop.

"Off the job" safety will keep the production lines rolling and families united and happy!▲

COMMUNICATIONS IN SAFETY

(Round Table Discussion)

T. J. CAIN, JR., Conference Leader

Report on Round Table No. 4—*"Communications in Safety"* by T. J. Cain, Jr.

Conference Leader: T. J. Cain, Jr., Director of Safety, The B. F. Goodrich Co., Akron, Ohio.

Conference Recorder: *N. C. Longee, Safety Supervisor, Passaic Plant United States Rubber Co., Passaic, N. J.*

T. J. Cain pointed out that we get from a conference what we put into it. In a few brief words he stressed the importance of effective communications and laid the groundwork for our work. He announced a prize of one dollar to be paid to the first one to utter the "magic word" which he felt was the real key to communications in safety. Each person was asked to stand, identify himself and name one communication medium he thought important:

—A weekly newsletter.
—Word of Mouth.
—Messages in the plant publication.
—Personal contacts.
—Daily memos.
—Daily reports of conditions, and follow up.
—Following established lines.
—Bulletin boards.
—Monthly meetings.
—Reports from line supervision to superintendents.
—Weekly meetings—use key men.
—Written reports to the top, sent back down the line as directives.
—Daily contacts—even by telephone.
—Boards showing comparative standings.
—Five-minute safety meetings.
—Post rules in departments, issue rule books.
—Contests.
—Direct communication with the worker.
—Direct communications, but through supervisor.

At this point the ideas began to emerge, and the following were added to the list: Safety book racks, slogan contests, letters to homes, cards to homes on special occasion, visual presentations, such as movies, sound slides, photo projection and safety workshops, a device the Union is beginning to use.

Glenn Gross of Firestone Co. used the magic word when he stressed the importance of listening to the other fellow, and getting his ideas. Cain was delighted to hand over the dollar prize.

John Kumpel AFL-CIO urged that material be presented in a clear, dignified, forceful and attention-compelling way. Mobile displays and message tapes were suggested. Cain reported briefly a contest that ended in the low man serving as valet for the winner at the Congress.

Kumpel said the URW has a film library in great demand. He commended the film, "It's In The Cards." It was noted that the National Safety Council is a good source of safety films. Among other visual aids to communications, Cross uses a 16 mm camera and makes his own films; some plants are using Polaroid cameras, equipped to deliver slides; Dale Knox of Dayton Rubber, uses a display of safety shoes that have saved toes.

Some plants hold meetings on company time; others have special arrangements. J. M. Papp, of Goodrich, suggests that at *any meeting, you will learn more by listening* while the men talk. Cain noted that an intentional error checks on whether or not a report has been read. Cain also recommended that symbols used in a report be explained, in case the message doesn't get through.

Cain stressed the importance of a plan for use to combat rumors, in case of disaster. Public relation is extremely important.

Cain read off a number of ideas represented by various displays and recommended we look over the NSC exhibits for more. Although ideas were still coming in, time ran out and Cain closed with the point that "what we do is more important than what we say" when we are trying to communicate with people, and that one of the best things to do is—listen to the other fellow.

THE HUMAN FACTORS IN SAFETY

by ROBERT L. CRANE

manager, Supervisional Training, The Goodyear Tire & Rubber co., Akron, Ohio

Goodyear Tire and Rubber company emphasizes safety through programs in supervisional training conferences, and the safety department.

A program, entitled "The Human Factors in Safety," was presented to approximately 3,000 supervisors in 15 Goodyear plants. The program consisted of four, one-hour sessions and stressed the importance of supervisors' using good *human* relations in accident prevention. We have had programs on human relations, and many on safety. But this was the first attempt to tie them together in one program.

The three objectives in putting on the program were:

1. To help supervision recognize the types of behavior that frequently lead to accidents.
2. To help supervision analyze daily reports for accident prevention.
3. To emphasize that good human relations plays an important part in accident prevention.

We started the program with a review of the four foundations for good relations which we and a good many other companies have stressed in human relations programs:

- Let each person know how he is getting along.
- Give credit when due.
- Tell him in advance about changes that will affect him.
- Make the best use of each person's ability.

LEARN EMPLOYEES' PROGRESS

In session one, we concentrated on the first foundation. Let each person know how he is getting along—safety-wise. But first we must know how our people are doing safety-wise. There are two major sources of information that can help supervision *find out how their people are doing:*

1. REPORTS

The reports available to supervision are:

1. Foreman's reports of injury
2. Hospital or first aid reports
3. Attendance reports
4. Production reports
5. Quality reports

In our sessions we discussed how each of these reports can help us prevent accidents. For example, foreman's reports point out: accident repeaters, hazardous operations and violations of safety rules.

Attendance reports reveal conditions of health that lead to accidents, or that people are having difficulties at home. Production and quality reports may point out poor job conditions or personal problems of the employee. These reports can give us a lot of information *that will help us to build* a road to a better safety record.

2. BEHAVIOR

However, reports are not the entire answer to accident prevention. The other source of information is the behavior of our people. There are seven types of behavior which are accident hazards:

1. Anger
2. Indifference
3. Confusion
4. Fatigue
5. Carelessness
6. Daydreaming
7. Worry

We ended the first session with a discussion of what action can be taken when these types of behavior are observed.

Session two was devoted to the 16 safety rules of our company, because to let a person know he is breaking a safety rule we ourselves must know what the rules are.

To give credit to our people for following the safety rules we must know what the rules are. So we attempted to get our supervision thoroughly familiar with the rules.

We used this technique: We picked the key word out of each safety rule and put it on a three by five inch card. One safety

rule says *not to use air hoses to blow off our clothes,* so we put the words *air hose* on a card.

We distributed these 16 cards to the conferees, and in discussion asked "Who has the card that says "*air hose*?" when somebody raised his hand, we asked what the safety rule was about air hoses. Normally they came pretty close to the rule, and we discussed each rule and its importance. The conferees brought out many examples of accidents that happened because the rules were broken.

LOCKING-OUT RULE

Session three was devoted to one of the safety rules: "The zone engineer or engineering supervisor is responsible for properly safeguarding against dangerous conditions developing during the progress of a repair job." The area of safeguarding machines from being started when being repaired is potentially very dangerous.

In our company some machines are quite large, extending three to five stories high. It would be easy for a worker to start such a machine when someone was working on it, if proper precautions weren't taken.

To drive home the necessity for "locking out" a machine *every* time it is worked on, we showed a film, "It's in the Cards," produced by the Abitibi Paper co. of Canada. In our conferences we asked the conferees to note the behavior of the people to see if they could pick any of the seven types we discussed in session one.

We concluded the session agreeing that it is important to observe the behavior of our people to prevent accidents.

PERSONAL TRAITS EMPHASIZED

In our last session, we discussed how people are both different and alike. Sometimes we overlook that people are so different, one from the other. To demonstrate this the conferees participated in a little experiment. We gave them a number and asked them to double the number and then re-double as far as they could go in 60 seconds.

After the minute was up, we read correct answers and asked them to mark on their paper how many times they had doubled the number correctly. In every class there was a terrific range from a low of two or three times up to 20 or 21 times. It was pointed out that this large range of differences was true in any group of people for any ability trait or characteristic.

We discussed the people who would most likely cause problems, and concluded that most problems would come from those at either extreme of the range. Then we said that although every one is different, there are distinct and similar types of personalities.

Five of the common types of personality that can cause difficulties are:

1. The fellow who is sloppy
2. The tough guy
3. The show off
4. The loud mouth
5. The practical joker

The ***sloppy man*** is frequently lazy, leaves things lying around. *The tough guy* thinks safety is for sissies. He's the fellow who runs the machine with the guard off. He's much too tough to get hurt! The *show off* is interested in calling attention to himself. He will take chances to get people to notice him. The *loud mouth* attracts attention to himself by telling others how to do their job. He's the authority on everything. The last one, the *practical joker* can give us a pretty rough time.

The problem is not how to recognize them but how to handle them. The session ended with a summary of the four sessions and the four foundations for good relations. Any house of safety would have to be built on these four foundations:

1. To let each person know how he is getting along, supervisors must know the accident, hospital, attendance, production and quality reports with an understanding through observation of the behavior of our people.

2. To give credit when due, supervisors should have an attitude of fairness and sincerity.

3. To tell people in advance about things that will affect them "safety wise" they must know the safety rules.

4. To make the best use of each person's ability they need skill in leadership remembering that everybody's different and recognizing that people must be treated as individuals.

These are the foundations upon which any house of safety must be built.

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE HOME SAFETY CONFERENCE

This volume is a record of the sessions held at the 1957 National Safety Congress by the Home Safety Conference. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Conference carries on in behalf of its members, and for the benefit of accident prevention work in the home. The Conference gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of the home.

The activities of the Conference are under the direction of its executive committee, the members of which are listed at the close of this volume.

HOW TO INTEREST PEOPLE IN WHAT THEY DON'T WANT TO KNOW

REMARKS OF FAIRFAX M. CONE

chairman, Executive committee, Foote, Cone & Belding, Chicago

I know almost nothing about the organization of your work for safety. I can only talk to you a little but out of a fairly long experience in selling, and most of this through advertising.

But it just may be that advertising, properly planned—with the right appeals, and done according to certain standards, can be important in reaching certain objectives.

The thing here, as everywhere, of course, is how advertising is used. For advertising without a plan is no better in most cases than no advertising at all. I am not at all sure that advertising of the means and the rewards of safety—in any of its areas of interest, can ever be wholly planned.

There may simply be too many well-meaning people and dedicated organizations at work in the field—each going his own way or its own way, to make possible the unified planning that makes good advertising effective.

On the other hand, advertising may be helpful. For advertising is one of *our* most powerful means of communication. And it is our only controllable one. It is the only one where you or I can say what we want to say, when and where we want to say it—without change and without interference. The great problem is to make advertising, in cases like this one, a part of a plan. When you can, few means are more productive.

PLAN ADVERTISING

Over a long period of years, ever since I was a little boy, the press and the periodical press, and later the radio—and, still later, television, and pastors and priests and rabbis, all worked at the problem of voting. And all that happened was: the percentage of eligible voters who went to the polls declined —steadily and drastically.

The best selfish reasons that could be presented were of no avail. The trouble was that there actually were too many arguments. No one could hear any of them, or see any of them, because of the din of the sounds and the confusion of all of them.

There was nothing wrong with those arguments; in fact, they were very good ones. But no *one* stood out. There was no voice of authority; no single command. And I think this is a little bit like our current campaigning, for instance, for traffic safety.

It needs not more money to be spent or more people to be interested in it; but only more planning.

This is what happened to getting out the vote.

One simple idea—"See you at the polls," became the slogan and the selling idea for everyone who was interested: radio, television, press and pulpit, and millions of school children working on their mothers and fathers—did it.

CAMPAIGN GOT VOTERS

A single campaign turned the tide; voting increased everywhere in the country in 1952. A repeat of that campaign, that single theme, further increased the vote in 1956.

Now, I certainly cannot tell you what the theme of an advertising campaign for traffic safety should be; or how much or what kind of an organization would be required to successfully back it up. But I can tell you that various efforts under a variety of auspices at varying levels of intensity are not the best way to sell anything.

There are right ways and there are wrong ways and, in between there are indifferent ways. What is worst of all are the misguided ways; and these, more often than not are the uneducated ways; the amateur ways.

The men and women of the National Safety Council are professionals. I think they can do no better as a starter than to try to rule out the amateurs.

Sticking to traffic, as an example, I would hope that you could regulate signs and no-

tices, and establish professional standards. Here are two examples of what I mean.

Anyone who has driven on Chicago's Outer Drive has seen what is surely one of the most oversigned roadways in the world. Almost every lamp post carries some kind of message. Highway numbers are easily confused with speed limit signs. And almost every overpass is decorated with highly embellished warnings to drive carefully.

So highly embellished are these, with so many different messages, in so many kinds and sizes of type, that to read them surely must create a traffic hazard in itself.

SIGNS CAN BE HAZARDS

Every time I see one of these I am reminded of another traffic safety sign that I saw on a narrow, twisting road in Sonoma county, California, between Petaluma and Rio Nido, on the Russian River. This was on the back of a billboard structure that faced north.

Coming from the south I saw a line of white letters on the dark back of the structure, letters about five inches high, and when I got right even with them, peering across the road, I was just able to read—in the face of oncoming traffic:

"Drive safely, the life you save
may be your own!"

I have no doubt of the good intentions of the man who painted those words on the back of that billboard structure. But I also have no doubt that the result could be awful.

Incidentally, on that same drive, crossing the Golden Gate Bridge from San Francisco to Marin County, I saw what I believe is an example of very good signing. There are exactly three signs on that span; three each way, that is.

—One large one posts the speed limit.
—One medium-size one marks the county line.
—One other large one says: stay alert.

And there isn't any picture to distract you from the words.

Let me say again that I don't know whether any standardization is possible, either in the design of highway signs or in their wording.

But if there could be generally (much as there is beginning to be on the toll roads) the results would be startling. They could have some of the effect there that consistent advertising has for products and services whose worth is nothing compared to human lives.

I believe the same kind of planning of factory and plant signs—and perhaps even home safety instructions, backing up your best educational efforts would be no less effective.

STANDARDIZE ADS

The thing is to standardize—on professional standards.

I can give you no better example of what this may mean than the campaigning against forest fires since 1941. My own company happens to have made the very first outdoor posters with Smokey Bear. We also made the school posters, the radio warnings and the television films.

And we've made them to a single standard, for a single integrated plan, mapped out with the forest service of the U. S. Department of the Interior.

Last month I heard Richard E. McArdle, chief of the U. S. Forest Service, tell the story of results. Up to 1942 the number of forest fires was increasing rapidly. Then there was a sharp decrease. During the war years there were many fewer people in the forests. However, at the end of the war there began a greatly stepped-up activity—more visitors, more timber-cutting, more land-clearing and road-building; and the number of fires increased sharply.

SMOKEY CUT FIRES

Now the Forest Fire Prevention campaign took hold. Approximately 350,000 fires a year were expected at the time and there were less than half of that number. In 1942 fires blackened 30 million acres of forest land. By 1956 this figure was down to six million.

During the 15-year period of this campaign, McArdle said there was a total of 600,000 fires expected that did not start. There were 260 million acres of forest land that did not burn according to schedule; and there was 10 billion dollars of forecast damage that did not occur.

The timber and water and wild life saved and soil preserved passes any possible dollar estimate. This was the savings through the kind of planned warnings and planned national campaign that I hope may some day be yours.

REMARKS OF PIERRE MARTINEAU

manager, Research & Presentation Division, Chicago Tribune, Chicago

One of the most battered cliches in the world of the social sciences is "the individual as a whole." Educators talk of "teaching the *whole* child"; psychologists mention the "personality as a *whole*"; and sociologists stress "the relationship of groups to the *whole* person."

In talking about the individual as a *whole*, however, the exigencies of language force us to talk of sections of the personality—we speak of "knowledge," "information," "interests," "needs," "predispositions," "beliefs" and "attitudes." As men have sought to understand personality and the reasons why other men behave the way that they do, there has been a compartmentalization due to these words—an isolation of "factors of the mind."

TERMS ARE THEORETICAL

To be sure, writers always add a preface or foreword that states something about the dynamic interaction of various factors, but when the chips are down, the conversation usually turns to a description of how a particular "belief" or attitude," by itself, influences what somebody or some group does.

Just as there is no such thing as an ego, so too is there no such thing as a need. All our terms are only theoretical guesses about what exists within the churning mass of a man's brain. We shuffle explanations and regroup hunches; we alter relationships and construct systems of behavior that we think does a better job of explanation.

But we always have to remember that there is no surety that we are correct. The responsible social scientist is always sensitive that it is a dull knife with which he is cutting the pie of personality and the explanation of behavior.

The great contribution of Freud to the social sciences was that he sharpened the knife, and by so doing, changed the distribution of slices. But many of Freud's followers have been overly rigid in their view of behavior—just as the more "scientific" camp has been overly rigid in so precisely looking at factors that they have forgotten where the factors came from.

CONSIDER THOUGHTS, BEHAVIOR

I suggest that we take the largest possible overview of behavior. Men's thoughts and their behavior—and change in their thoughts and behavior—have two major influences on them. The first of these is what the individual man wants to do. At the simplest level, when he gets hungry, he wants to eat—no nonsense about it. But every time a man is hungry, he doesn't eat. And when he doesn't eat, it is because of the way that he sees the world around him.

A man having a job interview doesn't pull a candy bar from his pocket in the middle of the interview—even though his stomach may be growling away; it isn't the thing to do at this time or in this place. The world outside the individual brings pressures to bear on him—pressures that modify what he can do, the ways he can do it, and when he can do it.

If we want to change behavior—that is, to influence people to do something they are not doing, and to tell them things their ears are closed to—we should try to understand how the two considerations of individual wants and group pressures relate to each other.

INTERPRETING COMMUNICATION

Take a common piece of behavior and communication—a friendly face to face conversation. Going into the conversation, each member already has ideas about the other—his habits of speech, his status position and power, an evaluation of him as a man.

When A says to B "nice job you did," B immediately interprets the message. Is he really giving out congratulations, is he being patronizing, or is he saying "It's about time you did something good"? The past experience of the two men will give the listener the cues to interpret the message.

A's meaning may be greatly distorted, but it is the interpreted meaning that B will act on—not the intended meaning. With the interpreted meaning now serving as the "motivator to action"—the listener will come up with a reply. He might say to himself "of course," or "Thank goodness" but this will not be his reply. Just as the message

was altered in meaning, so too will the reply be altered.

If A was president of the firm, the answer might be "thank you, oh sir." If A is a mailboy, the reply might be an impatient nod. The output will be modified and distorted just as the input was. The *effect* of behaving the way that you *want* to behave to the answer will be weighed, and your reply will depend at least on these two levels of interpretation.

This is a theoretical example of a situation in the smallest possible group. Let's look now at an experiment which shows the same skeleton form of behavior in a larger group and with a message that had little appeal to the audience.

GROUP BEHAVIOR

During World War II, there was a strong movement urging housewives to serve cheaper cuts of meat. For the most part, the early parts of this campaign were a flop; housewives did not want to, and did not serve kidneys and beef hearts—these foods did not fit into their image of the good housewife. In order to convince housewives—to tell them something they didn't want to know or do, a social psychologist experimented with two different approaches to selling the idea of serving sweetbreads, kidneys and beefhearts.

With one group, he had an authority—a sweet, motherly home economist—lecture a group of housewives about all the advantages of these foods. The economy, the nutrition, savory methods of preparation, and the contribution to the defense effort were all mentioned. This home economist talked, and the housewives listened. The end result was that 4 per cent of the housewives served the foods that they were informed about in a convivial lecture.

DISCUSSION GROUP EFFECTIVE

Another group, very similar to the first, had the same information presented to them —price, economy and so on. But the technique was to give them a short talk first and then a discussion period about how husbands would react to the foods, cooking odors, and any other questions that the housewives felt were important.

This group—the discussion group— had *eight times* as many housewives go out and serve the food to their families as the group that was just told about all the benefits of sweetbreads.

The information communicated was the same in both cases—the knowledge that the women had was the same—but this startling difference came about. The explanation that has been given centers about the interpretation that the housewife gave to the *results* of serving the food. No matter how "right" she felt serving brains, or how "good" it *would be for her family*, the basic consideration was the acceptance of the food by the family.

In the group discussion situation, the sharing of the problem with other housewives showed up the individual housewife's concern—and the group gave her the confidence that she would not look worse in her family's eyes for serving the food; at *least, she would be no worse off than other* women in her same position.

The same man, Kurt Lewin, showed that the same results could be obtained with as important an area as a mother's wish to take good care of her child. The value of serving orange juice to infants was presented in the same two methods and the same findings occurred. Those who just *heard* about how good orange juice was for babies did little about it; those who discussed serving orange juice actually did do something—they were positively influenced to serve orange juice to their children.

FEAR MOTIVATES SAFETY

These are both examples of how relating the knowledge to a group situation activated *the knowledge—made it a stimulus to* behavior instead of idle thought. Information alone never sells a thing—information must have with it a catalyst that will produce action, which, directly or indirectly, is the goal of most communication.

Safety is centered around fear; we don't take safety measures because there is some inherent value in being safe; we are safe because we are afraid of being hurt or hurting others.

Advertising and promotion in prior safety campaigns have played on the fear element and "you can't afford not to be" has been an outstanding example of this.

Fear is a necessary part in the selling of safety ideas, but to be effective, the proper

amount of fear has to be injected into the communication process. If there is too much fear, the listener will be repelled by the whole business. If there is negligible fear, he won't be disturbed enough to do something about the threat that you present to him.

To be most effective, the appeal must first arouse anxiety and then present a believable solution to the problem.

One of the major advantages of using fear is that it is an emotional *rather than* an intellectual or rational approach, and is thereby more powerful in stirring up feelings.

EMOTIONAL APPEAL BEST

Lewin's studies, and the experience of many advertisers, shows that information alone is not enough. The cancer threat in cigarettes has not harmed long term sales; in politics a study has shown that an emotional appeal produced a 15 per cent greater vote for a party than an identical appeal which was rationally based. Information is necessary, but it can never be relied on to carry singly the burden of influencing others.

A famous study in dental hygiene shows how the strong emotional approach of fear and various intensities of fear influence the receivers of a message.

The same dental health information was presented to three different groups. The first group was given a strong fear approach —the showing of gory pictures, dire threats and the like. The second group was given a more moderate dose of the same treatment. The third group was presented with material in a low fear setting. The result? The low fear group showed a 36 per cent improvement toward better hygiene, the moderate fear group a 22 per cent improvement, and the appeal in a powerful fear setting produced an 8 per cent improvement. Four times as much success with the low fear approach as the high fear approach.

But this was not all. The three groups were followed up and all were exposed to information that belied everything they had been told about dental hygiene. Despite this contrary evidence, the low fear group still believed what they had been told first. But, the moderate and high fear groups switched their allegiances to the last message.

Thus, in terms of both long and short term results from the message, the low fear setting was far superior to the other two treatments. Powerful tool that it is, fear cannot be used indiscriminately.

COMBINE GROUP, FEAR FACTORS

Both the group and fear can be effectively united in a campaign to further safety. We know that fear is powerful if used properly, and we know from observation how important others are to an individual's ideas about safety.

Consider a man driving. It is quite likely that if his wife and children are with him, he will be more careful—and not just because of the wife's nagging. He may be devil-may-care and ignore the skull and crossbones signs, when he is alone, but the presence of his family forces him into a responsible role.

To some degree, all of us have a sense of "personal invulnerability." But the sense that nothing is going to happen to me—the sense that makes for carelessness and accidents—can be short-circuited by arousing the important image of the family.

Now, this won't be easy. The home particularly is a haven from the struggles of the world—a safe place to retire to at the end of the day. If too strong a campaign were used, the campaign ideas run headon into this idea of the comfortable retreat.

EXPLAIN JOB, HAZARDS

Better to state positively to the man his job—that of providing a safe place to live for his family. Shore up his confidence in *this*. Then inject a little fear by pointing out the common accidents in the home and on the road.

After he is slightly concerned, offer solutions that will eliminate the concern. The safest (psychologically) of all places—the home—can be made even more safe.

The feeling of safety can be sold at the same time that responsibility can be sold. The *individual is reached on two levels*— his own personal, and individual state of well being and his job to the group, his family.

It is more difficult to communicate via one of the mass media than it is on a face to face basis. But practical considerations force us to think in terms of the mass media.

SELECT RIGHT MEDIA

Use media that have high prestige. It has been found that a message gains a great deal from the "ruboff" or association with the media in which it appears. To increase believability and impact in your message, a solid and serious television show would be better than situation comedy; the major newspaper in a city would probably be good, as would be association with a high status commentator—say Edward R. Murrow.

There is a greater risk in television than in other media of arousing too great a fear. Go soft on the more blatant results of carelessness; imply them, but don't show a distorted man hanging from a car.

The running media of radio and television can offer a good deal in sequential development of the "fear then resolution" idea. The print media (magazines and newspapers) can give more weight to your message by nature of the public's perception of them. The broadcast media are primarily light; the print media are primarily heavy.

Basic to every man is his allegiance to himself and to his group (be it family or friends or community). The most successful communications will be those that play on both allegiances; communications that offer to the man as individual greater happiness and to the man as group member a more adequate filling of his responsibility.

REMARKS OF VICTOR M. RATNER

vice-president, Benton & Bowles, New York city

Let's start with some specific questions, for example: "Is it possible to interest people in what they don't want to know?" Or:

"In order of importance, which of the following have the greatest positive reaction, from the standpoint of safety precautions: pictures, the written word, the spoken word or personal experience?"

And just one more, of the many questions received: "Are mass media effective in influencing a change in people's habits, to the same degree as in the purchase of something which gives immediate satisfaction?"

"Is it possible to interest people in something they don't want to know?" The answer is "*Yes*"—in almost every case.

"What creates the greatest positive reaction . . .?" I would place "personal experience" and "face-to-face" communication so far ahead of the "written word" and "pictures" as to put them into separate categories.

Furthermore, I would suggest that—in such a complex area as safety precautions—you cannot begin to move people very much or very far with the "written word" and "pictures" alone, unless these are somehow used *together with* "personal experience" and "face-to-face" speech.

As for our third question: "Are mass media as effective in changing people's habits, as they seem to be in getting people to buy specific merchandise . . .", my answer, here, would be a large and flat "*No.*"

EVERYONE WANTS TO KNOW

These may guide us toward answering almost any question. Let's look, then, at the first question again: "Can we really interest people in anything they don't want to know?"

If we stopped at that, the answer, of course, would be that we cannot. But this needn't be discouraging. For Aristotle pointed out, a long time ago, that *"all men have the desire to know"*—and this is true, even if it be only a desire to know who is going to win next Saturday's football game.

Certainly, every normal human being *is* interested in many things. Certainly, he is interested in himself and in his family. And just as certainly, the real question you face is, "How can I best relate what *I* want to say to something he is already interested in?"

If you can, you can reach him, and you can teach him. But you must realize that this is a two-step process. You must first take the trouble to interest your man. And then, you do your teaching.

Putting this another way—one of the axioms of effective communication says that: "You must start with where your audience is, not with where you are." And surely, anyone you are trying to reach has some interest, some need, some desire, to which you can relate yourself and your message; something in which he is interested, rather than something in which you are interested.

RELATE TO NEEDS

You must find this need or desire, and use it to anchor an emotional or intellectual "bridge" between you and your audience. You then send your message to them over this "bridge." If you don't, it's as though you are shouting from bank to bank across a wide river. This is fundamental to all teaching and all selling, whether you're selling a man a new house, a new car, a new hat . . . or a new idea.

The basic act of selling is to try to relate something to someone else's need or desire. You must make him feel that this something will serve one of his needs or desires—or why should he buy what you have to sell, whether it be "better schools" for his community, or a brand of beer, or even the Brooklyn Bridge?

You see, I am not discussing the morality of selling but the act of selling. Until you *have figured out what need or desire* you can serve in someone else—and until you state it convincing to him—you cannot begin to sell a person, or even interest him, in anything.

This reminds me of something I once said while discussing a curious prejudice about the power of advertising. Oddly enough, it is a prejudice in favor of advertising, in the minds of its friends, and simultaneously, a prejudice against advertising, in the minds of its critics. It is the often-repeated claim that *"advertising creates desires."* Or, stated negatively, *"advertising makes people buy things they don't want."*

ADS DON'T CREATE

I think both the friends and critics of advertising are repeating a myth which has no substantiating data behind it. They have only hunches and opinions about it.

Advertising, I am convinced, cannot create a desire. It can only capitalize on an existing one. Thus, advertising which sold orange juice to mothers, derived its inherent power out of the desires mothers have to feed their children well. That desire was there, long before advertising or orange juice.

Such advertising told mothers about a new and healthier way to feed their children—a useful educational function, but not the creation of desire.

Does anyone think advertising "creates the desire" in women to look more beautiful or to wear new clothes?

This is something which started, I believe, in the Garden of Eden. And I refuse to think of the serpent there, as the first advertising man!

It's much the same with automobiles and washing machines, and even beer. People have basic desires for such things. That's the only reason advertising can help to sell them.

Similarly, you must effectively relate the important story you have to tell to some *basic desire* of people—in their terms, not your terms—and then you can hope to move them.

But let's try to get even more fundamental than this, in analyzing just what it is your communications must try to do. Where do you start, when you're planning any type of communication? If you want it to be effective, you must begin (either consciously or unconsciously) with a full realization of the fact that all communication has something very like the structure of a sentence.

ELEMENTS OF COMMUNICATION

A sentence, as you know, always has a subject, a verb, and an object.

And the meaning of each of these influences and modifies the meaning of the others; and of the sentence as a whole. Therefore, even a slight change in any one of these can make quite a drastic change in the meaning of the sentence.

Consider, for example, a sentence as simple as "John loves Mary." You could probably write a whole novel about changing just one word here: "John loves Sally." You see, Mary is John's wife. And Sally is her sister! Or change it to: "Jim loves Mary."

The confusion is compounded. Jim is Sally's husband! You see how intimate the relation between the subject and object can be? What does this suggest about "communication"? Well, like every sentence,

every communication has three elements—each of which determines the meaning and values of the other two.

There is a subject—which is the "content" of your communication, what it is you want to say.

There is the "form" in which you say it—how you express and transmit the "content," which includes both the medium and the words you use.

And then there is your "audience"—the object of your communication.

RELATE THE ELEMENTS

Obviously, until all three of these—"content," "form" and "audience"—are carefully and successfully related to each other, your communication is not likely to have the result you want it to have.

What you have to say must be properly and precisely related to your "audience."

How you say it must be properly and precisely related to both your "content" and your "audience."

When these three are not effectively related the communications fail tragically short of communicating. It is here, I think, that we find the fundamental differences between an amateur communicator and a good professional communicator.

The amateur is generally in love with his message. He tells it in his own way, in media of his personal preference. He is known as "message-oriented." He feels that what he has to say is so fascinating and important that everyone will drop everything to listen to it and absorb it. Your children are such amateur communicators.

The professional communicator, on the other hand, tends to be as much "audience-oriented" as "message-oriented." He is always conscious of whom he is trying to reach, of how that person thinks and feels, and he directs his efforts, shapes his message and his media as best he can to fit his audience.

To do this, he must start with his audience in mind. That, I think, is where all persuasive communication must start. You, too, can start with rather precise definitions of just whom you can realistically expect to reach. This is never the "many" people you would like to reach. It should be, rather, the "few" people you can really hope to reach.

AIM FOR SMALL AUDIENCE

I would earnestly suggest that, in your communication efforts, you aim for a small success rather than for a glorious failure. The small success will be hard enough to come by!

To do this, you should start with defining some small audience on whom you can hope to make a significant impact. The smaller the better! For, then, you can more specifically define your audience and its interests. You can learn, or guess, what is particular to these people—and you can then relate your message to their particular feelings, rather than your own.

This brings us to the question of the best media for reaching them—and here you run into all sorts of myths and fantasies about our modern communication media.

What I am about to say, now, may sound unorthodox to some of you. And it may sound paradoxical, coming from the vice-president of a large New York advertising agency, who also spent 14 years working for a major network.

All I can say is that I am serious; and that I am prepared to debate the validity of my observations until all our citizens really learn how to avoid having accidents at home.

Our mass media—our so-called "major media of communication"—are relatively minor media, when it comes to moving serious ideas into the heads of people.

They have, I believe, only a secondary role to play in helping you with your problems; and it is important that you do not divert too much of your limited resources, chasing after these media. They are not the first or second or even third media you should think of, to reach people, and to teach them serious things for their own good.

PURPOSES OF MEDIA

The basic reason I say this can be summed up very simply. Our mass media are busily at work doing three different things:

They move entertainment.

They move merchandise.

They move ideas.

I place them in that order because this is the order in which we are successful with them.

Our mass media are most effective, today, in distributing entertainment across the nation; whether in the form of popular programs on the air, or by comic-strips in the newspapers—the most widely-read features of any newspaper.

They are next most effective in moving merchandise into people's heads and homes. And our mass media, in themselves, are least effective in moving serious ideas to the public. The evidence for this is overwhelming.

This should not suggest to you I am criticizing our mass media. I am not. Like everything else, they are designed to do some jobs very much better than others.

We will not try to examine the reasons why I am sure that mass media are intrinsically weak media for moving serious ideas into people's heads, deeply enough to change people's behavior.

PERSONAL CONTACT BETTER

While they have a role to play, in this area, it is a secondary role, not a primary one. And it will be far more useful to you to direct your attention to what really is your primary medium for the work you want to do.

It happens to be the most powerful and most effective communication medium at anyone's disposal. If I were to try to wrap it all up into one phrase, it would be:

Face-to-face communication

All of you live and work in communities. You all live locally. Because you live and work in communities, you can all participate in, create and further "community action" programs of one sort or another.

In these, you can all use "face-to-face communications," with small groups of people, who are gathered together in one room, where they can see and hear each other talk.

The only hope of moving serious ideas into people's heads effectively, is for us to set aside the seduction of our modern, technologically-advanced, mechanical media—and to refocus our attention on the basic, old-fashioned methods of "face-to-face communication." This is still the only way most people get most of the ideas which move them!

Therefore, my basic recommendation is this:

- If you really want to teach people something, you cannot take "short-cuts" in doing so. The results we get from the "short-cuts" don't seem to warrant the time, effort and expense we put into them.
- If you want to take your efforts seriously, you must figure out ways to communicate with people in small groups, where there is a "live" discussion, among people gathered together in one room.

I know you can only reach a relatively few people this way, compared to the thousands and the millions you think you might reach by television or newspapers or magazines. And I know it is very difficult to develop such programs, and that they have little glamour about them.

It would, indeed, be nice if we could take the "short-cuts" to reaching lots of people, in lots of places, all at the same time. But even if you could get enough time and space in the mass media, beyond your wildest dreams, there is really no good evidence I have ever seen that such "short-cuts" to the people would work for you.

THE NEED FOR RESEARCH IN HOME ACCIDENT PREVENTION

REMARKS OF FAY M. HEMPHILL

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Many constructions and connotations might be attached to this topic. As long as 28,000 deaths a year in the United States are attributed to accidental circumstances which terminate in home injuries, there is need for research in the prevention of home accidents. Therefore, rather than discuss an obvious topic, I will present the needs which must be filled to have fruitful rewards from research in this domain.

I shall use the word *research* as defined in the dictionary, that is "studious inquiry or examination, critical and exhaustive investigation or experimentation having for its aim the discovery of new facts and their correct interpretation."

MUST DEFINE TERMS

The word *survey* will be used in its dictionary context also, namely "to take a general or comprehensive view of" or "to view in detail." I will use the words *studies* and *investigations* when I wish to refer to surveys and/or research and thus to generalize.

Clearly the mere enumeration of items and/or events does not constitute research; a survey may have objectives but rarely, if ever, does this objective deal with the test of an hypothesis. Experiments traditionally test hypotheses. I point out these concepts to call attention to the necessity for clear and concise terminology in any discussion of the needs for research.

The needs for research in preventing home accidents are not basically different from those for research in any other field. The problems of research in accident prevention are not as complex as those of nuclear physics or in making a vaccine against poliomyelitis. Only a few years ago the suggestion of releasing the energy of the atom was considered an impracticability and only five years ago there was little real hope of producing an effective vaccine against polio.

While both accomplishments have occurred through research efforts, each resulted from compilations of many items, experiments, survey efforts and observations. Within a general frame of reference, the needs for research fall under the following four categories:

1. A framework of terms, definitions, and concepts within which hypotheses and objectives may be developed.
2. A background of observations and experience from which opportunities for research may be fabricated.
3. Persons skilled in techniques and methods of research and motivated to organize and administer these skills.
4. An environment conducive to pursuing research activities, encompassing physical facilities, equipment, and financial support for continuing investigations.

This is only an attempt to suggest the needs which must be met for success in research. These suggestions are neither meant to be exhaustive nor detailed. The details must be spelled out by research persons.

NEED SPECIFIC CONCEPTS

Until quite recently there was no coordinated effort to develop a framework of definitions and specific concepts in accident prevention. However, there were satisfactory definitions and concepts of injury. The Committee on Standard Nomenclature for Home Accident Prevention prepared its first report on definitions and terms which should be helpful.

Definitions and specified concepts are prerequisites to any organized research or survey work, specific hypotheses being essential to experimentation and definitive objectives mandatory in planning surveys. Essentially, basic definitions and statements of underlying concepts must be established before studying a science.

Passing on to the background of observations and experience in accident prevention from which research undertakings may be fabricated, one is amazed at the quantities of data on injuries and at the paucity of compilations dealing with accident circumstances and conditions. This is not amazing in view of the lack of definition and specific language applicable to investigations of accidental occurrences.

I do not intend to belittle the enormous amount of background work accumulated, but relatively little benefit will accrue from these to investigators who try to understand events associated with accidental occurrences. Much can be accomplished in such compilations through studies and surveys before those specifically planned steps are taken and can be dignified by the term *research*. There are so few persons skilled in the exacting methodology of research or sufficiently motivated to investigate home accident prevention that all one can do at this time is decry the dilemma. Furthermore, I am not optimistic that this situation will be improved in the near future.

MUST MOTIVATE RESEARCHERS

Professional researchers are not and have not been attracted to accident prevention. I doubt if they will be until the terminology is specific and some gallant, brave surveys have been completed. All the attempts at describing the loss of life, human suffering and destruction of property through accidents has not motivated research in accident prevention.

Researchers are motivated by demonstrating procedures and devices used for measuring, calibrating or evaluating observations or other manifestations, usually in understandable objective units. Professional researchers are not convinced that there is a well defined area of research in home accident prevention or, to go all-out, in any other field of accident prevention. Relatively few research undertakings are found in the field of injury prevention. However, progress along these lines is showing a modest spurt in recent years and there is some reason for cautious optimism in this domain.

CONDUCIVE ENVIRONMENT

The fourth requirement for research is that of an environment conducive to the researcher. Certainly if there be concurrence with the opinions I have expressed on the previous three phases of research in prevention of home accidents, there is no reason to suppose that there currently exists such a situation. However, when and if such a situation is demanded, an imaginative and dynamic administrative leadership will be needed.

In addition, sufficient and continuing sources of economic support must exist for researchers to settle to their exacting tasks with confidence. Thus they may be assured their struggles will not be unduly drenched in administrative restraints, will be guaranteed opportunity for continuity of effort and equipped with sufficient facilities, equipment and supplies to pursue the steps involved.

These are my own biased opinions of the needs to be met for profitable results from research in home accident prevention, and my evaluation of where we now stand in fulfilling these needs. Let me assure you I consider my experiences on which I base these evaluations quite limited.

Furthermore, even though I may sound pessimistic in evaluating where we now stand, I am quite optimistic that these situations can and are being improved, and that great gains will be made in the future. I believe that gains toward this goal will be made in step-wise progression and that "Heaven is not reached at a single bound . . ." but that "We build a ladder by which we rise from the lowly earth to the vaulted skies."

I have ventured my description of the "lowly earth" on which I now believe we are with respect to research toward accident prevention, and I have depicted my opinion of the framework of the ladder by which we might rise. Let's look upward, build, and climb!

REMARKS OF ALBERT P. ISKRANT

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Research into the causes of accidental injuries is one of the most vital needs in public health today. We talk about the 90,000 deaths from accidents each year, the increasing proportion of deaths due to accidents and the fact that from ages one to 35, accidents are the leading cause of death.

We talk about the "epidemiologic approach," about "accident proneness," about emotional factors accounting for 80 per cent of accidents and about the medical aspects of accident prevention. We talk of the 28,000 deaths, the 800,000 lost man years of life, the four million injuries and the almost billion dollars cost resulting from home accidents. We recognize in a vague kind of way that the home accident is the leading cause of death of young children, and so we talk of slippery rugs and insecure ladders, and we decide to do a survey.

We organize the commuity, do a survey, and it is forgotten before the results are known. There is nothing wrong with a survey; it is an excellent method for determining the extent and nature of the problem. All praise is due to the Kellogg Foundation or the National Safety Council or the health departments and others that struggled so manfully in uncharted waters. Also the work of the national office of Vital Statistics and the Vital Statistics Bureaus of the 14 states that cooperated in the preparation of special forms for data on deaths from home accidents—all this deserves mention. Much invaluable data are contained in the report of this cooperative effort.

If we wish to apply to home accidents the same epidemiologic methods we used in combating the communicable disease we shall have to extend our efforts beyond the "survey." Tabulations regarding the who, when, and where of home accident injuries and deaths help identify problem areas and the need for control measures, but they *do not* provide solutions or identify causal relationships.

RESEARCH PINPOINTS PROBLEMS

Much research has been done in the field of home accidents, especially in children. In poisoning, in particular, a great deal of practical knowledge has been obtained. And the subject of "accident proneness," and the personality traits of accident repeaters, has been dealt with widely, though sporadically. But the findings don't "hang together," and there is no organized research expected to come to fruition within a definite time.

In spite of the repeated declarations that we must apply to home accidental injuries the same epidemiologic techniques used in determining the etiology and control measures for communicable diseases, we have not gone past the stage of the survey. If we really believe home accident injury, disability and death constitute the health problem, and that we need to know more about the circumstances surrounding them to develop preventive efforts, then it is high time we started a research program commensurate with the problem.

The immediate goal of a research program for home accident injury prevention is to identify and eliminate the basic causes to reduce accident frequency and/or severity, save human life and decrease disability.

Ordinarily we consider epidemiologic studies as being concerned with the host (person who has the accident), agent (physical, chemical, or biologic), the environment (physical, biologic or socio-economic), and their interaction. Hypotheses developed from studies should be tested by the most stringent statistical tests possible, and through controlled experiments whenever feasible. The team approach should be used in these epidemiologic studies to give the investigations the maximum talent available, and to exploit to the fullest the opportunities presented. Physicians, engineers, nurses, psychologists and investigators can all contribute. In addition to a statistician and clerical help, the composition of a team would depend on the type of investigation. Poisoning investigations of children take different talents from one of falls from ladders in young adult men.

ACCIDENT PRONENESS UNREVEALING

The subject of "accident proneness" should be explored. To date the term describes a series of personality traits not yet identified. Scattered studies have identified various traits which might be the product of the author's imagination, or his pet belief, or else traits found in most people. Characteristics suggested by epidemiologic studies should be subjected to the most vigorous tests under controlled conditions.

Apart from any inherent "accident proneness" which may exist in individuals, attitudes developed because of social or environmental forces affect human behavior and safety. Workers who are extremely careful on the job may be careless around the house. A person cautious around the house may drive like a lunatic. While many authors feel the key to the accident problem lies in this area, virtually nothing is known, although much is speculated. There is great need for developing and using methods of assessing attitudes, to identify those which predispose unsafe behavior, and to modify or change attitudes and behavior.

A particular problem in home accidents concerns older people, which account for more than half of the home accident deaths. We must convince older persons they are not as young as they used to be, and modify their behavior pattern for greater safety. Very young children must be protected against accidents, but older children, especially those attending school, must be instructed in safe behavior. More needs to be known about children's conception of, and attitudes toward accidents at each stage of their development to plan realistic safety instruction for different age groups.

EFFECTS ON ACCIDENT OCCURRENCE

Organic disease, impaired functions, and aging processes increase the accident potential of individuals, but their effect on accident occurrence is largely speculative. The extent people "compensate" for deficiencies is not known, and differences in exposure make comparisons difficult. When we find greater than expected prevalence of specific conditions among accidents, we must then compare the accident experience of a group of persons with the condition and a control group without the condition, matched on age, exposure, and other variables.

Because of the difficulty of selecting appropriate groups with particular conditions or defects, and following their accident experience, it may be more appropriate to give physical examinations to entire groups of persons, and then do follow-ups for accident experience. In this way many hypotheses could be tested in the same group of persons. Another approach would be through records of an organization which provides routine medical care and physical examinations. Here both the physical condition of participants and also all accidental injury experience needing medical attention would be known.

The prior or future incidence of accidental injuries in persons with particular defects or conditions can be compared with a control group. If the organization enrolls families, additional studies can be done on family accidental injury experience.

In considering the relationship of physical conditions to accidents, children's growth and development and their effect on their activities offer a very fertile field for developing realistic safety education for children of different ages.

SECONDARY PREVENTION

The term "secondary prevention" in the health field designates measures to minimize disability and death after the illness or infection occurs. To a large extent the first aid and medical care given to injured persons are important to determine whether the injury results in recovery, permanent disability, or death. Accident victims who are not killed immediately can best recover if they receive early and adequate first aid. Proper training in first aid is important but little is known about teaching methods or effectiveness. Present methods of teaching and administering first aid must be studied to be sure that first aid manuals include latest medical information. Medical treatment of injuries also must be continuously appraised and evaluated.

Accidents are a function of the hazards to which people are exposed and a function of peoples' way of living. Socio-economic and cultural patterns help determine the type of accidents people have. Children who accidentally ingest aspirin come from families where aspirin is accepted, probably in childhood medical care Poisoning from kerosene

ingestion obviously occurs in a different cultural pattern from poisoning from tranquilizers and barbiturates. There needs to be definite research into various cultural patterns and ways to motivate people to safer conduct.

MUST STUDY ENVIRONMENT

Epidemiologic research in the field of home accident injuries can not be limited to identifying susceptible individuals nor can they be removed from the environment after identification except by making them less susceptible. The role of the environment in its relation to the host must be studied for general and specific accidents. The contribution of various environmental factors to accidents may offer more immediate control measures than identification of "accident prone" personal characteristics.

For both the environment and the agent, research which identifies causes of specific accidents will produce "pay dirt" most quickly. For example, changing door locks on refrigerators, or removing doors from abandoned refrigerators, may be more immediately profitable than attempting to modify childhood behavior to keep children from entering refrigerators.

This does not mean that a wholesale program of research, such as one directed at housing design for maximum safety would not be a profitable undertaking. On the contrary the elimination and control of hazards by efficient planning design and construction of homes and installation of household appliances and equipment, is of highest priority. It is rather futile to tell householders about even treads or standard risers when they buy or rent houses already built. Research into the design of homes for maximum safety is a vital need, particularly in homes for the elderly.

The differences between the epidemiologic research we propose for home accidents and that ordinarily [illegible] is that the former case deals with a whole spectrum of events and causes. Each innovation brings new ways of injuring, maiming, and killing. The introduction of the tranquilizing drugs immediately presented new opportunities for childhood poisoning and other accidents; the rotary mower brought new opportunities for cutting off toes and putting out eyes.

We must carry out a two-edged research program—general and specific. The general approach is new in public health. To my knowledge, an epidemiologic investigation into "illness" as such has not been conducted although yellow fever, malaria, tuberculosis and syphilis have been studied, and the causative agents isolated. Cuts are not caused by a single agent, but rather by an ever-changing gamut of events, from slipped nailfiles to crashes of huge airliners. Anyone who has looked at the results of a home injury survey, or reviewed the certificates of deaths from accidents could see the almost infinite variety of accidents. Therefore, we must identify the common causes as well as the specific causes of accidents.

RESEARCH INCLUDES CAUSE, EFFECT

Our epidemiologic research will become more specific as sufficient numbers of accidents with common causes are identified. When we learn that power mowers are cutting off toes, we must proceed to try to do something about it. If children are being burned by falling in fires, we must introduce a program of fire-screens.

But all the time we must work toward the goal of identifying common causes—the effect of weather, climate, topography, training, education, personal factors, fatigue, drugs and alcohol and housing design. Otherwise we will just be plugging holes, while other holes appear as fast as the economy and technology advance. The *Daily Tribune* of Gallipolis, Ohio, wrote an editorial which illustrates my main point: "The number of serious accidents is appalling. Fractured skulls, broken limbs, mutilated faces, scalps and ears torn off, and spines crippled, are the daily record. And almost without exception every accident is the result of fast and reckless....." The year was 1897. The agent was the bicycle!

REMARKS OF FLOYD A. VAN ATTA

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One of the primary needs in accident prevention research is to know what we are really talking about. And I do not find it easy—or even possible to distinguish home accident prevention research from any other type of accident prevention research in this respect.

This necessity for knowing what you are talking about is simple and primary, but the human mind is so constituted that we make it complicated—almost all of us make every new question hopelessly complicated before we even start to look for an answer. One of our favorite ways of complicating matters beyond any hope of recognition is by means of our own sloppy speech and slovenly thinking. This is a very fundamental part of our problem.

One example which annoys me more than most, mainly because the habit of speech becomes or signals the habit of thought, is the almost universal trait of talking about accident rates when what are really under discussion are injury rates. There may be some a priori reason to assume that accident rates will follow a course parallel to that of injury rates. I do not know, nor do I know of any objective attempt to find out.

FIND INJURY CAUSES

Certainly there is no good reason for not finding out the causes of injuries and means for preventing them if possible. And in recent years we have made some progress in this direction. But let us do it in the knowledge that we are preventing injuries and not preventing accidents. We are accustomed to filling out an Accident Report on every disabling injury in industry and to collecting many of our home accident statistics from hospital records.

I am quite sure also that one of the things which has made the investigation of home accidents peculiarly uninviting to any research people who would not have been repelled by the general tone of accident prevention propaganda has been this same peculiarity of the basic data. It has generally been collected for clinical, for insurance, or for other purposes not necessarily related to accident prevention or even to injury prevention.

I once had a desire to find out something about the causes of window washing accidents. I set myself an easy task by looking for the ones which resulted in compensated injuries because there had to be a complete report on each of them in the custody of the compensation authorities. The Industrial Commissions of three of our larger industrial states were quite cooperative and in each of them I read the original "accident" reports on every reported injury of this type for three years.

NO CAUSAL INFORMATION

At the end of this rather tedious chore I had, in addition to sore eyes, a great deal of information on the nature, location and extent of the injuries; the clinical course of the patients; and the amounts of compensation and medical payments. The only thing which I lacked was any clue as to where to start to look for the causes of any of these accidents.

This is a specific example of a general condition. To look a little closer to home I might suggest a look at the rather famous "heart kitchen." I do not wish to suggest that the idea of the "heart kitchen" is not good or even that its practical effect has not been desirable, but I do wish to suggest that the whole thing was set up in the presence of a woefully inadequate amount of evidence.

The general idea is to save effort, and presumably strain on the heart, by saving steps and by saving stooping. It would seem logical before going into this project to determine in an objective manner what types of activity would demand the maximum metabolic price and, presumably, put the maximum strain on the ailing heart. A preliminary determination of the metabolic cost of a number of movements of this sort has since been made for quite another purpose and it turns out that the values are surprising, at least to me.

RESEARCH—CRITICAL STUDY

This brings me to a second general point, that research in general is not only a close

or intensive study of a phenomenon or substance. It is also a critical study. I have seen a Master's Degree thesis on the use of articles by Shakespeare. It certainly represented a close study of some parts of Shakespeare's writing but it was, in my estimation, about as much a research project as it would have been for the young man to have spent the same amount of time in counting his toes.

It established with an unspecified precision a series of numbers which were already known with an unspecified, although presumably lower, precision. I do not classify it as useless research; for all I know it may have some very practical application, and I think that it is generally both risky and unprofitable to comment on the practicality of any project.

I criticize only the fact that it is completely uncritical and, as a direct consequence, adds nothing to the sum of human knowledge. This is the fundamental difficulty with a great deal of what has frequently passed as research in home accident prevention. It has been more closely related to propaganda or education than to research.

RESEARCH—UNGLAMOROUS

It is an unfortunate fact that research is seldom glamorous and seldom spectacular—that is something which the press agents have thought up for the purpose of capturing the public's money for medical research to the probable detriment of the research.

Research is normally a process of isolating a part of a phenomenon small enough that you can begin to understand, or at least observe, the conditions which control that part. Having picked out the controlling conditions it is necessary only to arbitrarily vary each of them in turn while holding the others constant to arrive at an understanding of that particular system.

Sometimes we are lucky enough to be concerned with a relatively simple system—a rigid ball on a rigid plane perhaps—in which we can observe the significant conditions directly and unequivocally. In this instance any single ball from a universe of balls and any single plane from a universe of planes will tell us all that we require to set up a mathematical formulation of the system.

Sometimes the situation is more complex and we cannot observe the boundary conditions directly—perhaps we are concerned with the molecules of a gas. In this instance, if we are really lucky, the unobservable [illegible] may follow the simple laws of [illegible] and by observing a sufficient number of instances their effects will cancel themselves out, permitting us to observe the effects of the conditions which we can control or which we can observe. We then have become in some sense statisticians.

HUMAN EXPERIMENTS DIFFICULT

If the *universe in which we wish to make* our examinations happens to be a human population there is generally an unwillingness on the part of the experimenter to apply experimental conditions with rigid controls and an even greater reluctance on the part of organized society to permit him to do so even if he has the desire. Normally this makes it extremely difficult to carry on meaningful investigations of any sort with human populations.

If we can locate two closely similar populations in one of which chance has provided *us with a condition*—perhaps a *smallpox* organism—which is not operating in the other we have a controlled experiment provided by chance and in observing it we become not only statisticians but epidemiologists.

Obviously it is not necessary for the experimental variable to be an organism. Any defined variations between two recognizable and otherwise homogeneous populations will yield results by the methods of the epidemiologist.

It is, however, necessary in any such investigation to be able to define the populations involved, to demonstrate that there is a single defined cause or a finite number of defined causes at work, and to demonstrate that except for these causes the populations are homogeneous.

DEFINING ACCIDENT CAUSES

In accident prevention investigations the difficulty which the epidemiologists have lies in the fact that there has been, up to now, no demonstration that there are two or more *definable populations at any point in time* or space one of which is contracting accidents as the result of one or more definable causes while the other is not contracting accidents because of the absence of these causes. It would be more hopeful if you could demonstrate two otherwise homogeneous populations one of which was contracting accidents.

R.S.F. Schilling has expr[illegible]situation well for industrial health investigations when he says:

"It seems we must await the development of better techniques for assessing mental illness and determining its cause, and we must define health in measurable terms. Until this is done the research worker will be inclined to leave health and mental illness aside and study disease which can be measured. As he grows older and becomes more aware of the immense difficulties of methodology in occupational health research he will derive more satisfaction from planning and completing neat and conclusive investigations than from making heroic attempts to achieve unattainable ideals."

MUST PIN-POINT CONDITIONS

Change the industrial health phraseology to accidents and it applies perfectly and completely. When we come down out of the clouds, stop being do-gooders, strip our problems down to a size where we can actually see the important conditions, define precisely what it is that we wish to know, and consider critically how to find it out, we may begin to make some substantial progress in accident prevention research.

This is not nearly as glamorous a prospect as looking at the "big picture" and writing erudite papers on the "accident prone" or on the "wish for self destruction" or on "*guilt feelings in* accident causation" but it will eventually bring some definable results. When it has proceeded far enough that it is possible to set up a reasonable research project with definable and possibly achievable goals it might even become easier to get some money to carry on the work.

As a start on the language side, which I think is an essential ground-work, I would recommend to you the definitions in the September 1957 issue of Home Safety Review.▲

THE ROLE OF NATIONAL SURGICAL ORGANIZATIONS IN PUBLIC SAFETY

by DR. JAMES K. STACK

secretary, American Association for the Surgery of Trauma, Chicago

The American Association for the Surgery of Trauma was founded in 1938, and Article II of its Constitution states:—"The object of this Association shall be the cultivation and improvement of the science and art of the surgery of trauma . . . and the consideration of such other matters as may properly come within its sphere." We feel that public safety comes within our sphere.

The Association has 250 active members, approximately 80 senior members and 25 honorary members. The founding members felt that the surgery of trauma would be of *increasing importance and set out to stimulate* the medical profession of this country and Canada to a correspondingly greater interest in this field.

The fellowship is made up of surgeons who are active in the practice and/or teaching of surgery, or one of its branches, and are in a position to bring about this influence in the communities in which they work.

The Association has no administrative staff. Its activities are directed by its officers and Council and participated in by all of its members. They are in a position to influence medical school curricula, hospital teaching programs, and the trends of postgraduate education on the local, state and national level.

COLLEGE OF SURGEONS

The American College of Surgeons was founded by the surgeons of the United States and Canada in 1913 and its fellowship numbers about 16,000. It is divided into state chapters, and, in the larger cities, metropolitan chapters. Of particular interest

to you, is its Committee on Trauma—a group of 42.

This Committee was originally established in 1922 as the Committee on Fractures, and its appointment was stimulated by the generally poor results that were being obtained country-wise in that era. Later, it became the Committee on Industrial Medicine and Traumatic Surgery, and its present title—Committee on Trauma—was authorized by the Board of Regents in 1950.

There is a similarity between you and us, and a difference between another part of you and us. Let me illustrate. Most of you are dealing in your everyday work with individual problems arising, usually one at a time, with the accident victim, with the colleague who is responsible, with the morale of a single worker who can set the mood for a group.

We, too, are dealing, for the most part, with a succession of individual problems of people, and for that reason we both are concerned with the question of individual variability. Let us say that none of your "accident-prone" workers, and none of our patients will react in the same way in point of time regardless of other similarities they may have.

DATA NOT APPLICABLE

When you deal with a single person for whose safety you are responsible, you are practicing an art, and you cannot validly apply data you have on him to conclusions reached by data drawn from a group. There are others, especially those within the organization of the National Safety Council itself, who are practicing a science, namely, that of statistical measurement.

They are safe in applying statistics to a given problem and passing them along for your consideration, but, no matter how accurate their tools of collection and assimulation become, you will err if you attempt to apply it exclusively to a single problem.

In our work, the temptation to do so is great. To statisticians, the five people killed when their car failed on the curve are five rectangular holes in one of St Peter's IBM cards. To you, they are five different problems causing you to review your off-the-job safety program, and to us they are five deaths on which to ponder cause, from the medical standpoint, and prevention, perhaps through closer contact with you.

I am sure that we are closer together than we may think. "Whatever the values of a manager or supervisor, whatever wonderful potentialities he may have, he is limited on the job by the skill with which he is able to guide, lead, teach, direct, control and motivate others." Isn't that also a characterization of a dedicated doctor? Newer trends in medical education are leading the student away from the statistical trap and emphasizing more, both in the pre-professional and professional years the art of understanding and handling people.

FRUSTRATING PROFESSION

Medicine is unique in that its professed purpose and highest end is its own oblivion. It is on our road to this oblivion that we meet with many frustrations, and these keep us from getting there as quickly and directly as we would like.

There are many road blocks and detours over which we have no control, and we find ourselves stopping too frequently to classify repair or dispose of human debris. The road block of poliomyelitis, for instance, still has some debris around it, but the wall is lower now because a large crew under a man named Salk is at work on it with much modern machinery provided by both private and government funds.

There is a long and ancient detour lined by many dead and many more pulmonary and skeletal cripples, and these have for years slowed our journey. It seems that they are mostly people who have been underprivileged and social and economic conditions made it difficult for them to combat tuberculosis. This detour is, however, a little smoother than it used to be because streptomycin and other drugs and surgical advances have been so helpful.

But just when we think we are making good headway to this oblivion, and the road seems clearer, other obstructions keep appearing, and there is one with a frightening potential that seems to be developing fast. It is labeled "highway accidents" and it is unusual in that it is at a place which is quite wide and smooth and generally attractive, and also in that the human debris around it seems to include all ages and types and all socio-economic groups, too.

YEARLY DEATHS

It is striking, though, how many are young and would have been in the prime of life. This block is said to be increasing in size, and, of the 93,000 deaths at all ages from accidents in 1955, almost 40,000 are piled up here. Home accidents are not far behind—28,000 of the same 93,000 in the same period. This increase is taking place in spite of the many groups of people who seem busy in this area.

These workers do not seem to be always as well coordinated as they might be. Some are working in a plodding manner, observing, measuring, noting, while others are working feverishly, almost vengefully, as one might spit into the hurricane that has just destroyed his home.

These are homely examples of the many frustrations and disappointments in the daily life of a doctor. There are so many instances in which safety directors and workers can correct potentially-dangerous machines and locations; you can erect guards, change design and install fire-doors to make sure that such an accident will not happen in just that way again.

But we cannot change the design, for instance, to restore calcium in aging bones so that the left hip won't give 'way a year after recovery from the fracture and pinning of the right. You can solve the problem of the hazardous, incompetent alcoholic who has been wrecking your safety record by letting him go, but we are unable to reach the underlying cause that will enable him to keep from injuring himself or others in the area of everyday living when constant conduct supervision is impossible.

SUGGEST HABIT CHANGES

You can grant a pension to the old employee who has developed a Parkinsonian tremor and whose unsteady gait makes him liable to fall, but we cannot protect him because we do not know the basic cause of the degenerative changes occurring in a certain part of his brain.

The surgeon's contribution to accident prevention consists most likely of suggesting little changes in the mechanics of living. You had better take up those throw rugs in the parlor so grandma won't trip and fall. You had better move that window seat or radiator so father won't hurt his back when he leans over with his knees straight to open the window.

It would be best to put a guard on that open gas heater or Sally will be burned again (but the question of flammable clothing is not such an easy one). Why don't you send that rotary lawn mower back to the factory so that shrapnel-like flying broken blade won't cut the tendons of your other foot the next time.

MUST BEGIN PREVENTION

Surgeons, through their organizations, especially the two groups I have described, have done somewhat more, particularly along the lines of education of the medical profession toward better results in the treatment of accident victims, but here again we are dealing with the wreckage after the fire and not helping to hold the hose that is pouring water on the base of the flame.

We surgeons, because of our first-hand knowledge of the immediate and final results of accidents, in our emergency rooms and wards, and in practice in general, are, we think, in a position to contribute more to accident prevention.

We certainly are in a position to have impressions, and, even if we do not always have statistical evidence, these impressions are passed along to our colleagues through the medium of meetings, publications and the like, so that those of us in one community may know the nature of the problems in another, and be ready should they strike.

We may know by having things told to us through privileged communication that would not appear in an accident report, and these could be acted upon in an indirect way that would be helpful and still not be a breach of professional confidence. The accident victim may not admit to an investigator that he has had trouble recently adjusting his insulin dosage, that he had some strange feelings and slight seizures that made him wonder if he was going to be like his uncle who "used to have fits."

PEOPLE CONCEAL FACTS

He might not reach into his bedside table and show the insurance adjuster the little tablets he takes when he gets attacks of shortness of breath and dizziness. His wife would not repeat to the safety man from

the company that John drinks heavily over the week end and that she hates to see him leave home on Monday morning so shaky and depressed; besides, she wanted him to give up the job of structural steel worker a long time ago. Thus, we see the effects, but could we, by, a posteriori reasoning perhaps throw more light on the cause.

How many people suffer really serious injury or death in their first accident? Is this the first time they have had an impressive injury (one that requires special treatment other than household care)? What is the percentage of repeaters and is this high enough to be a factor in the patient-surgeon relationship the first time?

In other words, if all surgeons caring for accident victims the first time were more prevention-conscious, could they, during the time of this care, make such an impression on the patient by word, deed or opportunity to observe other casualities, that the chances of this person ever getting into another accident would be lessened?

To put it another way, would the primary accident victim be less likely to have another, perhaps worse accident, if he was in some way impressed with the people around him in the ward, in the physical therapy department, who were so much worse off than he? What is the role of such comparison? What is the role of remorse?

VICTIM RECEIVES NOTICE

I am sure many of you are aware that the accident victim becomes the center of attraction as his family and friends surround his hospital bed. Later, he may wear his cast, crutch, brace or sling as a badge of merit, or, certainly, as a comment-inviting device. We know that children just gloat on a bandage or cast, as witnessed by the present-day vogue of signatures on it. The more signatures, the greater the triumph. "Your cast just went up to your knee; that's nothing—mine went all the way to the hip."

We must not forget that in the care of the injured we are dealing, for the most part, with the average person, and I need not remind you of the intelligence or educational level of the average. Does it make any difference whether the patient was truly an innocent victim or not? Whether he was hurt because of his own ignorance or foolishness or not?

Should we, as surgeons, use a different personal approach (naturally, the quality of the medical care will be the same for all)? In other words, should some accident patients be treated as if the cast on the arm should be a dunce cap on the head? For awhile in Chicago, a traffic judge sent certain serious violators to visit the larger fracture wards of the Cook County Hospital so that they might see the actual results of their violations. Is such a course effective?

What do the parents do when the son riding his bicycle illegally on the sidewalk, carelessly 'rounds the corner and injures the aged pedestrian and, of course, falls off his bike? Does the abraded knee get the same loving care; are the tears kissed away in the same way as if he had injured the knee on the catcher's cleat while sliding home with a winning run in a Little League game?

MAKE PATIENT AWARE

Can we utilize the time (and it may be considerable) and relationship (and it may be close) to impress the patient so that it will really make him be more careful and observant? Can we help in this way? Last year 30 some inmates of a Georgia prison farm fractured their legs simultaneously by sitting down, putting their foot up on a rock and hitting themselves on the shin bone with sledge hammers.

The management of these patients, i.e. the medical management, will be discussed at the coming meeting of the American Association for the Surgery of Trauma, and perhaps we will learn of an effective method to keep them from becoming repeaters.

We, as doctors, are at the grass-roots level of any safety campaign because we participate from the beginning. As far as highway accidents are concerned, local or state police are also there from the beginning, and, at least in Illinois, a medical report is sent by the treating doctor to the Secretary of State which completes the statistical picture.

REPORTING PROBLEMS

The reporting would be somewhat similar in railway, aviation, industrial and marine accidents, but, supposing the victim is taken to his home and no hospital report is available; then only the doctor knows of it. Is the reporting of these accidents vital in prevention? You will immediately answer "only if something is done about it."

If I, as an individual doctor, see a patient with, let us say, serious fractures and lacerations because of a defective electrical tool or lawn mower, or the like, to whom do I report? He is admitted to the hospital as a private patient and the police, therefore, are not notified.

Do I report it to the retailer who sold him the gadget, the wholesaler, the manufacturer, the local Better Business Bureau, the Consumer's Research, the Underwriters' Laboratory, the National Safety Council? The first three may have a financial stake in the patient's predicament and be on the defensive. The next four might say that it is out of their field and they might or might not be able to help.

They might not think that a single mishap such as this was important, or they may even consider it a case of personal negligence. If, on the other hand, one of these surgical organizations had a means of collecting a number of such mishaps countrywide and then presenting these data to the National Safety Council, to the manufacturers, to the Consumer's Research, would this add to the safety of the product, and, thus, promote the public safety, at least in this instance?

PROMOTING PUBLIC SAFETY

Or would it be like getting the slum landlord to repair the third floor back porch railing, or the city to fix the sidewalk after the third broken ankle? You may think these are very foolish questions, but I am sure that in asking them I represent the average doctor's wonderment about his position in regard to public safety. He may know his duty as a citizen, but does he know his duty in this area as a doctor? Or does he have a duty?

Each year many new products come into the market to beautify the home, to decrease the burden of those who live in it, to expand their recreational activities, both at home and on vacation; just like each year many new medications come on the market. Then later it is found that these new medications are not as effective as first announced, and that some have produced under certain conditions dangerous complications or unpleasant side effects.

These announcements are not necessarily made by the manufacturers of the product, but are published by those doctors whose patients have been involved. The article may not condemn; it may simply show that under certain circumstances this is what happened. We, in the medical profession, are helped in this way. Is this an equally effective way to protect the public against the new nonmedical products that may be equally hazardous and equally disappointing to their originators?

KNOW THE HAZARDS

Does the salesman, selling the home tool, know about the potential hazard as much as the doctor writing the prescription, and, in the event it does not live up to its expectations, does he, the salesman, have the benefit of this knowledge presented in a factual and timely way?

Would a trade journal accept an article published under the aegis of a committee of a national surgical organization, outlining the surgical experiences that prompted it to be labelled a public hazard? Or would such an item be more properly presented to the public through the National Safety Council, or some other medium? In other words, could we as an organization, promote the public safety in such a way, and would the end result justify the time, effort and expense involved?

The medical profession is pretty well tied down, so to speak, to the job of practicing, teaching, learning and disseminating information at the postgraduate level, so that most of us do not have the opportunity to acquire the answers to the questions above. We can't be sure of our own knowledge of the motivation of those who manufacture and distribute products that are related to public safety.

ARE YOU SURE?

Can you, who are not in the insurance business, be sure that the advertisement that you read, cautioning you to do this or that, or advising you to have an examination at this or that time, is prompted by the company's true interest in a long and healthy life for you, or by the fact that more people healthy means less waiver of premiums and more people older means more annual premiums?

In the efforts of one of our sub-committees to promote the installation and advertising of safety devices, they were told that one doesn't sell automobiles by calling the cus-

tomer's attention to the fact that he will be less likely to be killed in it if certain equipment is included. Judging by the automobile advertisements, the pitch is beauty in the sweeping line, plus power and comfort. The safety part of it is the customer's option; he can take it or leave it.

At a meeting of the American College of Surgeons in April of this year, Dr. George M. Wheatley, vice president for Homes of the National Safety Council, said, "It is gratifying to have surgeons begin to turn their attention to the study of the cause and prevention of trauma . . . the public has learned to look to the medical profession for this kind of leadership."

DOCTORS PREVENT ACCIDENTS

I should remind you that, in spite of the numerous questions I have asked, indicating perhaps a frightening ignorance of many phases of public safety, many doctors are already actively engaged in accident prevention.

For instance, the team physician who supervises or applies preventative bandages or appliances to vulnerable parts of athletes; the boxing commission physician who decides that the fight will stop to prevent lasting injury to a participant; the industrial specialist who confers with the safety director and industrial hygienist about certain potentially-hazardous working conditions; the flight surgeon, or specialist in aviation medicine, or his counter-part in the submarine and diving activities; those doctors engaged in protecting against radiation injuries in the ever-increasing expansion of nuclear energy programs.

Other medical organizations are also awakening to their responsibility in prevention. The American Association of Plastic Surgeons in 1954 began to participate in prevention efforts because, as one of them said, "In spite of all surgery and medical care can offer in the way of repair, there is bound to be residual scars of body function and mind."

In 1950 the American Academy of Pediatrics established its national committee on accident prevention, and the surgical section of this Academy is playing its part. For example, they established shortly afterward the Chicago Poison Control Center. This aroused great national interest and similar centers are now established in some 44 other cities. Dr. S. D. Woodward, Chairman of the Committee on Automobile Crash Injuries and Deaths of the American Medical Association did much to persuade manufacturers that designing safer cars was part of their business.

NSC POLICY

I started this talk with a quotation taken from the published policy of the National Safety Council, and now let me conclude it with a further excerpt from this same statement of policy:—

"The Council is also properly engaged in . . . helping formulate model safety legislation when the force of law is required, in participation in planning and executing educational programs, in disseminating accurate information to the public and in encouraging the establishment of community and state safety organizations."

Surely in such a varied attack on the factors that kill and cripple so many Americans each year there is a place for the particular outlook and ability of surgical organizations. Let us not continue to go our parallel but separate ways like the ships in the Tales of a Wayside Inn—"That pass in the night and speak each other in passing. Only a look and a voice; then darkness again and a silence."

THE ACCIDENT PREVENTION PROGRAM OF THE PUBLIC HEALTH SERVICE

by DR. JAMES L. GODDARD

chief, Accident Prevention Program, U. S. Public Health Service, Washington, D. C.

In no field is the work of the voluntary organization more valid and appropriate than in the area of accident prevention. In many of the major problem areas of public health the conscientious private citizen finds that his chief contribution at the present time is limited to the support of medical research.

But everyone can take direct action to help prevent accidents. Only when everyone is persuaded to take action—personally and consistently—shall we see a significant reduction in the toll of death and disability caused by accidents in this country.

RECENTLY ORGANIZED

The National Safety Congress has for 45 years demonstrated the value of organized effort in the accident prevention field. Compared to this history, the record of my own agency, the Public Health Service, is a brief one: although we have carried on activities in the home accident prevention field for many years, (for example, the Division of Sanitary Engineering Services established a home accident prevention unit in 1949), it was only recently (1956) that an official entity, designated as the "Accident Prevention Program," was established in the Division of Special Health Services of the Bureau of State Services.

The State Health Departments—cooperation with which is one of the leading functions of the Federal Public Health Service—are also considerably junior to the National Safety Council in the accident prevention profession.

The public agencies have, indeed, received support as well as inspiration from private sources interested in home accident prevention. I refer to the generous contribution of the W. K. Kellogg Foundation, which has awarded grants making possible demonstration projects in home accident prevention. Three local health departments were thus enabled to undertake such projects in 1951, and eight State health departments received Kellogg grants in 1953 for statewide demonstration projects (California, Georgia, Kansas, Kentucky, Maryland, Massachusetts, North Carolina, and Oregon).

AGENCIES CONTRIBUTE

At a recent meeting in Washington of representatives of these state and local demonstration projects the Public Health Service received the benefit of some half-dozen years of experience by typical official health agencies engaged in home accident prevention work, and we participated in a detailed evaluation of that experience. In all the reports and discussions of the group, great emphasis was placed on the value of cooperation with local branches of the National Safety Council.

It was the hope of the Kellogg Foundation, in sponsoring these projects, that the states involved would perpetuate the activities in the form of permanent programs, and it is equally the hope of the Public Health Service that this development will be a major result of the demonstrations.

It is still too early to tell how many of the seeds thus planted will grow into vigorous plants, but we have faith in this method of program development, and, indeed, are committed to it as a principal modus operandi of the Public Health Service in carrying out its function of providing leadership to state and local health departments.

The public health movement in this country recognizes accident prevention as one of its prime responsibilities for the same reasons that carry weight with your own organization.

Accidents are now the leading cause of death at every age from one to 35. Accidents are now what tuberculosis was a half-century ago—the leading health menace to young Americans.

NEED INTENSIVE EFFORTS

These two grave and disturbing facts are in themselves, and standing alone, sufficient justification for intensive public health pre-

ventive effort at every level—federal, state, and local.

The last 50 years have witnessed many public health victories over communicable diseases. The last decade, in particular, has seen an amazing advance in preventive as well as curative medicine. The techniques of prevention, perfected during the long fight against infectious disease, are now being employed in the chronic disease area to minimize disability through early detection and to maximize rehabilitation. Accidents would seem to qualify as chronic diseases in this country, and we are all dedicated to the proposition that accidents are preventable diseases.

Accidents don't just happen. They are caused. And home accidents are quite as definitely caused by human behavior as are motor vehicle accidents. In both cases, alteration of human behavior patterns is the ultimate solution to the accident problem.

RESEARCH, CONSULTATION

The Accident Prevention Program follows a traditional Public Health Service procedure by emphasizing two basic functions, namely research and consultation. On the one hand, we have, during the few short months of our "Programs" existence, drawn up plans for research studies designed to probe more deeply into the behavior problems that underlie accident causation.

On the other hand, we attempt to supply consultation service and technical assistance to state and local health departments concerned with accident prevention. We hope to make a contribution to the accident prevention education field, to the extent that this is appropriate at the federal level.

The three operating sections of our Program are designated as Operational Research, Program Services, and the National Clearinghouse for Poison Control Centers.

OPERATIONAL RESEARCH

Operational Research is concerned with identifying the basic causes of accidental injuries, in developing and testing hypotheses for accidental injury reduction, and in developing and operating a program of accidental injury reporting, which is basic to evaluation. Areas of research in which we shall concern ourselves in the future include:

1. *Studies of the behavioral and "attitudinal" aspects of accident prevention.*

Much more information is needed along the following lines: possible relationships between individual characteristics and the tendency to have accidents; the effect of individual attitudes on accident experience; possible methods of altering individual attitudes to achieve accident prevention; and evaluation of the effectiveness of attempts to produce safety-mindedness.

The ultimate goal, that of changing unsafe behavior to safe behavior, requires, we believe, extensive research in the directions enumerated.

2. *Epidemiologic studies into accident causation.*

In 1948 Dr. John Gordon, at the seventy-sixth meeting of the American Public Health Association delivered his now famous address on the epidemiology of accidents. In that speech he stated that the home accident problem should be approached in the same manner as any other public health problem, namely 1) epidemiologic analysis, 2) establishment of causes, 3) development of preventive measures and 4) evaluation.

EPIDEMIOLOGICAL MEANS

We in the Accident Prevention Program sincerely believe that the epidemiologic approach will produce many tentative hypotheses which can be tested in accident prevention programs. Much of our effort in the years to come will be placed on epidemiologic investigations into accidents.

We propose to use the team approach in some of these studies, utilizing the skill of many professions, including engineering, social science, psychology and statistics as well as medicine. During this fiscal year we have planned an epidemiologic study of accidents in old people and one in children. We have planned an epidemiologic study of injuries due to kerosene explosions in a southern state, and a large scale study of poisoning.

3. *Effect of physical conditions on accident causation.*

While we generally agree that physical conditions seem to affect accident occurrence, we are not sure to what extent they do so. While we feel sure that persons with diminished reflexes and failing sight are "more likely" to have an accident, we do not know

to what extent people compensate for these defects. We propose to find out more about the relationship of physical conditions to accidental injury experience in a group of old persons who have a complete physical examination and a continuous medical history.

ACCIDENT HISTORY

A complete history of their accidental injury experience will be maintained. Also in a large organization where physical examinations are given every two years, and a complete history of accidental injury experience has been maintained, we propose to compare the physical status of those with frequent accidents to that of the accident free.

For our major research project in this area we propose to study a large prepaid medical-care plan, where complete medical care is furnished, including treatment of injuries, and where periodic physical examinations are performed. We propose to abstract the records of approximately twenty thousand members, and relate the accidental injury experience to the various physical abnormalities.

4. *Effect of socio-economic and cultural factors in accident causation.*

It would seem obvious that accidents are, in large part, a function of the hazards to which people are exposed, which in turn are functions of ways of living. For example, injuries caused by accidental ingestion of poisonous substances occur mainly in younger children, while injuries from falls are frequent both among young children and old persons. Deaths from automobile accidents are highest in the late teens and early twenties, and are much more frequent in males than females.

These are obvious differences in the types of accidents that occur to persons of different ages. Some states have non-automobile accidental death rates twice as high as other states, and automobile death rates five times as high as other states. Evidently geography affects the occurrence of accidents. The effect of income, education, family size, weather, etc., are less clearly defined.

STUDY POISONINGS

During fiscal year 1958 we intend to engage to a limited extent in studies of accidental poisonings, from data collected in connection with the National Poison Information Center. We also intend to extend studies into accidental mortality in an attempt to identify some of the socio-economic factors associated with excess mortality.

5. *Study of methods of secondary prevention.*

During the year we expect to engage in a study to obtain information regarding the types of persons administering first-aid or emergency medical care, and the kinds of emergency care given for different types of injuries resulting from various kinds of accidents. We hope, through this research, to improve the quality of first-aid, and thereby prevent much disability and death through more effective teaching methods.

Currently we are participating in a study of the effectiveness of various types of treatment for kerosene poisoning, and we expect to expand this type of therapy evaluation to treatment for other types of poisoning.

I should like now to mention briefly, some of the Program Services operations of the Accident Prevention Program, which supplement and complement our research work.

STATE AIDS

Services to states have included assignment of a medical officer to the New York State Department of Health. This officer helped to design a project for a Driver Research and Testing Center, a cooperative undertaking of the Bureau of Motor Vehicles and the State Department of Health. A public health representatives was also assigned to assist the California State Department of Public Health in activities connected with the Cornell Crash Injury Studies.

These studies have been conducted since 1952 in the Department of Public Health and Preventive Medicine, Cornell University Medical College, New York City with support of outside grants from the Commission on Accidental Trauma of the Armed Forces Epidemiological Board and the National Institutes of Health of the Public Health Service.

Assistance was provided to several states in developing portions of institutes on principles of epidemiology, which presented the epidemiological aspects of accident control.

Consultative work done in various states had some specific results. In Wayne County, Michigan, for instance, experimental nursing records were revised to include recording and coding of specific work in accident prevention. In Pennsylvania long-range plans were developed for improving nursing services in home accident prevention.

In Rochester, N. Y., analysis of data concerning accidental injuries collected over a three-year period by the staff of the Visiting Nurses Association resulted in revision of the record form to provide clearer information. In Arkansas a plan was developed to begin evaluation of nursing services in accident prevention and to provide a basis for staff education conferences to be conducted during 1957.

AID UNIVERSITIES

Assistance was also extended to educational institutions, such as the University of North Carolina and the University of Puerto Rico, in preparing and presenting courses on accident prevention to nursing, sanitary engineering, and medical students.

There has been increasing acceptance of accident prevention responsibilitiles by state and territorial health departments during the year. Thirty-eight reported specific accident prevention services as part of their total public health programs. Eleven additional departments, in their official state program plans, expressed an awareness of the problem and a desire to undertake accident services.

Following broadening of the scope of the Public Health Service Accident Prevention Program, there was an extensive movement among the state health departments to expand activities formerly directed toward prevention of home accidents. These enlarged activities are in such fields as traffic, school, recreational, and farm safety.

PUBLIC HEALTH TRAINING

The training function is always an important operation in public health. This principle applies with more than usual force to the field of accident prevention. We plan to conduct training in accident prevention methods and techniques through assignments to schools of public health (and other specialized schools,) organization of seminars in various parts of the country, assignment of personnel to training situations in state and local health departments active in accident prevention work, and through financial aid to schools to develop course materials and curriculum content in accident prevention.

The third operational unit of the Accident Prevention Program is the National Clearinghouse for Poison Control Centers.

POISON CONTROL CENTER

Staffed by a pediatrician, a pharmacist, an education specialist, a records analyst, and statistical and clerical personnel, the Program's Clearinghouse for Poison Control Centers has been set up to service the rapidly expanding network of local poison control centers which are now operating in more than 101 communities in 38 states and the District of Columbia.

The first local poison control center was opened in Chicago four years ago as a cooperative undertaking under the chairmanship of Dr. Edward Press, jointly sponsored by the heads of the pediatric services in major local hospitals, by the Chicago Health Department, the Illinois State Toxicological Laboratory, and other state and local agencies.

From this beginning the poison control center movement has spread throughout the country, preserving the initial purpose of supplying essential information on an immediate and round-the-clock basis to physicians who are treating cases of poisoning. Research, follow-up, reporting, and similar functions are closely related to this primary operation.

PURPOSES OF CENTER

The National Clearinghouse for Poison Control Centers, which was established following requests for such a national service from the American Academy of Pediatrics and the American Public Health Association, has the following purposes:

1. Interchange of information with local poison control centers throughout the country.
2. Stimulation of development of new or improved methods of prevention and treatment of poison cases, and encouragement of research, both basic and clinical.
3. Assistance to states and local communities in establishing poison control centers by providing technical assistance and consultation.
4. Study of national and area trends in poisoning and successful methods of prevention and treatment; preparation of news releases for professional and lay health education.
5. Serving as a repository of information voluntarily provided by manufacturers.

In connection with this last item, the almost endless list of household products containing harmful ingredients has created perhaps the greatest potential accidental poisoning hazard. The American Medical Association estimates that a quarter of a million brand-name chemical products are now on the market.

Here are a few categories of such products, suggestive of the extent to which these goods have become a common feature of the average American home: laundry and dry cleaning chemicals; cleaning, polishing, and deodorizing products; auto care and repair supplies; art and hobby materials; and the garden-group, composed of fertilizers, weed-killers and pesticides.

CENTER AIDS COMMUNITY

The Public Health Service believes that, whatever the organizational pattern of the local poison control center may be, the local health department belongs in the center of such a community activity. In New York City and in Florida, for example, it has been demonstrated that operation of a poison control center has strengthened the cooperative relationships between the health department and the local hospital and medical groups.

It is inevitable that the long experience of health departments in liaison and advisory operations can be of great value in pooling efforts and facilities that must be achieved if a successful poison control center is to be created in the community. Furthermore, the traditional public health techniques, such as epidemiology, casefinding, and follow-up, lend themselves naturally to poison control work.

The processing of information received from all over the country will be a major activity of the National Clearinghouse.

The analysis and tabulation of this material, and the preparation of summary reports, will be supplemented, from time to time, by the issuance of special reports devoted to new treatments, changes in formula of trade name products, new toxic materials or toxic materials encountered under new conditions, and the like.

MORE RESEARCH NEEDED

Opportunities for further research will be brought to the attention of individuals and groups having competence in the areas involved. We need to know more, for instance, about the action of certain poisons, and experience has shown that some current forms of treatment are unsatisfactory.

Our plans for the future of the Accident Prevention Program of the Public Health Service have been formulated in cooperation with the leaders of many groups, both public and private, having long experience in the field.

It was on the basis of recommendations by such groups that a categorical program in accident prevention was established at the federal level, and we look forward to many years of fruitful collaboration with organizations such as the National Safety Council in mutual efforts to reduce the alarming hazard of accidental death and injury in this country.▲

THE 1956 HOME SAFETY INVENTORY

by A. F. SCHAPLOWSKY

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No businessman today would consider staying in business without periodically taking an inventory of various aspects of his operations. His success or failure depends to a large extent upon how well he analyzes what he has done in the past and how well he plans for the future. It is just as logical to conduct periodic inventories and appraisals of health and safety programs. In this way they will continue to be improved and developed.

Prior to 1954 individuals interested in the prevention of home accidents frequently asked themselves, "I wonder what is really going on around the country in this field," and "How do the things we are doing in our community compare to what others are doing?"

At the 1954 annual meeting of the home safety conference of the National Safety Council, this very matter was discussed. Who in this country is doing what in home safety? How could such information be obtained? Would an inventory of program activities be a helpful addition to the Home Safety movement? At this meeting the home conference instructed the home division staff to implement the organization of such an inventory, guided by a special inventory committee appointed by the conference. Financial assistance was afforded by a grant from the W. K. Kellogg Foundation.

600 ANSWER TRIAL TEST

A trial of the inventory was conducted in 1955. Questionnaires were distributed to state and local organizations asking them to report their program activities. Six hundred reports were received in this initial effort.

The inventory committee and the home safety conference recognized the potentials in these reports and endorsed the expansion of the program for 1956. Two staff members were added to the home division to devote their time and efforts largely to this activity. Inventory centers were established in each of the 48 states, the District of Columbia, Hawaii, the Virgin Islands, three of the Canadian provinces, and in more than 100 local communities throughout the nation.

The two primary objectives of the 1956 inventory were, to find out who is doing what in home safety, and to stimulate future home safety program activities.

A program summary form was prepared, tested, refined and finally printed and distributed. Some 85,000 copies of this form were sent to clubs, organizations, industries, governmental agencies, fire departments and similar organizations and groups throughout the states, territories and provinces which had set up inventory centers. These forms were distributed and the completed reports were collected later through the local and state inventory centers.

41 HUNDRED GROUPS RESPOND

By January, 1957, the replies began to return to the inventory centers. The forms collected by local centers were sent to state centers, and in turn, sent to the National Safety Council. The reports were then coded and the data was put on punch cards. A total of 4,126 organizations submitted summaries of their 1956 home safety activities. It is obvious that these program summaries do not begin to include all the home safety activities conducted throughout the country in 1956. These summaries, however, do provide more information than ever before available about what is being done. Thus, no claim is made that this inventory is a statistically accurate sampling of existing program activities. However, it does offer practices and suggestions which may be of assistance to future program planning.

A breakdown of the sources of the summaries received indicated that 145 were submitted by organizations whose programs are national in scope, 348 were from statewide organizations, 1,600 from groups which function at the county level, and 1,993 from clubs and organizations active mainly on the community level.

Program summaries were obtained from 55 separate types of clubs, groups and organizations. More summaries were received from business and industries than from any other type of organization.

MANY TEACH HOME SAFETY

An overwhelming percentage of those replying to the inventory questionnaire indicated that their home safety activities involved educational methods. This is as one would expect, as the very nature of the problem dictates that this approach must be the main method of reaching people in their homes.

A wide variety of specific activities were listed and described in the narratives which accompanied many of the program forms. The findings revealed the tendency for organizations to pick their subject matter because it "was a good idea" or because it "was part of a regular annual pattern." Only a limited number of organizations took a survey of their local accident situation to discover whether the aspects of home safety emphasized were those which needed attention. This is a defect of many programs, as our changing environment creates new hazards each year and programs must be developed to meet them.

Inventory centers prepared reports for their states or local areas. These reports were distributed to groups who participated in the inventory. They were an important step in the process of community-wide planning, and served as a stimulus to new and improved programs. Thus every group which contributed learned what all other groups were doing. This is a brief description of the mechanics and findings of the 1956 home safety inventory. The objectives were met, in that the inventory revealed for the first time, on a national basis, who is doing what in home safety. It is now a guide for future plans and projects, and is stimulating the development of increased activitiy in this field, especially at the local level.

WHAT ABOUT THE $64,000 QUESTION

In planning development and improvement of the home safety inventory field, the inventory committee during this last year asked itself questions like these: "Sure, in the 1956 inventory, we found out that a lot of different types of organizations are engaging in a great variety of activities throughout the country, but what about the $64,000 question? Do any of these activities actually prevent any accidents, and if so, are certain types of activities more productive in this regard than others, or are a lot of people merely engaging in a lot of activties with little or no effect? Can future inventories be designed and improved so that the data obtained will bring us nearer to the answers to these questions?"

To be sure if such information could be obtained, accident prevention workers could develop programs using tools which would compare in effectiveness with the Salk vaccine in its prevention of paralytic polio. Unfortunately the answers to these questions are elusive and may never be completely sound. However, when more and more dedicated workers throughout the country add bits of knowledge here and there in the years to come, the answers will begin to emerge. Inventories can play an important part in this process by periodically gathering, analyzing and disseminating details about the thousands of programs and ideas that will continue to develop.

When I become impatient with our progress, I remind myself that in the field of public health those problems with known single biologic causes have been solved and controlled. Those diseases with multiple and varied causes such as heart disease, cancer and mental health are still defying man's attempts at prevention and control. Activities undertaken in communities in attempts to control these diseases are almost as great and varied as are those employed in home accident prevention programs, and yet the time and money expended on these programs is tremendous when compared to that expended on home accident prevention.

SHOULD PROGRAMS CONTINUE?

Indeed, the causes of accidents are equally as multiple and complex as any of these diseases if not more so. Independent research and inventories with improved procedures, techniques and instruments in the years to come can provide us with data which will enable us to improve our programs and effectiveness in reducing the number of accidents.

Another question which I have occasionally been asked in regard to the inventory is, "Should we continue to stimulate more

groups and agencies to engage in activities which we aren't sure will really help solve the problem? Shouldn't we wait until we have more definite information?"

I have answered these questions in this manner. Research in other fields is not based on an "all or nothing" program. Man simply will not sit back and wait for the day when someone announces a complete cure or preventative. He does what his best information and judgment indicates will help in the situation at the present time. From his attempts, experimentations and activities will come some new thoughts and some answers. Indeed if more individuals and groups concern themselves with the problem of home accident prevention, successful techniques and activities soon become clearer and better defined. Today we might say we are using a shot gun in our home accident prevention programs; tomorrow we will be using a rifle.

The Inventory has been an important step in the home safety field. It can continue to crystalize home accident prevention activities and techniques throughout the country. The present inventory committee of the National Safety Council has recommended that a national inventory not be taken in 1958 but that one be taken in 1959 of activities which were conducted in the year 1958. Changes have been suggested for the form to be used and the methods to be employed in conducting it.

State and local inventory centers will again be requested to conduct the inventory in their respective areas. The format of the inventory forms will resemble those now being used for the traffic inventory in that one compiled report will be developed by each center and sent in to the National Safety Council. A kit of state and a list of local forms will be developed. To assist the inventory representative in gathering information from local organizations supplemental forms will be developed.

No long range plan for continuation of the inventory beyond the one to be conducted in 1959 has been developed.

Members of present and future inventory committees of this Home Safety Conference and staff members of the home division will welcome any suggestions individuals may have to improve the procedures and instruments used in future inventories.

HOME FIRE INSPECTIONS BY FIRE DEPARTMENTS

by CHIEF REYNOLD C. MALMQUIST

first vice president, International Association of Fire Chiefs, Chief of Minneapolis Fire Department, Minneapolis, Minn.

In attempting to prevent the loss of life and the start of fires in this country, the more we join hands with other organizations, the greater the possibility of reducing the loss of life and losses from fires. No one fire department or no one organization is large enough or capable of doing the job alone.

It is fitting that the tragic loss from fire be considered one of our major fields of activity. Each year America faces a tragic human and economic loss from fire.

When we consider that we are approaching, or probably already have arrived at the one millionth fire per year and that our fire loss will probably exceed the one billion dollar mark, we realize the challenge which confronts us, at least economically.

Serious as these figures are, the most tragic results from these fires are the loss of more than 10,000 citizens with probably 4,000 of the victims young people who have not had an opportunity to live.

FIRE CHIEF'S DUTIES

The International Association of Fire Chiefs is truly an international organization concerned with the problem which confronts the chief fire officer. As an administrator, the fire chief's duties today are not solely concerned with the extinguishment of fire. He must be equally concerned with the frequency with which fires occur. The best trained men and the most modern equipment are available to help him in his fight to extinguish the fire. Manpower and sound planning are needed to help him to prevent fire from occurring.

With this thought in mind, the International Association of Fire Chiefs two years ago entered into a program of promoting the inspection of the home. When this program was undertaken, there were many who felt that because of the sanctity of the home, the right to enter it by firemen would be seriously questioned.

The home inspection program to date is successful. At the end of the year the ten millionth home in the United States and Canada will have been visited by members of the fire service.

Generally speaking, the program is planned on a year-round basis, and while it is a part of fire prevention, the activities are not limited to fire prevention week.

OFFICERS MUST EDUCATE

While it is true that any experienced fire officer can, from his desk, describe the conditions which make fire a receptive visitor in the home, the challenge to him is to bring this information to the home owner and his family in such a way that common, every-day carelessness will not sadden his residence.

We have found that where the home inspection program enjoys the support of the chief executive of the state, it is much easier to consolidate our work and effort. Some 22 states are now actively engaged in the home inspection program. In the other states many departments have developed new ways to "back the attack on fire."

While statistics are dry, cold figures, sometimes they can be used to point up areas requiring additional consideration. We found that 94 per cent of our citizens invited firemen to their homes. The remaining 6 per cent feel that this is an intrusion of the home. Wherever a program has been successfully conducted for a 12-month period, we found that there is an approximate 30 per cent reduction in calls to the fire department for fire emergencies in the home.

WASTE OF MANPOWER

America today is an industrial and chemical nation. It is right that it should be for our standard of living is the highest of any country in the world. Yet, we can also brag that the loss from fire is equally high. No other country in the civilized world could support this tragic waste of manpower and natural resources year in and year out.

Hand in hand with this improved standard of living come the many new inventions and processes which make the home a better place to live. Home owners are not necessarily engineers or firemen and, while they enjoy modern scientific developments and improved household equipment, they fail to recognize that, while safe, they may contribute to a problem which is dangerous and hazardous to them.

The trained fireman can bring these points of danger to the attention of the home owner. In turn, he will develop a friendly public relations program which places the fireman as the partner in this group of public officials who are working for the safety of their citizens.

MUST PLAN DETAILS

Those of you engaged in the development of safety programs know full well that the success of any program depends upon the details of the planning. There is no spot where this is truer than in the area that undertakes the home inspection program. It is necessary that the chief completely sell his governing body on the intent and purpose of fire prevention in the home.

It is necessary that he sell the skeptics the soundness of bringing home inspections to the citizens of the community. Many will say that this is evidence of the rapidly developing theory of a police state. If steps taken by the department are so judged, and if subsequent investigations by other municipal agencies indicate that the information derived from home inspections is used for other purposes, the program will fail.

The people of the press, TV and radio can do much to bring the problem to the home owner. They can open the doors when they fairly present the soundness of the program and the reasons why it has been undertaken.

Generally, we find that fire department personnel, once they understand the need for home inspection, undertake it as a part

of the fire prevention program. They should be thoroughly versed in the reasons for the program. They should be trained on their approach to the public because usually it has not been within the scope and duty of the firemen to make good-will calls.

They must develop a spirit of cooperation and helpfulness. They must never institute inspections in the spirit of an investigation. They must assume that the conditions they find are human failures and are not developed as the result of intention or design.

In many communities the home inspection visit has been followed up by a personal telephone call by a chief officer. This gives evidence to the home owner that the program is supported by the entire department. It also acquaints the home owner with the recognized fact that he has been pledged, with his neighbor, to maintain a fire safe home.

The National Safety Council has become a partner with the fire chief in this program. Their annual home safety inventory now questions the fire activity in the communities surveyed. This, in turn, acquaints the fire chief with the fact that his work is being recognized by committees which normally undertake safety programs locally. Many times it places him on the advisory boards of such committees. To a greater degree it places before him a challenge to make his area a safer place in which to live.

Many of you, I am sure, are wondering how long an active program of this type can be kept going. As we envision it, there is no limit to the preventive side of fire fighting.

Our association is seriously considering the promotion of fire administration training on the college level. Should this be developed, we hope to include more and more fire prevention training in our teaching to firemen each year.

The day has long since passed when we considered the fire service as only an extinguishing agent, remaining exclusively within the fire station until some area of trouble develops. While it is true that there is considerable activity, which can only be undertaken in the fire house, it is equally true if we are to reduce the number of fires and the loss of lives, which are increasing each year, we must take our problems to the people who are, in fact, our customers.

HOME SAFETY NEARING INDUSTRIAL

Safety in the home has now reached the level of importance that safety in industry arrived at some time ago. This is correct because today more people are spending a greater number of hours in their homes than ever before.

There are many programs, which are being undertaken to bring to children—and through the children to their parents—the need for fire safety. We in the fire service feel that we must back up these programs by emphasizing to the parents the need for the greatest care and consideration possible in order that their homes may be kept intact and that their children have the privilege and the right to grow up and enjoy the benefits which are ahead for those living in America.

COMMUNITY FIRE PREVENTION PLANNING

by E. W. FOWLER

director, Codes & Standards, National Board of Fire Underwriters, New York city

The National Board of Fire Underwriters directs many of its activities to the community approach to fire prevention.

Three National Board of Fire Underwriters' activities most worthy of discussion are fire protection surveys of cities, building codes, and fire prevention codes.

FIRE PROTECTION SURVEYS OF CITIES

These surveys specifically deal with community fire prevention and coping with serious fires and conflagrations. In most of the conflagrations in primarily residential areas, wood shingle roofs on closely built dwellings of combustible construction were an important factor in fire spread. Other conflagrations, such as from hazardous occupancies or large buildings with combustible interior construction, usually developed because of inadequate public fire protection —that is, inadequate fire departments, water supply and other features for effective fire fighting.

Three large forest or brush fires known as the Malibu fires occurred nearly simultaneously in December 1956 in Southern California near Los Angeles county. In these fires 90 homes were destroyed and an estimated 1,350 homes burned. Effective work of local county fire departments kept the loss of homes down to about six per cent. Fighting conflagrations is definitely a community function.

Fire loss is also a community fire prevention problem. The community approach to this problem matches closely the approach of fire protection engineering surveys of cities made by the National Board of Fire Underwriters in larger cities, and local fire insurance inspection bureaus in smaller communities.

These surveys and reports include a detailed study, with recommendations, of public fire protection. These studies cover the adequacy and reliability of the water supply system, the effectiveness of the fire department, such as manpower, equipment and methods of operation, and the adequacy and reliability of the community fire alarm system.

They also analyze the size, type, congestion and fire hazard of buildings and the effectiveness of building and fire prevention codes in controlling fire hazards. These are studied for possibilities of conflagrations.

A local building code is important in the community approach to home fire prevention. It can prevent conflagrations and fires from one building to adjoining ones and can also prevent the fire from spreading in the house itself.

BUILDING CODES HELP FIRE PREVENTION

Many features of a building code relate to control of fire spread in business, commercial, industrial buildings and apartment houses. Other features deal with fire prevention in dwelling houses. Some features that relate to fire spread in buildings generally are:

1. Fire limits or zones prohibiting wood frame construction and unprotected metal construction should be established. This can reduce the likelihood of spreading fires in congested business districts.

2. Heights of buildings must be limited according to the type of construction. Any building too high for the fire department to fight a fire effectively must have floors and other structures that will resist as ordinary fire without collapsing.

3. Areas of buildings must be restricted to type of construction and occupancy. Consideration should be given to sprinkler protection and height and separation from other buildings. The larger the building the greater the difficulty fighting a fire, and the greater the likelihood to involve other buildings.

4. Exterior wall openings near other buildings must have suitable protection such as wired glass in metal frames. Such protection helps the fire department stop fires from spreading from building to building.

5. Stair, elevator and other openings to floors of buildings are important elements in fire spread if not properly protected. This is particularly important for the safety of occupants.

6. Fire walls dividing buildings must have sufficient structural stability and fire resistance to control the spread of fire from building to building. Openings in fire walls must have standard fire door protection or the walls are ineffective.

The important features of a building code related to fire prevention in the individual dwelling house are roof coverings, firestopping, chimneys and heating appliances and systems, and proper installation of electric wiring and equipment.

ROOF COVERINGS AND FIRESTOPPING

The combustibility of roof coverings should be regulated to control fires spread by flying brands landing on roofs. In a large midwestern city a fire in a four-story building set 70 other buildings on fire from flying brands which carried about a mile away. A good building code limits roof coverings to those Class C or better under Underwriters' Laboratories' classification of roof coverings. This class is effective against light fire exposure and has no flying brand hazard.

Wood floors and walls and furred masonry walls can be hazardous, if proper firestopping is not installed. A fire starting in any concealed space will spread throughout the building before being detected. In such cases there is little possibility of extinguishing the fire before extensive damage is done.

A house had an oil burner fire in the basement a few years ago. By the time the local fire department arrived the fire spread through the unfirestopped stud spaces in the exterior walls and smoke came out around the eaves. The fire department had difficulty locating and extinguishing the fire in concealed stud spaces and the building was a complete loss. Suitable firestopping would have kept the fire in the basement until the fire department extinguished it.

CHIMNEYS AND HEATING APPLIANCES

Among the most important causes of dwelling house fires are chimneys, flues and vents, and heating appliances and systems. A properly enforced building code on such items can control this hazard.

Masonry chimneys should be solid masonry units, with wood beams, headers, joists and studs properly spaced from the chimney. Factory-built chimneys and special types of gas vents should be installed according to manufacturers' instructions and within the limits of their approval. Heating appliances and systems must have proper safety controls and be installed with proper clearances to combustible material.

Communities usually control installation of electric wiring through enforcement of the National Electrical Code, either by a separate electrical inspection department or by an electrical inspector working in the building department. Electric wiring should be installed in a standard manner and sufficient outlets installed to avoid overloading the circuits. In older dwellings proper extensions should be added to the house wiring system.

There are several widely used model building codes. The National Board of Fire Underwriters has published a recommended building code since 1905, the latest being the 1955 Golden Anniversary edition. An abbreviated form is available for communities which can use a shorter code.

The National Building Code recommended by the National Board of Fire Underwriters is the product of many years experience in building code writing and enforcement—experience with hundreds of adoptions, experience of specialists in all branches of fire protection and building construction.

On items which vary with local conditions, the code's provisions are flexible enough to use in any area of the country. Localities with heavy snowfall, exceptionally high winds, earthquakes or other conditions increase the requirements according to their needs.

Approximately 1,000 cities and towns use our code or have a similar building code.

In recent years several building officials' organizations produced and fostered adoption of model building codes. The three model codes of building officials' organizations are much superior in regulating building construction to control fire hazards than the average old locally prepared code.

FIRE PREVENTION CODES

A local fire prevention code may seem less related to preventing fire loss in a dwelling than the building code. But fire prevention codes do have an important relationship. A fire prevention code which specifies safeguards for oil burning equipments has a direct relationship to dwellings where fuel oil is used.

Other code provisions, such as storage and handling of gasoline, all highly flammable liquids, explosives and hazardous chemicals, are important because fires or explosions from these products could effect many dwelling houses. These fire and explosion hazards occur where these products are regularly handled and also when transported through the community.

The National Board of Fire Underwriters has been a pioneer of model codes to aid communities in their fire prevention responsibilities. In 1895 the National Board published the first nationally recommended electrical code, in 1905 the first model building code, and in 1930 the first model fire prevention code.

Zoning regulations are not often considered home fire preventions, but they are significant. Zoning regulations often separate dwellings from lot lines and limit heights of buildings. Separations are helpful to a fire department in controlling a dwelling fire.

An effective community fire prevention program cannot be accomplished without the support of people in the community. The services of the National Board of Fire Underwriters are available to all communities. Communities must do their part for an effective community fire prevention program. By working for fire prevention you protect your own home as well as your neighbor's. ▲

LET'S STOP THESE FIRE DEATHS!

by PERCY BUGBEE

general manager, National Fire Protection assn., Boston

Present estimates are that we have 5,000 fires every day of which about 1,600 occur in buildings. The great majority of all of these fires are due to simple, readily understood causes. One has only to look at the daily record of fires in any large city to realize that this is so.

As an example, I took a look at the fire record prepared by the Insurance Patrol in Chicago for one recent day. There were 80 fires recorded on this particular day. Of these, 27 were from careless disposal of cigarettes or matches, 14 from accumulations of rubbish near heaters or other open flames, 11 from defective furnaces or chimneys, nine from the careless handling of gasoline or kerosene, eight from portable oil stoves, six from defective electrical wiring, four from gas burners, and only one from a special hazard.

When it comes to deaths and injuries due to fire, the same general situation applies. Every day our Fire Record department receives reports of local tragic incidents such as these.

Perhaps one reason why the general public does not become aroused over such needless waste and suffering is that good, reliable statistics nationally on deaths and injuries in fire have not been available and these isolated cases arouse interest only in the local area where they occur.

For many years we have been struggling with this subject of reliable fire casualty statistics and the NFPA Committee on Fire Casualty Statistics has come up with a standard form for reporting fire casualties. This is being tried out at the present time in a number of states and we hope eventually to persuade all of the states to use it so that in course of time reliable fire casualty statistics may be forthcoming. Your help in getting recognition of this form and its use in your own states and communities would be very much appreciated.

EDUCATE CHILDREN ON FIRES

How can we attack this problem which is so important? How can we effect a mass education of all of the people so that as part of their daily routine they will not commit acts of carelessness that result in death and destruction? What are the forces that are or ought to be available to us in a mass attack upon this problem? Rather obviously, a basic consideration is the education of the children in the schools in the simple principles of fire prevention. The National Education Association has been tackling that problem in recent years with conspicuous success.

Teachers are overburdened and resist any attempts to introduce new material and new subjects into their courses of study. But the NEA proceeds on the principle that teachers will much more readily accept suggestions and material prepared by teachers for teachers. It produced a series of excellent manuals on how to teach fire prevention in existing courses of study from the elementary grades up to the high school grades.

The teachers that have experimented with this material and have taught fire prevention in their classes in science, English, art or civics have found that the subject is a great attraction to children and the response is excellent. In view of this development, all that remains to be done in this field is to gain the teacher's acceptance of the material so that we can insure that subsequent generations will not handle fire so tragically carelessly as does the present generation.

HOUSING INSPECTIONS

Another new and growing and very important force in the overall attack upon fire deaths is the campaign initiated by the International Association of Fire Chiefs through the Fire Prevention committee of that association headed by Jay Stevens of San Francisco. Stevens has recognized that one simple, effective and inexpensive method of attacking this problem is through the simple inspection of all dwellings in a community by the fire department.

This approach is not new. It has been tried in several hundred cities, in some as much as 20 to 25 years ago. Wherever it has been tried it has shown a marked reduction in dwelling fires with subsequent reduction in loss of life because after all, the great majority of fire deaths are in homes and among the children and the aged. Stevens says that already on the West Coast more than 2,000,000 homes have had such inspections by the firemen and that the campaign has been successful in such cities as Los Angeles and Berkeley, Calif., Seattle, Wash., and Portland, Ore.

A third approach to this problem and also one that has been tried with great success in numerous individual communities in various parts of the country is the inspection of homes for simple fire hazards through home inspection blanks distributed to the children in the schools. Here again we have a device that is simple, inexpensive and effective, and wherever it has been done on a consistent basis it has worked.

USED INSPECTION BLANKS SUCCESSFULLY

Kansas City, Mo. was perhaps the most notable example of this type of approach when during a period of several years of consistent home inspections by the school children a bad record of deaths, injuries and destruction in dwelling fires was materially reduced.

A fourth attack upon this problem of fire deaths is the year-round educational campaign directed at home fire prevention conducted by the National Fire Protection Association through all of the existing publicity media such as the newspapers, the television and radio stations, magazines, house organs, and the like.

Sparky, the firehouse Dalmatian dog, is the symbol of this campaign and has become a familiar and well-liked figure to the American public. Hundreds of communities have organized Sparky Fire Departments for the children of the community under the sponsorship of the fire department.

We have now available, therefore, these movements and these tools that we know will do this job and we must find ways and means of utilizing them effectively. The great American Red Cross has realized through its disaster relief program that a substantial majority of all the disasters are fire disasters.

UTILIZE COMMUNITY GROUPS

Certainly we should take advantage of the widespread community organization of Red Cross chapters everywhere to work through this now interested group to gain acceptance of the educational program, the fire chiefs' program, the home inspection program through school children, and the Sparky home fire prevention program everywhere.

The Boy Scouts of America have discovered that one of the potent sources of sponsorship for Boy Scout troops are the volunteer fire departments of the country. Here is another great nationwide organization that can be of tremendous help in a broad attack upon the problem of reduction of fire deaths.

There are other great national groups that we have yet to reach effectively but that I think can be reached. I am thinking of the General Federation of Women's Clubs, the life insurance companies and the labor unions as examples. I can see no reason why these and other groups cannot be interested in supporting in every community throughout the country the principles of fire prevention once they understand that such support is not costly or difficult or unreasonable.

Such forces working in each community with the help of the local Chamber of Commerce, safety council, insurance board, Rotary and Kiwanis Clubs, and similar local civic groups, can effectively stop these fire deaths.

I have tried to outline the simple measures that need to be taken and in broad terms the sort of support that is needed to put across such measures. Is this job too big, too comprehensive and too scattered so that we must admit defeat, or is this problem so simple and so common place that it is not challenging enough to fire protection people? I am not suggesting for a moment that we should not proceed in every way that we can to improve our standards of fire protection engineering, to improve our fire training programs, our fire department operations and our fire prevention activities in more complicated fields.

But if we are to perform the greatest public service then we must constantly hammer away at the simple, every day things that cause the greatest toll of death and destruction by fires.

OFF-THE-JOB ACCIDENTS HURT INDUSTRY TOO

by J. L. RIDINGER

director, safety and plant protection, Inland Steel co., East Chicago, Indiana

During the year 1956, 80,700 people died because of off-the-job accidents. If these accidental deaths continue at the current rate for 1957, the undertakers, the grave diggers, the tombstone people, the florists and the cemetery associations can say they have had another successful year.

Have we become so calloused to accidents that we are no longer impressed with the seriousness of this humane and economic problem? Are the medias of communications such as the press, radio and television, "missing the boat" to the extent that the general public has accepted unnecessary off-the-job accidents as a part of modern day living?

I have taken issue with the press and radio on several occasions, for their gory accident stories. I have been told the public is more interested in spectacular bad news than in constructive good news. How many times have you been disappointed in finding safety articles relating to industrial or civic safety accomplishments, relegated to the back pages of Section #2 of your local newspaper?

If the public is more interested in reading about bad news than good news then our job is to change public opinion. How can this be done? First there must be a common understanding of the need for safe practices and conditions on streets and highways, in

the home and in other public endeavors. Second, the public must demonstrate their desire for traffic safety, home and public safety by complying with regulations and by cooperating with the various law-enforcement agencies.

PEOPLE ARE LAZY

My experience with various public endeavors, political, civic and social, is that the average person feels he is too busy to take an active part in these affairs because he is more concerned with utilizing more and more of his time for personal enjoyment. Also I believe most people are naturally lazy, both mentally and physically, when it comes to joining a worthwhile crusade that may interfere with personal plans.

I also believe to be successful in our campaign against off-the-job accidents we must form the type of crusade that will shake the average person from his complacency. At present this crusade is in the formation stage. Its nucleus consists of the mourners of the dead, the National Safety Council, the press, the radio, the TV, manufacturers, business people, civic and political groups.

Our main objective is to get this safety crusade on the road. To do this job effectively we must have more than casual support from sponsoring groups and the public.

The National Safety News article, "The Challenging Decade," stated, "Population in the age groups 45 years and over will increase during the next 10 years because of the small families during the early 30's. In the age group 25 to 44 years it will decrease."

"If our economy continues to expand at recent rates, the gross national product must increase more than 40 per cent with the per capita share of this product to increase some 25 per cent."

"These figures all boil down to the fact that our productive population will be decreasing while our non-productive population and overall demand for goods and services are increasing."

"To keep pace with this situation we must conserve our manpower, upgrade its skill and increase individual productivity."

To illustrate the effect of off-the-job accidents upon industrial productivity, here are a few case examples.

A steel mill roller with 40 years of experience had the bumper of his car and another become locked. Trying to free his car he sustained a severe back injury and lost two months work. As a roller, his knowledge, training and experience is invaluable, and his company had to upgrade different crew members and break-in a new man to fill the crew.

In spite of close supervision there was a daily loss of production. This accident was costly to the injured and his family in terms of lost wages, to the crew in terms of a reduction in tonnage bonus, to the employer in the loss of production. Customers were dissatisfied because of delayed shipments.

CASE NO. 2

Elmer was a farmer when he was not running an open hearth hot-metal crane. Last year he helped his neighbor harvest corn. Elmer started around the corn elevator, but at a point inches from the coupling of the unguarded drive shaft, he slipped and his leg skidded against the rotating shaft. Quickly his trouser wound itself around the shaft, and his trapped leg became a pulpy mass of flesh.

This accident has changed Elmer's way of life—off and on he spent over two months in the hospital. Approximately five months later Elmer was ready to return to modified work. He lost $2,500 in wages, aside from an estimated $2,000 cost of living expense.

Elmer's accident also caused a chain reaction at the plant. Although Elmer's replacement had been well trained in the proper operation of hot metal cranes, additional time and experience was still required before he became as proficient as he should be on a single crane. Accident exposure is certain to be greater during such periods.

The relief craneman, in turn, had to be replaced by a crane operator learner. The problem faced by this man is a magnification of what the relief craneman had to undergo. Then another employee had to be placed as a crane operator learner. This chain reaction of operational changes created problems for everyone from the lowest hooker to top departmental supervision.

CASE NO. 3

Robert, a sheet piler was driving home, missed a curve and crashed into a ditch. He fractured his left tibia and fibula and was hospitalized nine months.

One month before Robert's accident, his department had installed a new production line. A three week training period was held on the new unit. The department was desperate for trained personnel so Robert's loss to the department was even more frustrating.

His replacement created additional work difficulty and presented greater accident exposure which had to be offset by additional supervision and personal awareness of the new man. During the new man's training period as piler, lifts had to be repiled, sheets rejected, and everyone on the line had to cope with the added consideration of working with a new man.

Because Robert had to be retrained for the piler job, the entire training period in wages alone was a complete loss—about $200. Wages paid Robert during his training periods when he returned to work were beneficial since they were an investment for future job needs, but this was a needless cost, amounting to $900 or $1,000. Other cost figures not available, were wages for repiling badly piled lifts, and other incidental costs in connection with handling of same. Finally, additional services were required from the staff and departmental personnel to integrate Robert into the work force.

These are but a few of our off-the-job case records. Others involve supervisors, clerical workers and a variety of skilled craftsmen.

PUBLIC RESPONSIBILITY

Most men and women involved in off-the-job accidents are parents of children, or have parents or relatives dependent on them for support. Although more than 90 per cent of our employees are covered by off-the-job insurance we cannot expect insurance to replace the worker's wages for an indefinite period of time. When insurance payments run out, various types of tax-supported welfare aid begins, which means tax bills and industry pay the greatest share of the country's tax.

The public should be interested in accident prevention work to prevent pain and suffering from accidents, and at the same time eliminate the need for public charity.

Whether your business employs one or a thousand workers, accidents hurt industry too. Workers are part of the assets of any business. Whenever a worker is fatally or seriously injured on or off-the-job, both the worker and business suffer an economic loss.

Although much credit must be given the National Safety Council, local safety councils, civic groups and law-enforcement agencies for reducing off-the-job accidents, our crusade against accidents will not be successful until all business and industrial groups take an active part in off-the-job accident prevention work.

During the past three years the Inland Steel company has spent considerable time and money to make our workers more safety conscious about off-the-job accidents. We have used the following programs with a favorable degree of success:

TRAFFIC SAFETY CAMPAIGN

- Inland Safe Drivers club—Membership in the club is voluntary. Workers are solicted by their foremen at safety meetings. Those that sign a safe drivers pledge are given a reflectorized bumper sticker for their cars. This is a continuous campaign.
- Safety seat belts—In addition to equipping all company cars and trucks with seat belts, our employees can purchase seat belts and have them properly installed at a reduced rate. Seat belts should be considered standard equipment on all cars and highway trucks.

During the past year you have had the opportunity to read many articles on the pros and cons of seat belts. Seat belts should not be considered as a panacea for all automobile accidents. Like safety glass, tires and highway rail guards, their use can only help to minimize injuries.

- Safety car checks—During the past two years we have cooperated with the local police by checking all company cars and trucks. In addition we have set up check lanes to check all cars driving in the plant.
- Education program—(a) Traffic safety films are shown at group safety meetings. (b) We publicize and post pictures of local highway accidents, furnished by the Indiana state police. (c) Our employees are kept

abreast of traffic safety activities in the state by information we receive from the Indiana Traffic Safety foundation. (d) Facts and figures published in the National Safety Council *Traffic Safety* magazine are used extensively.

HOME AND PUBLIC SAFETY

——Home inspections—At intervals our safety engineers inspect the homes of employees for unsafe acts and unsafe conditions. Pictures are taken and safety stories are published in the plant newspaper. These inspections are made at the request of our employees.

——Cartoon Contests—Safety cartoons showing unsafe conditions and unsafe acts, in the home and on city streets, are published in the plant newspaper. Wives of employees submit a list of unsafe acts and unsafe conditions found in the cartoons and are eligible to compete in a turkey drawing contest.

——First Aid Training—Each year more than 10 per cent of our employees are trained in first aid. Some employees have saved lives because of their knowledge of first aid. This year we expect more than 40 plant teams will compete in our annual first aid meet.

——Safety eye glass program—Employees who must wear prescription glasses are encouraged to purchase safety glasses. The company pays for part of the cost. With safety glasses the worker is safer in his car, at home, on the golf course and while participating in other sports and activities.

INJURY STATISTICS

For the past two years we have publicized throughout the plant on-the-job and off-the-job injury statistics once a month. Figures for the first eight months of 1957 are as follows:

Plant disabling injuries	54
Fatalities	0
Off-the-job injuries	144
Fatalities	13

Employees spend more time away from work than on the job, but this is no justification for people to have more injuries at home, on the streets and highways, or while on vacation and week end pleasure trips.

There are several reasons why workers should be safer on-the-job than off-the-job, even though exposure to injury is greater on-the-job than off-the-job:

1. Industry, whenever possible, selects the proper type of person for the job.

2. Workers are trained to develop and use safe work habits.

3. The employer's machines and equipment are equipped with approved safeguards.

4. Workers who willfully disregard safety regulations are subject to disciplinary action.

5. Last, but most important, employers know that accident prevention programs can not be successful without a continuous campaign to improve the worker's attitude toward his own safety and that of his coworkers.

Over the years industry has made tremendous progress in the scientific field. This has resulted in fewer accidents, increased productivity, push button control operations and better working conditions.

Many of the new technological devices such as automatic switches, safety interlocks, electric eyes, television and radar controls prevent accidents and injuries to workers.

. . . BECAUSE OF HUMAN FAILURE

We still have not reached the push button stage insofar as using it as a positive control for human behavior. Human failure is still responsible for 85 per cent of the industrial injuries. However, the total number of industrial injuries has been considerably reduced because of our accident awareness program. We believe that because of this continuous program to prevent injuries anywhere, we have helped to make our workers' homes and communities a safer place in which to live.

Many of the safety control measures used in industry can be used to control off-the-job accidents if properly applied.

EDUCATION is most important. There must be a common understanding of what is right and what is wrong, by all agencies such as schools, churches, civic, social and political groups.

LEADERSHIP—There must be leadership and cooperation. Every person must assume his share of responsibility for his safety and that of his family.

The National Safety Council and the American Society of Safety Engineers are well qualified to provide leadership on a nation wide basis. But each community can be best served by its own local safety council in cooperation with the National Safety Council.

Our big job is to stimulate an awareness within people to want safe homes and safe highways and other public places. Until people develop this awareness they will continue to destroy themselves and others, at home and on the highways and in other public places.

FLEXIBILITY AND FEEDBACK PROGRAMMING FOR A MULTI-LOCATION OPERATION

by M. FRANCES DEVINE

personnel supervisor, Northwestern Bell Telephone company, Des Moines, Iowa

We are keenly aware of what safety means to people and what people mean to industry—people alive, healthy and whole. There is nothing more important in the whole world. People mean life. Abraham Lincoln said, "next to creating life, the greatest thing a man can do is save a life." We are interested in this since we are vitally concerned with the number of bodies being needlessly dismembered, disabled, and lives lost from not realizing the dividends of safe living.

How can industry get more and more people imbued with the knowledge of living safely no matter where they are or what they are doing? Industry has accomplished a great deal in promoting safety on-the-job. Of recent years many have expanded these activities to safety off-the-job, many with special emphasis on home safety. The Northwestern Bell Telephone company, like all Bell System companies, has had active on-the-job safety education for many years and with splendid results. Results earned the National Safety Council Award of Honor five out of the last six years.

Telephone work is safe and is becoming more safe as time goes by. But how much of this is being carried away from work? Our company examined off-duty lost time injuries three years ago. Our off-duty injuries far surpassed those on duty. The need to expand our program for preventing off-duty injuries was urgent. This problem is far reaching, involving not only employees but their families. How does industry approach such a problem? A challenge indeed —off-duty safety promotion requires a different approach than on-the-job. To be of assistance when needed is a basic characteristic of human nature. We knew if our people were informed of the problem and enlisted to prevent painful injuries, we would get some effective action.

Our problem was to reach the 7,000 employees in the Iowa area. We have offices of varying sizes in many locations. On-the-job safety education is to a great extent departmentalized, but off-the-job safety lends itself better to an interdepartmental set up.

COMMUNICATIONS IMPROVED BETWEEN DEPARTMENTS

Number one in importance: effective communications from one location to another. This required a multi-location operation by expanding existing safety committees and organizing additional ones, such as:

1. Area interdepartmental safety committee, Iowa area headquarters, expanded activities to off-the-job promotion.
2. District interdepartmental committees organized in each of the eight districts and
3. Local interdepartmental committees in most of the 64 exchanges in Iowa.

The program had to be adaptable to all locations. Because every person is different in background, motivation, previous experience and viewpoint, the information had to

be able to reach not only each force group but each individual.

People should not have to experience injuries to learn to live safely. Our objective was to generate interest and participation from our people to think of their responsibility in the prevention of injuries and then to act. This requires a program flexible in all phases with many different approaches and ideas. What will interest and appeal to one will have no effect on another. Our objective could be accomplished if enough interest was sparked to get each location actively engaged in formulating ideas of their own.

Initially the material was referred from the area to the district committee and then to local committees. After the interest was stimulated and various committees produced ideas and material of their own, a feedback of what is being done and how, is necessary. It is valuable information for passing on for use elsewhere and also for appraising results. This requires sustained interest and effective communication at all points in our multi-location set up, from our top executive down. The better the communication the better the feedback.

MULTI-LOCATION OPERATION

A letter signed by department heads containing comparative figures of on- and off-the-job injuries was forwarded to 32 district heads in our eight districts. The letter emphasized knowing what the situation was to stimulate their thinking and lead to corrective measures. To assist them and safety committees, printed matter and visual aid material was sent to the district interdepartmental committees for all employees. The area interdepartmental committee assisted in organizing district interdepartmental committees and supported them. The area group also encouraged reports of the program from each district.

District interdepartmental committees were organized and the names of the chairmen and members sent to the area committee. The committee chairmanship is rotated in some locations. Many existing departmental committees in the local exchanges were expanded to interdepartmental membership. The committee membership in the local exchanges is on a rotating basis to reach and interest each individual and stimulate ideas and suggestions from the group. Their meetings are held monthly during working hours. Here is some of the material forwarded (and some on a continuing basis) by the area committee to the district committees for a review and distribution to local exchanges to stimulate interest and participation:

1. *Living Safely Off-the-Job* prepared quarterly.
2. Summary of off-the-job employee lost-time injuries.
3. *What's the Answer*—booklet about child accidents, also samples of universal antidotes for poisons.
4. Copies of Home Safety News Service (N.S.C.) and subscriptions for this service for each district head.
5. *Industrial Supervisor*, another N.S.C. publication.
6. District chairmen placed on mailing list for *Targets for Home* and *Traffic Safety*. National Safety Council. Also mailing list of Iowa State Department of Public Safety.
7. Promotional material for national campaigns for traffic safety and campaign to prevent falls.
8. Minutes of area interdepartmental safety committee meetings. Supervisors informed of problems and expansion of activity to prevent off-the-job injuries.
9. Bell System booklet—*Safety In the Bell System*—pertaining to both on- and off-the-job injuries.
10. Safety buttons for safety committee members.
11. Safety films suggested.

FEEDBACK MATERIAL

It wasn't too long before we started getting "a take" so to speak. The district and local committees began originating ideas of their own and securing material from other sources. Following is some of the feedback we received from them:

—Employee made posters—poster contests.
—Join the crusade—Against home accident prevention.
—"Could This Be You or Yours"—for posting.
—Newspaper clippings submitted by employees.

—Rickard's method of artificial respiration for children under two years of age — reproduced from Home Safety News Service and mailed to all employees' homes.
—Danger of using carbon tetrachloride—reproduced from Home Safety News Service—also mailed to employees' homes.
—"Let's Make April Fall Free"
—Bulletin on safely cleaning yards
—Open Season Booklet—Outdoor Activities
—Safety Slogan Contest
—First Aid Training
—Home Safety Displays
—First Aid Charts
—Safety Jingles—Act put on from wheelchair demonstrating various kinds of injuries.
—Article on Power Lawn Mowers
—The Road Ahead—As You See It
—Various pamphlets from National Safety Council—*Vacation Safety—10,000 Mile Living Room, Take It Home With You, Dennis the Menace, On Safety* and many others.

We knew there was a great deal going on in various locations, but it wasn't until all this information was compiled for the National Safety Council *1956 Home Safety Inventory* that we saw it all together.

How has this effected results?

OFF THE JOB LOST TIME INJURIES

1956

No. of Cases		*Days Lost*
83		1138
1 Fatal Auto Accident		
Two Major Cases and Most Serious		
Falls — 36	—	623 Days
Auto — 17	—	319 Days

1957

No. of Cases		*Days Lost*
73		699
0 Fatal Auto Accidents		
Two Major Cases and Most Serious		
Falls — 33	—	317 Days
Auto — 21	—	282 Days

Approximately 50 per cent of the accidents occurred in the home.

As can be noted from the results, the first six months of 1957 had 10 less cases and 437 less days and no fatalities. Safety activities are more far reaching than we know—there are others, such as familiy members, friends and neighbors who no doubt have also been saved from injuries. For instance, in one case an employee used the Rickard method of artificial respiration on his six day old baby and feels this saved the child's life.

These results are immensely encouraging and satisfying to all who have helped promote safe living. It makes us realize even more the big job to be done. Programming for a multi-location safety operation is not simple or easy. It can present some real difficulties, such as, some of our barriers to a successful safety operation:

1. Sustaining interest at the area, district and local levels.
2. Breakdown in communications.
3. Failure to plan ahead.
4. Failure to follow through.
5. Recognition—insufficient or none.
6. Effective distribution of material.

Constant attention to these barriers is essential to a continuous safety program. Promoting safety, especially off-the-job requires time, patience and persistence because we are dealing with people and the habits of people and some people are more adaptable to changing habits than others. Industry can approach the problem of educating people to be safe at all times by:

1. Employee participation — people who work on safety, become safety conscious.
2. Effective communications — two-way—through all lines of organization.
3. Recognition—for participation—results and interest.
4. Flexibility — throughout to reach all people.
5. A feedback of what is being done, will in turn strengthen and reinforce the entire program.

When this program is actively under way, an ever increasing circle of employees, their families, friends and neighbors will work and live more safely, and spread the message of safety. Every action we take in support of such a program has its compensating effect somewhere—on someone. It can truly become, a crusade for safe living!

CONSUMER EDUCATION AND PROTECTION

by JACK H. CORNELIUS

manager, Community Relations, The Peoples Gas, Light & Coke co., Chicago

In a story on safety in a magazine that crossed my desk recently there appeared this quote. "Unguarded machines cause less than five per cent of total accidents; unguarded minds cause 95 per cent."

At Peoples Gas we are not quite sure of the accuracy of these percentages, but to be on the safe side we have developed a full program in both areas.

The appliances on our lines must be soundly engineered and properly constructed to utilize our fuel safely. The gas industry as a whole, long has recognized this basic fact and as a result has for many years conducted a program of laboratory testing of gas fired appliances. This laboratory testing program, conducted by the American Gas Association, has led to the development of a set of performance requirements to be met before the appliance can be granted a seal of approval.

The gas appliance manufacturers fully approve, in fact, financially support this program and work closely with industry testing people in developing new features to be incorporated into modern gas appliances. The industry has been responsible for the attachment (by manufacturers) of clear, simple operating and lighting instructions to all automatically controlled gas appliances.

TESTS APPLIANCES

Peoples Gas also has a laboratory in which it tests appliances distributed in the Chicago area. This may seem like gross duplication since we test appliances previously approved by the American Gas Association industry-wide laboratories, but I hasten to point out that the AGA tests hand-tooled prototype models while we test production models. Often there is a considerable difference. Then, too, Chicago has some problems peculiar to this area, such as the large number of small stove heated dwelling units, that make it desirable for us to have more rigid safety requirements.

Our testing people also help find practical solutions to service problems which may arise as a result of a serviceman or engineer visiting a customers premises. Testing also closely observes the performance in the field of newly developed equipment. At present they are conducting tests of gas air conditioning installations.

Another way in which we attempt to upgrade the quality of appliances attached to our distribution system is through a dealer education program in which we urge the dealer to sell a better equipped gas appliance. Our sales division has a dealer contact section to administer this program.

INSTALLATION INSURES SAFETY

In order to get top efficiency from a well designed appliance it must be properly installed and adjusted. Peoples Gas makes few installations of appliances. Recognizing the need for improving the knowledge and ability of outside service personnel who install and adjust appliances the company has established a training program at one of our public schools, the Washburne Trade School, where plumbers and steamfitters are taught proper installation practices.

In addition, our sales engineers cooperate with heating contractors in advising them on proper space heating equipment installation methods. We inspect all completed water heater and space heating installations to make certain they meet safety standards and that they are operating efficiently.

So you see, we do recognize the importance of the machine and men in any safety program and we have developed this comprehensive plan to insure a minimum amount of trouble due to appliance failure.

Our late president, Mr. George F. Mitchell, often said, "Wherever you have concentrated energy, you handle it with respect." The gas industry has long recognized the truth of this statement and has developed programs to implement Mr. Mitchell's philosophy. This problem is not peculiar to the gas industry alone. The electric industry faces the same situation. Each industry has of necessity recognized its responsibilities, and has developed educational programs to teach customers to handle these forms of concentrated energy with respect.

ADDED ODOR FOR PROTECTION

Natural gas in its original state has no taste, no smell, nor can you see it. In order that uncontrolled gas can easily be detected we have added a very unpleasant odor in the form of a specially developed chemical —and we have made it just as "stinky" as we possibly could and still have it smell like the manufactured gas we remember so well.

Then too our customers receive, from several sources, instructions on how to use their gas burning appliances. It starts when the salesman is making a sale. Part of his pitch is what the appliance will do and how it does it. This necessarily entails an explanation of proper operation of the gas appliance.

If after the customer has received delivery of the appliance he or she does not understand fully its operation, one of our home service representatives will, upon request, visit the customer's premises and give on-the-spot instructions.

SERVICEMAN AIDS CUSTOMERS

Another source of customer education is the serviceman's call. Thousands of such visits to customers' premises are made each working day of the year. And in many instances the serviceman is called on to explain to the customer what has gone wrong and what should be done in the future to insure efficient operation of the appliance.

For example, if the serviceman finds excessive grease on the range burner or in the broiler he will point out this is a potential fire hazard; then he will instruct the customer in the best way to clean the burner and how to keep it clean easily.

Our public contact employees, those who talk with customers coming into our offices and those who answer telephone calls to the company, have all been instructed in safety measures to be observed in appliance operation. As a matter of fact, each of these persons has undergone a course of training in our Fitters School, originally established to train our servicemen. Each newly appointed customer-contact employee is given a course in appliance operation and in safety precautions to be observed, and each year all customer-contact employees are sent back to school for a refresher course.

During the war, when we had a shortage of servicemen, our customer-contact employees advised customers how they could correct many of the minor difficulties affecting the operation of an appliance.

PAMPHLETS, EXHIBITS EDUCATE

Pamphlets have been developed which instruct the customer in the safe, economical operation of the gas burning appliances. Here are some examples of booklets available at Gas Company offices:

Helpful Information on Gas Heating.

You Can Have More Hot Water Faster For Less Money.

The Gas Water Heater Installation Guide.

Practical Chimney Construction.

We also maintain at our main office location a customer display floor where we exhibit examples of proper installation of gas appliances and heating systems; where we have diagrammed and constructed models showing proper insulation of buildings; the proper construction and lining of chimneys; the correct venting of gas appliances and all the other safety features that lead to respectful handling of this concentrated energy. There are on duty at all times sales engineers to answer the questions about gas appliance installation from customers, contractors, and builders.

When a customer plans remodeling or adding a new gas appliance, he or the plumber can call the Gas Company and ask for an experienced inspector to advise on how the piping job should be done. One of our supervisory people will visit the premises in question and outline in detail what steps to follow and the pipe sizes to use to insure safe, efficient operation.

COOKING SCHOOL TEACHING

In furthering our program of consumer education we periodically furnish to the daily and neighborhood newspapers feature articles describing best practices to be followed when using gas appliances and instructions for proper maintenance to keep the appliances operating at peak efficiency.

Another phase of our consumer education program, which also is part of our sales promotion effort, is that of conducting cooking schools for our customers and the placing of gas ranges in Chicago schools to

teach high school girls how to use these appliances properly. This teaching includes operation and care of the equipment, safety precautions to be observed, and helpful hints in the efficient use of the appliance.

This then is the program we have developed to teach the public that properly controlled gas is a wonderful servant.

To complete our safety picture we follow-up these two programs with one of inspection—to insure our teachings are being heeded.

First let me point out that we cooperate fully with the municipal authorities—not only in the development of housing and building code regulation of gas appliance installations, but also, because of our frequent contacts with our customers, in helping secure compliance with the codes.

Some of these regulations have to do with proper venting of appliances, restrictions on location of various appliances, room sizes and materials to be used for piping. Because we make literally hundreds of thousands of visits to customers premises each year, our people can discover and report installations which are not in compliance with safety requirements.

We notify the customer he is in violation of a given ordinance, tell him what must be done to correct the violation and after a reasonable period of time has elapsed, inspect the premises to insure compliance with the statutes. The offending appliance is disconnected and left disconnected until the violation is corrected. All our people who visit customer premises (these include servicemen, meter readers and inspectors) are trained to recognize these violations.

CHANGING METERS

Just consider one phase of our customer premises operations—that of changing meters. We do a volume of 100,000 each year because we adhere to the requirements of the Illinois Commerce Commission in changing a meter each 10 years to insure its accurate registration.

By the way, we find, of the few meters not accurate within the allowed range, most of them register slightly in favor of the customer. In addition, meter readers read our more than one million meters six times a year, and our servicemen average about 2,000 calls a day on customer premises.

We are careful to set meters in locations where they can easily be reached and read, and we insist on the customer maintaining easy access to the meter location so our service people will not have difficulties.

In addition we have a program of renewing service pipes in areas where needed. And in the areas of substandard housing, where most of the breaking up of large apartments into small takes place, we make a house-to-house inspection looking for house piping installations which do not meet safety requirements.

How effective has this program been? It is difficult to measure accurately the results of such a program, but we know we are on the right track when reading the following report of the National Board of Fire Underwriters for the decade 1946 through 1955. Of the 19 categories of causes of fires, gas ranks 14th.

Fires in U. S. Resulting from Known Causes
(As reported to National Board of Fire Underwriters)
For the decade Jan. 1, 1946-Dec. 31, 1955

CAUSES	PER CENT CLAIMS
1. Matches, Smoking	26.26
2. Misuse of Electricity	14.00
3. Lightning	9.86
4. Petroleum and its products	6.90
5. Stoves, Furnaces, Boilers and Their Pipes	6.76
6. Exposure (fire originating off Premises)	6.43
7. Ignition of Hot Grease, etc.	4.36
8. Overheated or Defective Chimneys, Flues, etc.	4.28
9. Miscellaneous: Cause Known but not Classified	2.69
10. Hot Ashes and Coals: Open Fires	2.42
11. Open Lights	2.26
12. Rubbish and Litter	2.19
13. Spontaneous Combustion	1.74
14. Gas: Natural and Artificial	1.72
15. Sparks on Roof	1.62
16. Friction, Sparks from Running Machinery	0.94
17. Sparks Arising from Combustion	0.80
18. Explosions	0.36
19. Fireworks, Balloons, etc.	0.15
	100.00

These figures indicate our program has resulted in some measure of success, but we will not relax our vigilance or curtail our program. Safety is a full time, unrelenting job. We shall continue to work in the fields of appliance design and installation, to educate our users in safe practices, and to continue our inspection program to insure that all our customers can handle this concentrated energy called gas—and handle it with respect.

WOMEN'S SAFETY COUNCILS— THE BEST WAY TO THE MEN

by J. H. WILLIAMS
superintendent of safety, Texas & Pacific Railway co., Dallas, Tex.

We, of the Texas and Pacific Railway company, have found through study that an accident occurring to a member of a worker's family often is the direct result of the worker himself being injured, or by his mind being elsewhere, causing others to be hurt or causing damage to company property. This was my first real concern with home safety prior to the time that I became the safety officer of our company seven years ago while I was a division operating officer.

There have been occasions where it was necessary to relieve an experienced man of long service from duty immediately when an accident at his home involved his wife, mother or children, due to mental anxiety brought on by grief and worry. It was for this reason that as soon as I took over the responsibility of safety among our employees, I, together with our superintendents, gave serious consideration to doing something that might bring about desired results —"safety among our workers' families at home."

We knew that the women of our employees had to be reached and in such a way that they too, would become vitally interested in this subject and would assist us. The job was one that would require many people among our personnel if the plan was to succeed. With the help of our division superintendents we set out to encourage the organizations of T&P Ladies' Safety Councils at our terminal points where a sufficient number of our forces made their residence. These councils were to be made up of wives and mothers of our employees.

WHY WOMEN HELP

We felt that the women had three good, solid reasons for wanting to do what they could to help in the program by keeping things at home safe and pleasant so as not to ever send the menfolks off to work with a heavy heart and troubled mind. The wives, we knew, would cooperate because:

First . . . the man involved is the one that she loves and the one for whom she is most concerned.

Second . . . he is the father of her children, for whose safety she is also constantly concerned, and

Third . . her future happiness and well-being, and that of her children depend entirely upon his safety.

We were successful in getting these organizations started. At the beginning a few ladies, probably four or five, whom we thought would be interested, were asked to meet with us at a luncheon where we discussed the proposed setup, it being thoroughly explained that we did not expect nor desire that these groups take any part in our safety program among employees on the job . . . but to confine their efforts strictly to the job of eliminating accidents in their own homes and to do what they could toward encouraging the wives of other employees to do likewise . . . we pointed out why.

LADIES ORGANIZED GROUP

The small group immediately caught on and by circular letters addressed to all Texas and Pacific ladies in that particular town, signed by the four or five ladies who attended the luncheon, a meeting was called of any ladies interested, explaining fully in the circular what the conference would be about. To our utter surprise and delight they came in large numbers and were enrolled.

At this meeting, without any suggestions from the division superintendent or me, they nominated and elected their own officers and were furnished a membership card and a book of by-laws, and the regular monthly meeting place, date and time were decided upon.

As the councils at various points were organized, our company magazine carried the stories, and it was not long before groups in other towns were requesting such

an organization. We now have 11 councils at terminal points between El Paso, Texas and New Orleans, Louisiana, some with memberships running into several hundred, and most of them have been in existence for five or six years.

SOCIALIZING PROMOTED

We rarely hear of an injury in any of these homes because they meet monthly and discuss accident prevention and any accidents that might have occurred in the home must be reported for discussion. Another great thing that has resulted is that the men have fewer accidents at work. These organizations have been a fine thing in other ways, also.

The families occasionally get together for an outing such as a picnic or a party and they have formed great friendships where prior to the creation of such organizations they hardly knew each other at all. The really surprising thing that we did not expect is the part that these councils have played in safety throughout their entire respective communities. They have come to be recognized as an important organization and helpful public-wise.

I could go on and on telling you about their city-wide safety programs in the schools, their organization of baby-sitter clubs, their work with the state, county and local police departments, their city-wise bicycle safety contests, and work with the state and local safety organizations, and the many, many honors that they have received from persons in high station from the Governor down.

WOMEN BRING HONORS

For the past four years our company has been honored by receiving the coveted Public Safety Activities Award from the National Safety Council, which honor—for the most part—was directly the result of the work carried on by our Texas & Pacific Ladies' Safety Councils. Their activities have been most helpful from an employee and public relations standpoint.

They have used to a great advantage "Targets for Home Safety" which is distributed by the National Safety Council and which is reproduced in large quantities for their ready use. Much of the other material offered by the National Safety Council has been found helpful also. They receive a lot of help in the way of safety material from insurance companies, state and local safety organizations, and others.

They have written scripts and acted out the parts in colored, sound moving pictures on home safety that have not only been shown to our employees, but to the public as well. By the use of our Ladies' Safety Councils for these films and employing magnetic sound, the cost of such films have been kept to less than $100.00.

AID TO WOMEN'S WORK

These councils receive an unlimited amount of help in their work from ministers of all faiths, school officials, service clubs, newspapers, police departments, Chambers of Commerce, and from the state, county and city. Also leading doctors—particularly pediatricians—have helped them immensely. Any group of wives can do what they did, but they must receive proper encouragement and assistance.

Personally, I think it is a great thing, and so does our top management. In addition to helping in a small way financially, letters of encouragement are occasionally written by our Executive Officers to the heads of the councils, and to point this up I will quote a letter written to one of the councils by W. G. Vollmer, the President of our railroad, which reads:

> "I was given an opportunity to read the item in the Bunkie Record of Friday, October 7, about your big bicycle safety contest held on Thursday evening, September 29th, on the Bunkie Elementary School campus.
>
> "It gives me a lot of pleasure to extend congratulations to you, and to Mrs. Nelson and Mrs. Crouch, your co-chairman for this wonderful work. God bless you for your interest in it and in all mankind.
>
> Sincerely,"

Many letters of this type have been written to these ladies, complimenting their work, by our top management—and I must say that if any organization of this kind is contemplated by industry, it must have continued, enthusiastic support from the management of whatever company is concerned.

SAFE AT HOME

by WILLIAM V. KAHLER

president, Illinois Bell Telephone co., Chicago

(Presented before the Home Safety Conference Committee of National Organizations)

The telephone business started with a home accident.

Alexander Graham Bell—working in his rooming house laboratory—was trying out a new dilute sulphuric acid transmitter when he accidentally spilled some of the acid on his clothing. And as he called for help to his assistant in another room, "Mr. Watson, come here, I want you!" the transmitter in his hands carried his words as its first intelligible speech.

So far as I know, that is the only accident in any business that has been celebrated as a happy and momentous occasion. Ever since the telephone was invented—and made safe for all to use—safety has been the working creed of everyone in the telephone business.

For some 80 years folks in this country have been turning to their telephones when accidents occur in their lives. We're mighty proud of the reputation our operators, linemen—in fact all of our employees—have earned, over the years, for helping others in time of emergency.

TAKE SAFETY SERIOUSLY

In our handling of emergencies we take our safety seriously and that's why we take an active part in National Safety Council work. We hope that by so doing we will become increasingly conscious of—and better educated in—accident prevention and safety.

My interest in home safety is based on a practical consideration—which I'm sure motivates many other businesses, too. It is simply that in this country about half of all accidental injuries—and about a third of all accidental deaths—take place in the home.

Can we afford to be apathetic when we know that someone in this country is accidentally injured at home every seven seconds—that there is one fatal accident in the home every 17½ minutes? In one hour about 500 home accidents occur and 3 or more of the injured die because someone failed to form reasonably safe habits around the home.

ECONOMIC FACTORS

Aside from humanitarian reasons—which in themselves are sufficient to motivate us—the economic impact of home accidents is many times that of on-the-job accidents. Business men would be foolish indeed if they didn't do all they could to promote safety both at home and on-the-job—since in fact—these are times when fringe benefits are a considerable part of business payroll costs—and any improvement in the accident rate actually helps control the price of a product or service.

Perhaps some of you have seen this statement by James Cantlen, Vice President of Pacific Telephone:

> "For some reason, whenever people leave the job at 5 o'clock a big majority leave behind most of their training in safety. They rush down the stairs for the bus. They jaywalk. They do hundreds of foolhardy things to endanger their life and limbs. And they do it without thinking. In the average of the last 10 years, 173 Bell System employees have died in accidents off-the-job to 15 on-the-job, a ratio of about 11 to one. The dangers of just living seem to be greater than the hazards of working . . ." (at least in the telephone company).

And that 11 to one ratio of fatal accidents in the home to those on-the-job is more than matched by the less serious ones. In our company the ratio of all lost-time accidents is 13 off-the-job to one on-the-job.

JOBS SAFER THAN HOMES

These statistics—and I imagine they are representative of what happens in many other employee groups—all boil down to one simple fact: Our jobs are safer than our homes!

And that shouldn't be!

We have to admit to certain difficulties, however, as we look at the home safety problem. This emergency room record at Stamford (Conn.) hospital for one recent day suggests what some of them are:

A 4-year-old girl *injured in the ear* by a toothpick-wielding playmate.

An 11-year-old *struck in the eye* by an umbrella thrown by a playmate.

A 10-year-old boy *hit on the head* by a tin can.

An 11-year-old boy *broke an arm* playing basketball in his own back yard.

A 4-year-old girl and an 8-year-old boy *bitten by a dog.*

A 3-year-old girl *poisoned by a toadstool.*

A 3-year-old boy and an 8-year-old girl *sprained their wrists* falling from a tree.

A 9-year-old boy *stung by a bee.*

We can train an adult employee, but can we train a 9-year-old boy—or a bee?

MAKE MOTHER SAFETY LEADER

Busy as she is, can Mother add one more job to her manifold duties and responsibilities—that of Safety Supervisor? She's already the family chef, chauffeur, maid, and nurse—and goodness knows what else!

But in spite of these difficulties, the goal of this home safety conference is, I'm sure, no less than making our home life as safe as our business life.

As you work together for home safety, three areas of activity might be kept in mind:

INVESTIGATION
CONCENTRATION
INFORMATION

All of them must be keynoted by *coordination.*

Let's now look at three fields of opportunity where coordination can be applied.

INVESTIGATION

In a period of 30 years industrial management has cut accidents in half by eliminating accident causes. This excellent record of safety-on-the-job didn't just happen. It has come about because much investigation, research and analysis has been applied to individual accident occurrences. A similar opportunity exists in the field of home accidents.

Whenever a serious accident occurs in our business, we make a complete on-the-site investigation to determine all the contributing factors. This gives us the knowledge to educate and supervise our employees—to redesign tools—to change our work practices—as the case may be—so that a similar occurrence may not happen in the future.

A few months ago, an accident occurred inside our Cicero Exchange Building. A young apprentice cable splicer was identifying cable pairs at the top of a tall frame. He was standing on a rolling type track ladder, with both of his feet on the same step about eight feet from the floor.

NINE CAUSES OF ACCIDENT

Another employee was sweeping the floor around the ladder. In so doing, he moved the ladder sufficiently to cause the man on it to lose his balance and jump. He landed with all his weight on his heels. The result, the heel bones in both feet were fractured. He was off the job for several weeks.

Now this seems like a simple enough set of circumstances—and yet it was investigated and analyzed from every conceivable angle—to get at the contributing causes.

Nine factors were unearthed which combined to cause the accident—and nine recommendations were made to prevent a recurrence.

These recommendations—and all but two of them have been put into practice—involved everything from retraining our men in the use of rolling ladders—better use of ladder blocks—to best body position and other ways to provide greater body stability at the top of ladders.

Now I recognize that gathering facts from a family involved in a home accident takes some dedicated doing. But surely there is already pertinent information available in insurance company accident claim files—medical cases histories—and coroners' reports—so that a wealth of analytical material could be gathered. It seems we ought to get the material in these files in proper form for all to use. Coordination should make possible full utilization of this information, and our specific targets for attack are bound to emerge.

CONCENTRATION

In this phase we begin to use the products of investigation and analysis. If we are to be most productive in reducing home accidents, we should concentrate on those causes which contribute to our most frequent accidents—and also concentrate our efforts by proper timing.

Let's assume for the moment that *falls* perennially lead in home accident statistics. We would determine the period of greatest incidence of falls in the home and their predominant causes. We would then concentrate our efforts on a program specifically designed to prevent falls. We would review safety codes—standards—design deficiencies —explore manufacturing cooperation—and develop effective ways to strengthen our attack on this type of accident.

We would then have an opportunity to bring to the family group (1) a continuing consciousness of these particular hazards in the home and (2) specific seasonal messages to help in avoiding falls.

NEED GROUP EFFORT

Some years ago Illinois Bell mailed to the homes of our 2,000,000 customers an insert with the telephone bill, a home chart on first aid. I am certain that we went off on our own, either without thought as to the efforts of others, or proper timing, or proper emphasis on most frequent accidents, or any of the other factors of concentration. By hind sight, we would now most certainly want to merge our individual efforts (and I'm sure everyone else would) with consolidated group effort.

As an incidental thought about falls, I'm sure manufacturers would—if asked—cooperate by putting large safety reminder decals on ladders and appropriate signs on other appliances. Also, directions for using appliances and tools are so often ignored that decals could be put on the appliance, warning the user to "play safe—read the directions."

A concentrated attack on home accidents, supported by adequate investigative procedures would be of little value—it seems to me—without an imaginative public information program.

INFORMATION

The National Safety Council has among its membership such widely read publications as the *American Home Magazine* and *Practical Builders Magazine.* Suppose it enlisted the aid of other members of the press and folks in allied fields—organizations like the American Newspaper Publishers' Association—and the National Association of Radio and Television Broadcasters. Don't overlook the Advertising Council, and the Public Relations Society of America. I am convinced that—given the facts—they would all be glad to help in bringing vital home safety messages to the public.

And how about the artists—writers—and composers? Homes have always been a favorite theme of composers. Maybe we should write some new songs—and re-write some old ones—with safety as the theme.

SING OF SAFETY

"Home Sweet Home" might become "Home Safe Home" and "Home on the Range":

Give me a home that's not accident prone
Where the hazards are all stashed away
Where always is heard the right warning word
And the stairs are not cluttered all day.

Millions of impressions in trade papers—home magazines—on radio and television—all directed in unison at avoiding the same type of home accident—would have an indelible impact on many households—and I'll wager eventually would make a big dent in home accidents.

I'm convinced that industry would help, too, with your information program. I have already referred to possible use of Illinois Bell bill enclosures which go to some two million addresses. We also have an employee magazine which is mailed to the homes of our 44,000 employees 10 times a year.

Our company is one that stands ready to put these facilities to work in behalf of home safety, and I'm sure that many other businesses would help in this way, too, if they were asked.

We've found at Illinois Bell that employees and their families welcome Home Safety information and guidance.

SAFETY GLASSES AT HOME

As one phase of our on-the-job safety training we suggest that employees who are "do-it-yourself" fans borrow their com-

pany's safety glasses when doing any work around home involving a potential threat to their eyes. This program has already paid off. There have been at least two cases this year where employees followed our suggestion and avoided serious damage to their eyes. Pictures in our files showing cracked safety glasses are dramatic evidence of the effectiveness of this kind of safety training and practice.

Recently we gave certain groups of our employees refresher courses in automobile driving and suggested that they take printed pieces home to be read by other members of the household. One employee had this interesting reaction:

> "My wife believes this type of program is better than the group insurance. For some reason she would rather have me than the money."

Whatever methods and media are used, I'm convinced that any message on home safety must have imagination and punch.

HOME SAFETY WEEK

You could launch a National Home Safety Week. If we already have too many weeks, maybe we could hitch on to one that's already well established and call it National Fire Prevention and Home Safety Week.

I've looked into a specific or two—and I wonder if there may not be opportunities to look at home safety from a longer-range information and education viewpoint.

Again realizing we're dealing with an already overworked person—can we persuade the housewife-of-the-future to be more safety conscious than her mother or grandmother? It is encouraging to find—for example—that *in our Chicago high schools*, girls in home economics learn safety practices as an integral part of sewing—cooking—and home decorating classes.

Girls learn not only to concoct a tasty stew—but also how to do it without scalding themselves. Perhaps there are other schools in the country that are less mindful of the future housewife's role in home safety. And if there are, there is work to do!

FIRST AID TRAINING

Here's an idea which is certainly not new—but I'm impressed by the fact that experience has shown persons who have completed a *first aid course* are more *likely* to have better safety attitudes and fewer accidents than those who haven't. Is it possible to make first aid training even more widespread than it is?

Perhaps I am talking directly to Red Cross people when I make the suggestion that block or neighborhood first aid classes for parents could be organized on a wide scale. Enlist the interest of a key family in the neighborhood to invite their neighbors into their home to learn first aid. Such a neighborhood party, which can rotate month by month, *might be the* motivating urge.

This idea assumes a sufficient supply of first aid instructors from the Red Cross or other sources—firemen—scout instructors—industry trained people, etc.

I learned that in one of our outstanding engineering *schools, there are actually* sequences on safety; however in some schools of engineering the teaching of safety and design for home safety depends largely upon the individual instructor. Can more be done in this field? After all, who should be more mindful of safety than our engineers of *tomorrow*—*who will* design our structures and appliances.

As we look at the many ramifications, we can all agree that improvement in home safety will not come easily. It will require imagination and hard work.

COMMITTEE ORGANIZED

Investigation—concentration—and information—and all other aspects—require workable coordinating machinery to be effective.

Wisely, a "Committee of National Organizations" has been set up to explore the means of strengthening home safety activities through the coordinated efforts of interested national organizations. Such a committee can be the seed that will grow into an effective national effort—if everyone will provide the necessary nutrients.

You are the *policy makers*—the steering committee—and the rich source of ideas and facts. But I have found in my business that matters as complicated as home safety require a point of centralized staff responsibility.

Fortunately, you have that, too, in the National Safety Council Home Safety Division.

You in the Home Safety Conference have the respect and support of all persons interested in Home Safety. Collectively you represent millions of people whose joint efforts —if directed and focused—can save many human lives—most of them children.

And what greater work could any of us do?▲

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where ere we go
Regardless of amounts.
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

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Volume 11

GREEN CROSS FOR SAFETY®

INDUSTRIAL SAFETY

Transactions of the

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The three day series of lectures entitled Accident Prevention Fundamentals, sponsored by the American Society of Safety Engineers, has been published in a special volume, *Basic Steps in Accident Prevention—volume 3 of the 1957 Current Safety Topics.*

LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

ASSE SUBJECT SESSIONS

This volume is a record of the subject sessions sponsored by the American Society of Safety Engineers at the 1957 National Safety Congress. The conduct of these Congress sessions each year is only one of the many cooperative activities which the ASSE carries on in behalf of its members, and for the benefit of accident prevention work in industry generally.

ARE TRAFFIC ACCIDENTS CRIPPLING YOUR INDUSTRIAL SAFETY PROGRAM?

OUR AUTO FLEET DRIVES FOR SAFETY

by E. J. EMOND
director, Automotive Safety, Armour & co., Chicago

We make sure our auto fleet drives for safety. We select our drivers carefully, educate them in traffic safety and guard their physical condition. We maintain a safe driving incentive program, develop safety standards, work methods, equipment and create safety facilities incorporating all the latest innovations. We constantly create and maintain interest in automotive safety to insure understanding and conformance to safety standards.

We know how much an accident involving our driver and vehicle costs—our carefully compiled statistics graphically illustrate the costs, hidden and direct. Our fleet drives for safety because we know how much it costs in dollars and cents. What it costs in tears and suffering, we can only guess. We watch our company drivers and our accident frequency closely to stifle quickly any increase in accidents and costs.

We will not tolerate traffic accidents in our business, but we certainly do tolerate it on our highways. And this inefficiency off the job reflects itself in our profit-loss column whether we are aware of it or not.

For example, four of our cattle splitters get together for a gay evening. On the way home, they have a traffic accident and can not come to work the next day. You cannot put the cleavers they use in the hands of an inexperienced man. If four of our key men are absent—work in the beef kill is crippled to a standstill, and this setback is reflected throughout the entire plant. This is an obvious leakage in our profits—but what about the other leaks?

Time is lost as other employees stand around excitedly discussing the accident. Production time is lost not only from manpower, but because of idle equipment. Time is spent by the personnel department, payroll departments and insurance departments, filling in forms and checking records.

Time is lost in training fill-in help or new help to replace the injured employees and finally, even when the injured employees return to work. Because they are not paid their full salary while away, they often return before completely recovered, and their productivity is much slower than normal.

ACCIDENTS ARE EXPENSIVE

Based on a conservative estimate of $2.00 an hour, and without including the hidden costs, the industries in Chicago lost seven million dollars in 1956 from off-the-job accidents. For every $100 an employee loses in wages because of an off-the-job accident, industry loses $1,000 in production costs.

Traffic accidents are a big factor in absenteeism. They cost more lost time, are more severe, more frequent and result in more fatalities than any other type of off-the-job accident.

Last year, the highways killed seven times as many children as did polio. We have the Salk vaccine now for polio, but how can we be vaccinated against traffic accidents? An eternal traffic accident prevention program of unremitting education, strong appeal and stimulation, administered with the zeal of an evangelist and planned analytically like a military battle, is our vaccine against automotive accidents.

Traffic safety must be taught, instilled and developed by organized effort. Who is more organized and better equipped to institute and administrate a strong traffic safety program than industry? It is the obligation of industry to incorporate a traffic accident prevention program with industrial accident prevention, because management speaks with authority.

An employee is a captive audience. He comes to his job rested, refreshed, ready to go to work. It is the best time and place to inoculate him in safety on the job and off the job. Safety should be built into the mind and habits of drivers and pedestrians through education. A traffic accident prevention program conducted on the job will be carried into the home where safety habits will be instilled.

THE ALL-TIMES PROJECT

When a child begins to walk, we should begin his safety education. A respect for traffic should be ground into his subconscious. When he is old enough to get his two-wheeler, he is old enough to learn the traffic laws. Before he is allowed to sit behind the wheel of that lethal weapon, the automobile, he should have been so steeped in safety from infancy that the safe way will be the only way he will react.

You may say to yourself, "Why, our firm warns its employees about traffic safety. Every holiday, we put up the appropriate posters." But traffic safety education is not just for holidays, vacations, or Christmas; it is an ALWAYS, ALL TIMES project. Every item in an industrial safety program can be applied to a traffic safety program. It is our moral duty to use them, not only in our plants, but also included in the traffic accident prevention program.

There are many other ways for industry to cut the accidents on our highways. Industry and business should be represented by management in the safety organizations of their community. It is a wise investment since traffic accidents and violations have such a large influence on our job attendance.

When community traffic safety programs are supported year-round by industry, lives are saved, injuries reduced and industry has benefited. It can help itself and its community by financial contribution, by loaning its top safety men to local organizations, by offering its engineers to build safety into streets and highways, by working on committees and in other ways supporting the crusade for safety.

Industry should also support official activities if only for self-preservation. It should, for instance, back a courageous judge in his battle against a traffic violator who might be an employee. It should come out for stricter licensing, traffic legislation, better law enforcement and engineering improvements to protect itself against the unsafe acts of other vehicle operators and pedestrians. When we show consideration for the safety of others, we are also protecting ourselves.

We must do our utmost to remove from highways the individual who has been making our employees into statistics of traffic accidents and fatalities. These can no longer be titled "accidents." As stated at President Eisenhower's Highway Safety Conference, they are murder! A vehicle improperly controlled is an instrument of destruction!

INDUSTRY CAN BE A LEADER

Industry is morally responsible to be the economic and social leaders in the community, the state and the nation for backing the campaign for off-the-job safety. They should bring prestige to the program by lending their names to it. We are very proud of our individual products and their quality. We have quality control departments to maintain the top quality of our "brand." We should apply these reputations to the traffic safety program, so that our company behind the traffic safety program will bring the same assurance and dependability to the program as it does behind our product.

As in any enterprise, teamwork is the secret of success. What greater team is there than American Industry? We proved it when we teamed together to win the war, now we must team together to fight a larger, seemingly endless war—the war on traffic accidents—death—murder on our highways.

COMMERCIAL VEHICLE SAFETY CAN BE IMPROVED

by KARL SCHULZE
senior safety engineer, Western Div., Standard Oil co., San Francisco

Through contacts with the industrial safety engineers in the American Society of Safety Engineers, and observation of the injury statistics that are available, one can't help but conclude that engineers aren't doing the job they are capable of doing.

"Accident Facts," published by the National Safety Council tells us that motor vehicle accidents cause about one-fifth of all industrial deaths. No other source of deaths is as large. In California, which has more vehicles than any other state and probably uses vehicles more in industry than most states, the figure is considerably higher. Approximately 40 per cent of all industrial deaths in California result from motor vehicle accidents. No other agency even reaches 10 per cent by comparison.

In the petroleum industry, motor vehicle accidents are the leading cause of deaths, causing about one out of every four.

The statistics prove that the industrial safety engineer has a problem with motor vehicles he may not recognize and doesn't appear to be solving.

Can he solve it? I think so. That brings up the question, "What tools should all of us be using to solve this problem?" I would say, "You should use the same tools to solve your motor vehicle problem as you used to solve the rest of your injury problem."

TOOLS FOR PREVENTION

A couple of years ago a survey of education activities being carried on by a representative group of companies in the oil industry showed the following:

● Only 64 per cent of the companies occasionally distributed special literature on safe driving to their employees. Yet, everyone knows that a well-balanced safety program uses these education materials all the time. Literature on safe driving is available almost everywhere, much of it free. The insurance companies, the safety councils and the state departments of motor vehicles all are sources of this material. Set up a schedule in your organization and do some of this educational work.

● Only 61 per cent hold periodic safety meetings on safe driving. Here is another well-known medium that only a little more than half the companies are using. Certainly, again, the material for meetings is not hard to secure. Film strips and movies are available from many sources. Speakers are also available from the safety councils, highway patrols, safety societies—the sources of material are endless.

● Only 50 per cent use their house organ to carry the message of safe driving by means of articles, pictures, statistics, or other features. Now I know not every company has a house organ, but only half of those that do are using it for this purpose. Some editors may tell you that safety isn't newsworthy, yet surveys by responsible organizations have shown great reader interest in safety articles that have been prepared by smart editors.

HALF TEST DRIVERS

● Only 50 per cent give their drivers vision or other psychophysical tests. This may sound expensive or difficult, but it is not. A very useful, impressive set of equipment, including such tests as an eye screener, side vision test, color test, and coordination and reaction time test, can be had for $800. Some outfits are available for even less.

● Only 50 per cent give their drivers road tests. Now here is a funny thing. A big rig, such as a diesel tank truck and trailer or a full truck and trailer, may cost thirty or thirty-five thousand dollars, yet companies send employees out with these investments, and they haven't even checked to see if they know the clutch from the steering wheel.

● Only 46 per cent have some sort of rule book, safe practice handbook, or other published standards for the guidance of their drivers. What a wonderful out for the driver involved in an accident—"Nobody ever told me." Even if it's only a few pages of mimeographed material, we should give our drivers something to guide by, and it's wonderful material for discussion in safety meetings.

● Only 43 per cent use the National Safety Council or other posters on safe driving. Posters have long been recognized as one of the staples in a safety program. While we may sometimes wonder about them, many surveys have shown them to be an effective medium of very low cost.

● Only 36 per cent have Safe Driving Award Programs. Awards are controversial, yet I know of companies with fine rates, and almost their entire program is based on the National Safety Council Safe Driver Awards—a very inexpensive way to carry on an effective program.

FEW PUBLISH STATISTICS

● Only 11 per cent publicize their accident statistics to create interest. I don't know how you can get anyone to try to do better when they have no measure of where they stand or any progress they might make. In my own company, we spend quite a bit of money to put out our statistics in a nice printed pamphlet, and you will notice that the motor vehicle experience gets the same space and importance as the injury experience.

● Only 7 per cent use dash board cards or stickers. Cards or stickers are a very cheap, effective means of getting over a safety message. You can buy them from the National Safety Council, trade associations, or make them yourself. It's hard to understand the neglect of this effective medium.

There you have it, a survey of companies with good rates that are making progress, yet the highest percentage on any one item was only 64 per cent.

I would suspect that the same figures would hold not just for the educational part of the safety program, but to all the features of a complete Motor Vehicle Accident Prevention Program.

GOOD PROGRAM ESSENTIALS

A complete Motor Vehicle Accident Prevention Program would have all these features:

1. Proper testing, selection, and hiring of candidates.
2. A Driver Training Program for new hires.
3. A Driver Training Program for in-service drivers.
4. A procedure for thoroughly investigating the accidents that do occur.
5. A Repeater Program for those who become involved in accidents, with retraining, counseling, and the setting of goals of achievement.
6. A record system for keeping track of the accidents and developing proper statistics on frequency, types, basic causes, mechanical condition, and all the other factors which may influence types and frequency of accidents.
7. A record system for keeping track of the individual drivers and their performance.
8. A complete general educational program as already discussed, for maintaining driver interest, based on the statistical information developed regarding basic causes and types.
9. An award system.
10. A Supervisory Training Program so that the entire program can be effectively carried on.
11. A Vehicle Selection and Maintenance Program that provides adequate, safe vehicles in good mechanical condition.

To sum it up, the well-known tools will get the job done. Were we to adopt and use these features to the fullest, we would then have effective programs. We might then, in fact, have truly safe transportation. We would be "Backing the Attack on Accidents."▲

WHAT IS THE INDUSTRIAL SAFETY ENGINEER'S RESPONSIBILITY FOR MOTOR VEHICLE SAFETY EQUIPMENT?

by W. F. BROWN

safety director, Consolidated Edison co. of New York Inc., New York city

A recent sampling of the Motor Transportation Industry shows a frequency rate of disabling injuries of 24.02. Assuming that this sampling was large enough to be statistically significant, this places the industry in 40th position and Marine Transportation in 41st, or last place.

The automobile is one of the greatest killers of all time when it is unsafe or in unsafe hands. In each of the 40 major industries, a large percentage of accidents arises out of the operation of motor vehicles and auxiliary equipment. The problem is worthy of the best efforts of safety people everywhere.

THE SAFETY ENGINEER'S PLACE

The 1957 edition of "Accident Facts" shows that 3,000 (21 per cent) of the 14,300 occupational deaths were in the motor vehicle classification. If we added all the fatalities which occur as a result of faulty auxiliary equipment of motor trucks the percentage would be considerably higher. A sampling of 23 states shows 8 per cent of all vehicles in accidents had unsafe conditions such as unsafe brakes, improper lights, unsafe tires and unsafe steering mechanism.

"What is the industrial safety engineer's responsibility for motor vehicle safety equipment?" The answer is that the industrial safety engineer is responsibile for motor vehicle safety equipment to the same degree that he is responsible for any other safety equipment. As a staff man he is not responsible for the procurement and functioning of any equipment. This is the direct responsibility of the operating manager or supervisor of the activity. In other words, the safety engineer is not responsibile for accidents, but is responsible for the promotion of accident prevention. It is the safety engineer's function to inform and advise the transportation executive in all matters pertaining to safety, including motor safety equipment.

The equipment included in motor vehicle safety equipment — hand and foot brakes, headlights, directional signal lights, stoplights — are some of the most important safety devices and are usually regulated by state or federal laws. In some states they are inspected periodically and required to meet a predetermined standard under penalty of law. Every industrial safety engineer should have a working knowledge of the motor vehicle safety laws. These laws differ among the 48 states and there is a great difference in the degree of compliance and enforcement.

The horn, when used for warning purposes and not to express irritation, is an important safety device required by law. Its use, in many cities, is restricted to dangerous situations.

The fire extinguisher, if one is required, must be ready for immediate use. There is nothing quite as useless as an empty extinguisher when the vehicle is in flames.

Safe tires, with sound sidewalls and adequate treads, are important factors in any safety program. Where snow and ice is a problem, skid chains provide a margin of safety within their natural limitations of reduced speeds.

MOTOR VEHICLE SEAT BELTS

The big question today is whether or not to install safety belts in passenger cars and trucks. The automobile seat belt is intended to offer protection to the person in the vehicle at the time of a collision, either broadside or head-on or of an upset or roll-over.

Wearing safety belts does not insure freedom from injury in motor vehicle collisions, or plane crashes. But they minimize the injuries by preventing the wearer from being thrown out of an opened doorway and by

reducing the impact of his body against the dashboard or windshield. Of course, in a head-on collision or striking a tree at excessively high speed, no belt will prevent serious injury or death.

The following is an excerpt from our safety bulletin on auto seat belts:

"The belt, one for each individual, is securely anchored to the vehicle floor or chassis at its two ends, the straps passing between the seat and the back rest at about a 45 degree angle to the horizontal. The two straps are joined in front of the person's body with a special friction-type buckle with a quick release such as on aircraft seat belts.

"The belt is brought up both sides of the rider and buckle snapped, then the take-up is adjusted until the belt is comfortably tight. (The tighter, the better at the time of a crash.)

"The belt should hold the body by the lower abdomen and the hips, not by the softer parts of the body at the waist line. At the instant of impact, a person without a belt will be thrown forward and strike the dash or windshield with his head, the entire weight of his torso being thrust against his neck. When wearing a belt, if his head does strike, it will be only with the force of the head alone.

"The belt, the buckle and the anchorage all are of sufficient strength to withstand the force of 3,000 lbs. Also, if the vehicle is overturned, the buckle should be released by a finger pull on the latch of only 45 pounds even though a 250 pound person is suspended by the belt.

"The rider is warned when alighting from the vehicle to make certain that the strap does not hang out of the car where it may be damaged by being squeezed between the door and the sill. Self-retracing belts are now available.

"Although seat belts serve a very definite purpose, especially where vehicles are operated at relatively high speeds such as on parkways, no blanket installation of these belts is contemplated. The safety bureau will, however, approve their installation if requested by the department using the vehicle."

There are several other types of equipment or devices which have an important safety factor. These include devices to improve the driver's ability to see, such as proper windshields, free from stickers, and properly functioning windshield wipers, adequate rear view mirrors, properly installed, and easy to adjust headlight-dimming equipment and back-up lights.

DRIVER'S ABILITY TO SEE

Devices to permit others to see the vehicle also have an important bearing on safety. A light color paint provides greater visibility than dark paint, so we changed our vehicles from a dark gray to a bright orange. Larger and more powerful warning lights and reflectors, and reflecting material on rear and sides of vehicles also provide a greater factor of safety.

Serious hazards on the highway are weak directional signals which cannot be seen by drivers until too late to avoid a rear end collision. This is especially bad when the signal lens is dirty and is competing with brilliant sunshine. To make it worse, the driver signaling for a stop or turn believes he is doing everything required and therefore develops a false sense of security.

Devices intended for emergency use include safe jack, flags, emergency lights, tow rope and chains, first-aid kits. These are certainly of great concern to the safety engineer.

One of the basic fundamentals of a motor fleet safety program is the proper selection and adequate maintenance of vehicles to insure maximum safety and efficiency of both vehicle and driver. The safety engineer has the opportunity and the responsibility to advise and assist management in this matter.

Accident investigation, when properly conducted, usually suggests a remedy to prevent recurrence. The safety engineer has access to channels of information—insurance companies, safety councils, police authorities and others, which can be of great value to the fleet supervisor.

RELIABILITY OF BRAKES

A recent accident was caused by a rupture of the flexible hydraulic hose to the brake cylinder. This hose is subject to rapid deterioration and failure from higher pressures and higher temperatures. The best grade of hose is, therefore, the cheapest in the long run.

In a recent issue of *Society of Automotive Engineers Journal* there is a statement which is tremendously important to safety engineers and safety-minded fleet operators everywhere. It says "Brake fluids with low boiling temperatures are potential highway killers." That is why S.A.E. is recommending for safe motoring use only heavy duty 70R-1 brake fluids.

The statement continues—"Moderate duty brake fluids are no longer considered safe for modern, high-speed vehicles, so the S.A.E. has dropped the 70R-2 brake fluid specification from the Handbook. It is hoped that this action will guide state legislatures in passing laws prohibiting the sale of brake fluids which do not meet the S.A.E. specification of 300° F. minimum boiling point. Seven states, Minnesota, Georgia, California, New Jersey, North Carolina, South Carolina and Tennessee prohibit the sale of any brake fluid not meeting S.A.E. 70R-1 heavy duty specification.

"Main reason for the action is that today's vehicles are placing heavier demands on braking systems. Increased horsepower, automatic transmissions, smaller wheels, and smaller brakes all contribute to increasing the heat generated in brakes when stopping a car. For example, a 4,000-pound car, when repeatedly stopped from high speeds, may generate fluid temperatures of 250 F. or more from friction between brake linings and brake drums. This heat is transmitted to the wheel cylinders containing brake fluid. If this fluid has a low boiling point, the 250° F. heat may vaporize some of the fluid and cause brake failure.

HEAVIER VEHICLES AND SMALLER WHEELS

"Changing from open wheels to solid disc type, reducing wheel size, increasing width of rims and tires, placing brakes completely inside the wheel, lowering and streamlining the car bodies, adding fender skirts, improving heat resistance to brake linings, adopting automatic transmissions, and increasing the weight of the cars have increased the temperatures to which brake fluids are subjected.

"When fluid reaches its boiling point it starts to vaporize. Gas pockets or bubbles are formed in the top of the wheel cylinders or in the brake fluid lines. The vapor is compressible, so when you step on the brake pedal the pressure is absorbed instead of transmitted through the fluid to the brake shoe. Thus, the vehicle may not be stopped in time."

Recently one of our top executives had a serious accident in Florida resulting from brake failure caused by either fluid vaporizing or "phantom failure" due to heavy traffic brake applications. He is now using heavy duty brake fluids. There is still plenty of light duty fluid on the shelves of service stations all over the country.

75 POUNDS OF AIR IN A TRUCK TIRE CAN KILL!

"Death sometimes sets weird booby-traps for even the best mechanic.

"It was the evening of December 9th, 1954. One of our huge manhole cleaning trucks was in the garage with a curb-cut in its right rear outside tire. A simple routine job for two men with many years of service in the transportation department.

"They jacked up the truck and let the air out of the damaged tire. They removed the six nuts and two of the lugs that held the dual tire wheel assembly together. As the third lug was about to be removed something exploded. The tire shot forward hurling the mechanic backward. He lay unconscious on the garage floor. An ambulance rushed him to the hospital and three days later he was dead. His skull had been fractured.

DUAL ASSEMBLY

"The dual tire assembly is a mechanically logical and sound device. But like many other mechanical devices, it can and did go wrong. This time with fatal consequences.

"The defective lock-ring on the inner tire opened but the tightness of the assembly held it in place. When the pressure was released, the ring sprung and the inner tube could not contain pressure and it blew out.

"There are ways of preventing such accidents. We are checking all such tires in use or in storage. From now on all lock rings and rims must be unquestionably flawless. Until such time as a better method is developed to guard against this sort of accident, mechanics have been instructed to thoroughly deflate both tires of a dual assembly before starting to remove a tire."

Recently a heavy truck was involved in a serious rear end collision. The investigation revealed that the brake assembly made contact with the accelerator assembly at the exact moment the driver attempted to stop at a traffic light. Obviously, this is a matter of great interest and concern to the industrial safety engineer.

THE DRIVER TRAINING COURSE

This Training Course method has been a most effective means of obtaining the cooperation of drivers and mechanics to keep the vehicle safe. It is important that every driver have a general knowledge of how the power of the motor vehicle is developed and how it is transmitted to the wheels. Even though the driver is not expected to be a mechanic, he will, if he has some knowledge of the construction and functioning of the various parts, be more likely to keep his vehicle in the best possible operating condition, be less likely to strain or otherwise abuse his vehicle, and be better equipped to detect and report vehicle faults in their earliest stages.

It is the obligation of every company driver to perform the "7 Point Vehicle Check" before taking a vehicle on the road. So that this check will mean something to him and so he may recognize other types of erratic vehicle operation, a treatment of the basic mechanics of the vehicle will be given. This explanation will include a working knowledge of:

1—Brakes—how they operate.

2—Clutch—proper use of—how it is sometimes abused.

3—The Steering—its importance to safe operation.

4—Ignition—the electrical system of the vehicle.

5—Cooling system—its importance in relation to operation.

6—Lubrication—its importance.

7—The engine—how it operates.

8—The instrument panel—what does it tell?

9—The accessories—lights, horn, windshield wipers.

10—Exhaust system.

The alert safety engineer will take all necessary steps to insure the safety of auxiliary equipment which is a functional part of the vehicle and not a part of locomotion. Safe tow bars with secondary chains, properly designed safety props for dump trucks, wheel chocks and hydraulic stabilizers to keep the vehicle stationary, and many more items from the general safety environment of good vehicle operation.

AMERICAN STANDARD INSPECTION REQUIREMENTS

One of the most effective steps taken in motor vehicle safety is the development of the American Standard Inspection Requirements for Motor Vehicles D7-1-1956, approved and newly published by the American Standards Association.

This code is intended for use by inspection stations in states where regular inspection is required by law. It is also recommended to fleet owners, school and city buses, taxicabs and even owners of private cars.

Every industrial safety engineer should obtain a copy of this new standard and take the necessary steps to put it to use in his own firm.

The safety engineer is charged with the responsibility for organizing, stimulating and guiding the accident prevention program. If he is smart he will not overlook the problems of automotive safety equipment, or safe automotive equipment. This will have a beneficial effect on both the industrial accident record and the vehicular accident experience of his firm.

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MOTOR VEHICLE AND SAFETY MEASURES AND DEVICES—

What Can the Safety Engineer Support and Recommend?

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Broadly stated our way of life is characterized, in one respect at least, by our attitude of not remaining satisfied with any of the devices we use on a daily or even less frequent basis. This situation is mirrored by our continuing attempts to improve almost everything we use. Superficial examination would lead us to the conclusion that we have contrived to bring about a nice balance.

A more conscientious examination forces us to conclude that all is not well, however, in that we have not yet found out how to bring some of our larger problems into proper focus or, therefore, to subject them to rational evaluation. If we agree that these problems should be evaluated and ordered, then we must further agree that the longer we go on without doing so, the longer we are postponing the solutions. Within this general concept, motor vehicle traffic safety constitutes one of our most perplexing problems.

FAILURE IN STUDY OF MAN

During the past 40 years or so we have devoted discernible effort to research but in large measure it has been concerned with the physical sciences. Neglect, on the other hand, is more nearly descriptive of the effort in the life sciences or more properly, perhaps, in those areas of mobility where interactions between man and his environment are of prime importance.

Notwithstanding the upsurge in effort engendered by the needs and threats constantly confronting us throughout World War II we failed with the return of peace (however uneasy that peace might be), to recognize the need for employing adequate resources on the study of man. Consequently, we know all too little about his motivations, needs, capabilities and limitations in different roles in various dynamic environments.

In the matter of design for optimum safety performance there is substantial evidence to indicate that man is in the most compatible environment when he is in the workplace. This evidence, in part, consists of the record of improvement in conditions relating to health and safety during the past 50 years, and also by the year-in and year-out better safety record of the workplace compared with the records of other principal environments.

There is, however, at least one notable exception. When the workplace is behind the wheel of a motor vehicle on a public thoroughfare, the over-all safety record deteriorates; it does so because the operator is much more of a free agent than he is in almost any other work environment.

Even though less accident prevention control can be exercised over commercial vehicle drivers than is exercised in most other work situations, the control is nevertheless much greater than is presently feasible over the private passenger car driver. In the commercial category the selection, testing and training processes are quite well developed. Beyond this a variety of operational checks are utilized.

For example, many of the heavier vehicles are equipped with recording devices that furnish a profile of the vehicle's movement and speed ranges—starts and stops and the duration of the stops—and, therefore, of

the driver's performance. In the case of the vast majority of private passenger car drivers, the selection factor is non-existent, the testing is on a minimum basis, and training is predominantly in the form of self instruction on a trial and error basis after licensing. Parenthetically, we should point out a notable exception in the training area; this consists of the ever-expanding training function in driver education and training programs in our secondary school system.

RECORD VEHICLE MOVEMENTS

The continuous control exercised over drivers by recording instruments of appropriately equipped heavy vehicles is completely missing in the case of passenger vehicles and in most of the lighter commercial vehicles. But there are still other forms of broad control over the operation of light commercial vehicles including company owned passenger-type cars. One is the rate of fuel consumption, i.e., miles per gallon; another is the maintenance check coupled with the record of maintenance costs.

Before taking up specific safety devices we should like to discuss some further impressions and observations. Among traffic accident researchers a not inconsiderable number believe that continuous and adequate control of the present-day vehicle is beyond the capacity of the average driver. Of course this belief must be viewed in proper context, i.e., in the everyday driving environment in which occur incidents over which the driver has little or no influence as long as he elects to be in a driving situation.

WHAT CAN BE DONE?

If there is even a modicum of truth in the belief that the control demand of the automobile is beyond the consistent control capabilities of the driver, we might well ask what should be done about it? It seems crystal clear that there is no one panacea and equally clear that as a practical matter in this day and age it would be a waste of time to search for one. But there are many things we can do, as can be illustrated with an example. This example portrays both a deficiency and a belated corrective action, although credit rather than discredit accrues to the authorities who took the corrective action.

Some years ago a new type of highway facility was made available to the motoring public. Such a facility is variously called a freeway, an expressway or a throughway, depending upon the section of the country in which it is located. To guard against misunderstanding we should perhaps make it clear that we are referring to high-speed roadways having fully controlled access and no intersections at grade. Just how were motorists introduced to these new type facilities?

In general it was through publicity informing them that average speeds would be much higher than before, that congestion would be eliminated or greatly alleviated, that safety would be greatly increased, and that new low levels of economy in car operation would be attained. Few of these goals have been attained to the extent originally visualized and some not at all. There is increasing evidence that the congestion was merely transferred from one kind of a facility to another.

FREEWAYS REQUIRE NEW SKILLS

There is widespread agreement that the driving task on one of these high-speed facilities is quite different from that on any lower class of facility. This is to say that we need new skills in the form of keener exercise of judgment, sharpening of anticipation and higher levels of attention to the task. These are characteristics that can be improved through education and training. But during the years these new type facilities were being planned and built, no attempt was made to utilize such education and training to prepare the public on how best to use them.

Earlier we indicated that some authorities (actually two in this instance) had taken remedial action for which they are certainly to be commended. However, neither authority is a designer of the system treated and it is the thesis of the authors that the designer of any enginering product must bear responsibility for prescribing the rules governing its use.

It would seem to be quite clear that the people best qualified to promulgate the "rules of the road" are those who design and operate the road systems. This would be a combination of state highway departments (and their counterparts in county and city jurisdictions) and state departments of motor vehicles. Thus far, for the most part,

such agencies have not been able to interpret their legislatively granted authority to include responsibility for adequate dissemination of user rules. The lack of such logical activity has resulted in the assumption of responsibility for the task by a large heterogeneous group of official, quasi-official and private organizations some of which are in direct economic competition with each other.

In no sense are these remarks to be construed to mean, however, that the public school system does not have an educational function in the matter. On the contrary, it has prime responsibility for including all proper aspects of the task in the formal educational process. It is gratifying that this is being done on an increasing scale.

NEW SAFETY DEVICES

Education and training are not, of course, the only means at our disposal, but they are present, or should be, in some degree in all other accident prevention or injury mitigating measures. Another means lies in the use of safety devices. Here, however, we enter into an area that has long been characterized by controversy. It will now be our purpose to appraise a number of safety innovations that have been introduced by automobile manufacturers during the past few years.

Although we do not propose to discuss all of them in great detail, these innovations include safety door latches, padded dashboards or instrument panels, safety rear-view mirrors, dished steering wheels, torsion stabilizers, seat belts and others. Somewhat earlier the automatic transmission was introduced and although it would be difficult to evaluate its contribution to safety it certainly increased the efficiency of the large number of drivers who had recurring difficulty with the manual gearshift.

Safety Door Latches

A strong case has been made for safety door latches. Clearly they should be standard equipment on all motor vehicles, from the lightest to the heaviest. The lighter the vehicle the greater the need and the greater the potential benefit. In accordance with the philosophy of the industry we may confidently expect that door locks will periodically be further improved.

Padded Dashboards

Padding of dashboards or instrument panels is a step in the right direction and there would now seem to be a good understanding of the desirable characteristics of the materials used for padding. Earlier, sponge rubber and a variety of other next-to-useless materials were proposed and in some cases actually used. Basically, the material used should be energy dissipating, not just energy absorbing, and uniformly yield but stay in continuous contact with any part of the human anatomy impacting it. Clearly, too, the resistance offered by the material must not result in a "G" loading above the tolerance level of that part of the anatomy contacted. Complete restitution is also desirable but this must not be obtained through any compromise with the first stated requirements.

Dished Steering Wheel

Although the dished steering wheel has been evaluated as an improvement, designers have a long way to go in reducing the injury potential of the steering wheel and column. There is an immediate need to eliminate from the steering wheel all knife-like edges, decorative plastic cups (such as on those on the tops of some columns) and all pot metal components whatever their purpose. Eventually, the steering wheel and column, as we know them today, will have to be eliminated or, possibly, the column will be designed to yield under some predetermined loading without rendering it ineffective for its prime function.

Torsion Stabilizers

Torsion stablizers not only add to the comfort of car occupants but, more significantly, prevent certain distractive motions of the car. Thus, the driver is less likely to have his attention momentarily diverted from the driving task and, therefore, less likely instinctively to attempt some incorrect or dangerous maneuver.

Seat Belts

Beyond much doubt seat belts or, if you prefer, safety belts are the most controversial of all safety devices applied to automobiles in recent years. Inasmuch as we, the authors, have devoted a good deal of research effort to the design and evaluation of seat belts and other restraining configurations, we shall discuss certain aspects of such restraints in some detail.

During 1955, veritable rash of articles on seat belts appeared in periodicals ranging from top level professional journals like the American Medical Journal and Bulletin of the American College of Surgeons, to the popular mass media variety. These were augmented by a relatively larger number of articles in daily and weekly newspapers, another segment of the mass media. Throughout 1956 and up to recently in 1957, the argument has continued more or less unabated. During this same period a number of pertinent research papers or reports have been published, as well as factually based information bulletins.

RESEARCH OF SEAT BELTS

In the case of our own organization, the Institute of Transportation and Traffic Engineering of the University of California, we published during 1955 and 1956 a number of research papers on seat belts and other force moderating devices or principles. These augmented previous publications or presentations covering Automobile Collision Injury Research we commenced in 1949.

A discussion of seat belts generally includes some reference to anchorage requirements. It should, but often does not, also include consideration of seat configurations and anchorages. In all but the low-speed collisions (under 15 mph, into fixed barriers, and car-to-car closing speeds below 30 mph) in our experiments the seat anchorages of manufacturers proved to be inadequate.

Our objectives included the discovery of basic information covering the nature and extent of the force systems impressed on car occupants, and the collapse characteristics of the cars in collision events. Having determined the loadings under which seat failures occur, it no longer served our purposes to continue to permit such failures in our experiments. Accordingly, in subsequent experiments we reinforced seat anchorages to withstand the G loadings we anticipated. Such loadings were arrived at on the basis of our findings from previously conducted experiments.

Some years ago we suggested the anchorages of front seats of automobiles should be designed to withstand 10G or, preferably, 20G loadings. This same suggestion applies also to rear seats the backs of most of which are loosely held in place. As yet there is little evidence to indicate that designers have heeded this suggestion. In the meantime a greater variety of adjustments have been introduced in the seats of late model cars. This action compounds the difficulty of designing adequate anchorages but by no means places it beyond the capabilities of designers.

ANCHORAGE METHODS

Although there is general agreement that seat belts should never be anchored to seats, there is some difference of opinion as to the merits of frame versus floor-pan anchorages. Floor-pan anchorages can readily be made adequate by using plates or large washers to distribute the load. This is the method specified in the legal requirements of the California Highway Patrol.

With the notion that slight yielding of the floor-pan, under load, was wholly detrimental, some persons and agencies have advocated that anchorages be only to the car frame. In actuality, slight yielding of the floor-pan anchorage is beneficial in that it results in a reduction of both the rate of onset of loading and the peak deceleration. This valuable force moderating quality is essentially missing in the frame-type anchorage because of its greater rigidity.

FINDINGS OF STUDY

Without question there is a need for more information on the performance of seat belts in collisions. Also, since the deficiency of the lap belt in protecting the head and upper torso of drivers and front seat passengers is well known, there is a need for some sort of improved restraining device but it should not be concluded that this means further restriction of movement of car occupants. But even so there is substantial evidence to show that the lap-type seat belt can furnish highly significant protection to occupants of cars involved in collisions.

The validity of this statement is well supported by findings in a recently published report from Cornell University. These findings stemmed from "two preliminary controlled 'experiments' using the 'paired-

comparison' technique." In the first experiment analyses were made on 46 matched pairs of persons as to the relative injury risk of those who wore belts and remained inside a collision vehicle versus those who were not wearing belts and were ejected from a vehicle. The findings were that:

1. Users of seat belts experienced less risk of becoming injured (to any degree, including minor) than the ejected non-users.
2. Users of seat belts had less risk of sustaining moderate through fatal grades of injury (injuries requiring expert medical treatment) than the ejected non-users. The frequency of their injuries of this type was almost 80 per cent lower.
3. Users of seat belts had less risk of sustaining dangerous or fatal grades of injury than the ejected non-users. The frequency of their injuries of this type was over 85 per cent lower.

In the second experiment analyses were made on 81 matched pairs of cars as to whether the risks were different for those wearing seat belts and those who were not, with no ejections from either group. Here, it should be noted, the occupants without seat belts numbered 139 as against 97 occupants with belts. The findings were that:

1. Users of seat belts had less risk of sustaining injury than non-users. The frequency with which they were injured was about 60 per cent lower.
2. Users of seat belts had less risk of sustaining moderate through fatal grades of injury than did non-users. The frequency of their injuries of these types was about 60 per cent lower.
3. Users of seat belts had less risk of sustaining dangerous or fatal grades of injury than did non-users. The frequency of their injuries of these types was lower, but the amount of improvement cannot be stated statistically due to the present level of case volume. In another section of the same report it is stated, again on the basis of statistical analysis of actual accident data, that "Ejected occupants have a five-fold greater risk of fatality over non-ejectees."

In the light of the foregoing based-on-fact evidence one might well ask, What, then, are the grounds for the controversy referred to earlier?

The answer is not difficult to find. To begin with one must see truth in the premise that in all human activities there is no such thing as absolute safety. This is to say that in the safest possible situation contrived by man there is always some degree of risk. When the exceptional or against-fantastic-odds accident occurs it is a matter of widespread human interest and receives publicity out of all proportion to its true worth. On the basis of such a single case many people will make an unqualified decision, with respect to their own conduct, that can clearly be proven incorrect.

REASONS FOR CONTROVERSY

People in this category must subsequently be influenced to change their decision and, in general, this can only be done by furnishing them with adequate and completely understandable information based on fact. Additionally, of course, we know that humans view new procedures and devices with skepticism and will adopt them but reluctantly, if at all, if the change requires or seems to require added effort or an upsetting of habit.

These, then, are handicaps to more widespread acceptance of seat belts in automobiles but they do not constitute a revelation. Nor is the solution, namely education and training, or retraining, anything that we have not known for a long time.

LEGISLATION SUGGESTED

As is well known, it has been proposed that the installation of seat belts in automobiles be made mandatory. Assuming the enactment of appropriate legislation, the fact remains that it would by no means ensure the actual use of belts. Moreover, it seems fairly obvious that enforcement of the use of such belts would inevitably require the use of police power or what many people would view as serious invasion of private human rights.

Some authorities take a more comprehensive view, presumably in recognition of the belief that no great headway has been made in coping with the highway traffic accident problem. Avoiding single issues such as the pros and cons of seat belts these authorities suggest or advocate the establishment of some sort of a national automotive safety agency. If we agree with the idea of a national agency, the paramount issue is whether it should be implemented through a government agency with sweeping legal authority or through a non-profit private agency whose function would be limited to testing and approving safety devices.

"OPERATIONS PLAN"

We believe we would be remiss if we did not avail ourselves of this opportunity to cover some additional aspects of the Automobile Collision Injury Research performed at the University of California. In all of our experiments our objectives have been primarily to discover facts or basic information that would be useful in engineering design.

The nature of the task required, of course, that we include human considerations since our initial over-all objective was to mitigate casualties on our streets and highways. In an "Operations Plan" covering a series of experiments performed during the spring of last year our objectives were set forth as follows:

1. To determine the deceleration rates of the principal sections of the automobile during collision. Special attention will be given to the deceleration rates of the passenger compartment (unitized and frame type structures). The mechanism of collapse of the structure will be studied to determine possible means of improving its collision performance.
2. Evaluation of the forward interior surfaces of the passenger compartment with respect to their potential injury producing features.
3. Determination of seat belt loading and passenger deceleration rates for comparison of relative passenger protection for the unitized and frame type structures.
4. Determination of the comparative costs to repair the unitized and frame type cars following identical collisions.
5. Comparative analysis of permanent deformation for both type structures.
6. Determination of vertical accelerations for the two type structures.
7. To provide motion picture films of the dynamical features of collision deceleration for both the car and occupants for study and review by engineers.

In the light of our experience in experiments conducted five years earlier we had long since resorted to the use of anthropometric dummies as drivers and passengers to take the place of human subjects. These dummies are constructed to U.S. Air Force specifications and have been extensively used by John P. Stapp and others in experiments relating to both aviation and automotive transportation. In our pertinent technical reports, moreover, we should like to emphasize that analyses or diagnoses of injuries to dummies, including interpretation of what the effect would have been on humans similarly exposed, were performed by competent medical authorities.

PROMOTE SEAT BELTS

Where it was proper to do so we have, in our technical reports and other presentations, clearly set forth the benefits to be gained through the use of properly designed and installed seat belts. Although fatal injuries were inferred for all occupants of one car in one of our more recent high-speed experiments this finding certainly does not provide adequate grounds for condemning seat belts. It is widely believed that the vast majority of collision-type accidents occur at moderate speeds of 40 mph or less and it is in this range, therefore, that significant benefits can be gained on both an individual and national basis.

Despite the large resources being employed to cope with the highway accident problem, the gains are small, not always positive, and out of all reasonable proportion to the time and money being expended. In short, the situation is essentially out of control. Can we look forward to comprehensive and effective control and in what direction or directions? Without minimizing the importance of laws and punitive measures, we see little promise in adding greatly to the existing conglomeration of laws and regulations which, in large measure, are unenforceable on anything approaching a universal basis.

Rather we believe that control must be contrived through a more intelligent and subtle approach. This would be, for example, through expansion and intensification of education and training of highway users, application of the techniques of operations research to bring about improved design of the vehicle, the roadway, and the signal, signing and lighting systems used to guide and regulate traffic on the roadway, better licensing of drivers, improved accident reporting systems leading to effective use of the design criteria statistical analysis can provide, and, finally, the allocation or reallocation of greater sums of money for the necessary research.

AUTOMATIC OPERATING CARS

Laboratory experiments, utilizing small-scale models, have already been carried out on the automatic operation of an automobile. Thus, we might look forward to universal application of a device that would automatically cut off the power and apply the brakes under certain predetermined (dangerous) conditions. Short of complete automatic control, something we neither visualize nor advocate in the foreseeable future, such a device would be highly beneficial in that while it would not prevent all collision-type accidents it would bring about a very substantial decrease.

Likewise, we might well consider the development of a device that would record the speed of an automobile at the instant it impacted any moving or stationary object; here also, of course, above that determined dangerous. Such a device would naturally be as tamper-proof as possible and admittedly would have to be under the complete jurisdiction of legally constituted authority. Subsequent to a collision-type accident, the device would be removed, in its sealed condition, for determination of the impact speed and presentation in Court, if need be, as evidence.

It takes little imagination to visualize a number of highly significant benefits that would stem from the universal use of such a device. We might also give consideration to non-extensible or fixed periscope-type rear-view mirrors on all passenger vehicles.

In the commercial vehicle field, proposed remedies for several hazardous conditions might be mentioned. In the driver stand-up-type light delivery vehicle the use of any kind of a restraining device by the driver cannot logically be expected. In good weather the doors on such vehicles are generally kept open and in the event of a mishap that brings about a sudden change of course of the vehicle, the driver can readily be centrifuged out of it. To prevent this, air-actuated net-type doors constructed out of two to three inch webbing, such as that used in baggage compartments on some types of transport aircraft, could well be used.

It is common practice for light delivery-type vehicles to enter private driveways in residential districts. Backing up of the vehicles then becomes necessary and this operation annually results in the death of many small children who have not yet learned how to protect themselves from the hazard of the automobile.

In the long run, entry of delivery vehicles into private driveways should be made unnecessary and impossible but an interim preventive measure that is well within the realm of feasibility would be to equip all such vehicle with an electronic proximity device that would warn the driver of any object moving into the danger zone behind his vehicle in the course of a backing-up maneuver. Although the cost would be considerably greater, the device, through a servo-mechanism, could be made to control the movement of the vehicle.

VARIED WEIGHTS—HAZARD

Another type of hazard, or really two types, stems from the use of our highways by all weights of vehicles from the lightest passenger car to the heaviest truck-trailer combinations. The front bumper on truck tractors and the like are substantially higher than the bumpers on passenger cars.

When a passenger car is struck, in the rear for example, by a tractor or heavy truck travelling at any substantial speed the bumpers serve no useful purpose. Consideration might well be given, therefore, to redesign bumper configurations on trucks so that the trucks will not climb over and grind between them and the pavement passenger cars caught in accidents of the type just cited.

As can readily be verified by observation, truck trailers, as well as most of the heavier

type trucks, are not equipped with rear bumpers. Considering speed differences between trucks and passenger cars on grades, night driving with its inherent reduced visibility compared with that of the daytime, poor dynamic distance judgment of drivers, etc., it is not surprising to find that rear-end collisions between passenger cars and trucks (a passenger car running into the rear end of a slow-moving or broken-down stationary truck) are not uncommon.

In few of these accidents do the passenger car occupants stand much chance of survival, and in some such accidents—spectacular to be sure—the occupants of the front seats of the passenger cars actually have been beheaded. The solution is clear but, as is well known to most people concerned with highway operations, truck owners have great reluctance to add anything in the form of dead-weight to their vehicles.

SPEED PROBLEM

In the area of highway design and operation two conditions should suffice to illustrate the approach advocated herein. Speed currently is, and for a long time has been, the whipping boy of private and quasi-official safety organizations as a prime cause of accidents. These organizations seem to be not at all discouraged by their lack of accomplishment in bringing about any substantial change.

There is a growing awareness, however, that differences in speed, especially on high-speed facilities, are much more important to safety than speed per se. We are confronted here with a large-scale educational and training need that should, in our opinion, be met through the secondary schools and those official agencies that design and operate the highways.

The practice of constructing high-speed highways without adequate physical separation of the opposing ways of travel should be discontinued. By physical separation we mean physical barriers that will prevent crossovers and the often ensuing catastrophic head-on collisions. Although this is not a high-frequency type of accident its characteristics, the certainty of death or serious injury, wholesale destruction and lengthy periods of disruption in the operation of the traffic facility, should prompt us to adopt the preventive measure indicated above.

These are but a few of the possible steps we might be well advised to take. Their implementation, of course, costs large sums of money and some critics will no doubt ridicule them from the viewpoint of economic feasibility. A principal obstacle to resolution of the economic question is our failure to agree on a set of values. The much bandied statement that a dollar value cannot be placed on human life appears to be an opiate for national conscience, and one that prevents us from making a more realistic approach to a problem that is by all odds national in scope.

Perhaps it is not out of order to point out that in one area of our economic structure monetary values have been set on human life. This may be readily verified by reference to the workmen's compensation laws enacted by the Congress and every one of the legislatures of the 48 states.▲

TOTAL CAUSES OF ACCIDENTS ON FREEWAYS IN LOS ANGELES, SAN FRANCISCO AND SAN DIEGO
January 1, 1955 to December 31, 1955

Cause of accidents	*No.*	*Per cent*
Following too close	751	29.6
Unsafe lane change	499	19.8
Speed	282	11.2
Drunk driving	214	8.4
Unsafe turns	139	5.5
Subtotal	1,885	74.6
Others	641	25.4
	2,526	100.0

INDUSTRIAL FIRE PROTECTION

THE SAFETY ENGINEER'S RESPONSIBILITY IN FIRE PROTECTION

by ALLEN L. COBB

safety director, Eastman Kodak co., Rochester, N. Y.

Before beginning any discussion on the safety engineer's responsibility in fire protection, we must appreciate that there are just about as many concepts of the safety engineer's job and his responsibilities as there are industrial plants with variations in organization and in policy. In addition, there is often no established written policy regarding overall management responsibilities.

There is of course a general knowledge that fire and safety matters should be carried out. But without a clear policy the safety engineer's responsibility in the fire protection field is difficult to define.

However, there are two general types of organization in which the responsibilities are fairly well outlined.

The first type of organization creates a sharp separation of fire and safety responsibility. This is common and is most often encountered in smaller plants and industries where the fire problem is relatively simple, such as textile plants and the automotive and machine shop industry. In such plants it is common for management to delegate its fire protection responsibility to an insurance organization.

FOLLOWS INSURANCE COMPANY'S ADVICE

Since the majority of insurance recommendations concern matters of fire protection equipment such as automatic sprinklers and the typical safeguards against fire involved in equipment selection and plant design, the plant engineer or master mechanic carries out the insurance company recommendations which are often considered direct orders.

The plant provides a mechanic to take care of sprinkler valves, to refill the extinguishers and follow the mechanical details of the fire protection system. He may be called fire chief or fire marshal and may have the responsibility of organizing a plant fire brigade if recommended by the fire insurance inspector.

In larger plants with a similar organization the setup may be more complex. Someone in the engineering divisions may be charged with fire protection engineering layout and design and the fire chief may have more responsibility in routine inspections and supervision of open flame permits.

Basically however, there is a complete separation of fire and safety responsibility and the principal accent of fire protection work is mechanical in nature. Considerable reliance is placed on the fire insurance inspector and management may feel it has fulfilled its responsibilities by following laws and ordinances and by being insured.

SAFETY MAN SUPERVISES WORKERS

Under these conditions the safety engineer's responsibility may be very limited. The safety engineer is responsible for staff assistance to management in matters affecting the plant's personnel safety. Death or injury by fire is an industrial accident as is death or injury from machinery or from unsafe acts of individuals.

Therefore the safety engineer — even though job descriptions and organization charts show little fire safety responsibility under his general direction — does supervise safe means of egress, safety clothing, safety showers for clothing fires and fire safety matters in employee indoctrination programs.

Although there is no organization, the safety director and the fire chief or marshal are in close communication and the safety engineer is frequently called for suggestions in fire safety.

The second type of organization is the exact opposite and most often found in the chemical industry where fire and explosion are serious hazards to individual employees, and to the continued existence of the industry itself. Under such conditions management takes an active interest in fire protection and fully appreciates its responsibilities and prerogatives. It uses the technical assistance of the insurance organizations but carefully evaluates these recommendations in the light of in-plant knowledge of the processes.

Typical of such organizations are Carbide and Carbon Chemicals corporation, the du Pont company, the American Cyanamid company and Eastman Kodak company. A pamphlet entitled, "A Guide for the Organization of Fire Safety and Modern Industrial Establishments" is a publication of the National Fire Protection Association. Prepared by the Industrial Committee of the Association, the principal author was Stanley Spence, director of safety and fire protection, American Cyanamid company.

This is the best available guide to plant organization on fires and discusses types of organization and responsibilities in simple centralized plants and plants operating in centralized, partly centralized or completely decentralized organizations.

FIRE PREVENTION AND SAFETY

A fire or explosion in a chemical plant is just as serious a hazard to the individual employee as an acid splash. In many instances the same equipment used for fires would also be used in a chemical spill. Fire and safety matters are completely interwoven, and can not be separated.

When fire and safety are combined into a single organization operations with a relatively low fire hazard often have separate fire and safety inspectors but in serious situations, one man handles the entire job. For example, in the apparatus and optical division of the Kodak Company, the safety organization has separate safety inspectors and fire inspectors. But in plants having chemical operations such as Kodak Park and the Tennessee Eastman Division, each safety engineer or inspector covers fire matters as well.

In the plant with the complex problems the safety personnel require a greater degree of competence and take all phases of the work in stride. Any man technically competent in all aspects of fire protection engineering will also be able to undertake all engineering aspects of safety work.

The best background for a safety engineer is a thorough training in fire protection engineering. Some men responsible for this combined job in the chemical plant have had eight to 10 years experience in the engineering divisions in the industrial insurance organizations such as the Factory Mutual Engineering Division or the Factory Insurance Association.

SAFETY TRAINING EASY FOR ENGINEERS

A man with an engineering degree from a recognized college and with this amount of experience in fire protection engineering can master the engineering requirements of safety work in a relatively short time. The human relations aspect of the safety engineer's work is something else.

However, a man trained in engineering can usually acquire the human relations and human engineering subjects more readily than a man who starts out initially in the human relations field. This is not to say that the man who started in safety or in industrial relations cannot master the fire protection field. There are many outstanding safety engineers in industry who have followed this route, but the course is usually more difficult.

The safety policy of our company is typical of other companies so situated. Our policy states:

"In general, the company's policy is to do all that is reasonable to prevent injury to persons and damage to property and to protect the interest of the employees, the company, the customer and the public from the results of accident and fire. In interpreting this policy the company goes to great lengths to provide adequate safeguards against the fire and accident hazards with proper equipment, materials, methods and trained and instructed employees."

RESPONSIBILITIES OF ENGINEERS

Several items in this statement present a challenge. For example, the protection of the customer indicates the company products should be safe for the prospective users. Many items will have to be considered. The company may bring out a new gadget with mechanical hazards such as pinch points, toxic chemicals or a possible

fire hazard. The trained safety engineer can evaluate the hazards and make necessary recommendations.

The statement also implies that the safety engineer is directly concerned in matters entirely outside the plant. The chemical industry has a great responsibility to the public. It just does not pay to make yourself unpopular with the public. The safety engineer also has a direct responsibility in plant operation which may discharge fumes or other nuisances.

The key word in this statement is the word "reasonable." Safety engineers bear a heavy responsibility in making that important decision of just what is reasonable in fire and explosion hazards.

Our Standard Safe Practice Bulletin #1.01 lists the responsibility of the Department of Fire Protection and Safety. Here are the most important items:

"1.01A RESPONSIBILITY OF THE FIRE PROTECTION AND SAFETY DEPARTMENT.

The fire protection and safety department is responsible for staff assistance to line and service departments in fire protection, fire prevention, accident prevention, and in the control of emergencies affecting the safety of persons or serious damage to buildings, equipment and product.

Some specific duties of the department are:

1. To keep in touch with new developments in the field of accident and fire prevention and, if necessary, to carry on or cooperate in research on problems in that field.

2. To consult with and advise all departments on all phases of accident prevention, fire prevention and protection.

3. To prepare or review and approve, when satisfactory from a safety standpoint, all safe practice standards applying either to the plant as a whole or to specific departments.

4. To review new or modified methods, materials, supplies, and equipment, including buildings, machines, tools, and devices. This shall include the review and approval of building plans, plans of new machines and equipment that involve fire and safety hazards.

NOTE: As one purpose of this review is to provide adequate protection at minimum cost, new methods, unusual building plans or construction and new machine designs should be reviewed in early design stages, necessary factors to be agreed upon in consultation with engineers and operating department supervision.

5. To review and recommend the fire protection to be provided after consultation with the engineering division.

COORDINATES DEPARTMENTS' WORK

6. To review all inspections made by insurance or state inspectors, and in consultation with them and representatives of ECM&U service and operating departments where concerned, to arrive at a satisfactory disposal of recommendations.

7. To review standard engineering practices for fire protection and safety with the ECM&U.

8. To coordinate the work of departmental safety leaders, and to delegate to them such parts of the work that may be best handled in a local departmental organization; for example, investigations of certain accidents, investigations of suggestions, and approval of enclosure guards.

9. To train safety leaders in the basic factors of fire and accident prevention, and keep them informed of new methods and devices.

10. Initiate studies of new devices, conduct fire tests, either directly or with the assistance of other departments.

11. Make periodic inspections on the effectiveness of, and compliance with, all safety and fire precautions.

12. To develop plans for the handling of emergency situations, both these resulting from normal operations and those which may result from enemy action in time of war.

13. To direct operations at the scene of any major emergency. This shall include:

a. General direction of fire operations through the fire chief.

b. Requests for assistance of ECM&U emergency crews.

c. Direction of rescue operations through the rescue and salvage chief.

d. Shutting off services, control of dangerous materials.

NOTE: Matters relating to admission to Kodak Park, release of information to the press shall be referred to the Security Director.

14. To investigate and report all fires and lost time and serious non-injury accidents.

15. To make statistical studies of accidents for management, and for use in planning accident and fire prevention programs.

16. To work with law-making bodies and regulatory associations (American Standards Association, National Fire Protection Association, National Safety Council, etc.) in the formulation of acceptable safe standards and codes.

CONDUCT TRAINING PROGRAMS

17. To conduct, or assist in conducting, centralized training programs for supervisory and non-supervisory personnel in fire and accident prevention.

18. To develop a centralized program and to assist in departmental programs to develop and maintain interest in accident and fire prevention.

19. To interpret laws, directives, and codes dealing with accident prevention and fire protection.

20. To maintain a central control over known hazards through permits for work in designated areas or under hazardous conditions.

21. To investigate and report on safety suggestions or delegate such investigation to safety leaders.

22. To conduct fire tests either directly or in cooperation with the manufacturing experiments division, ECM&U division or others.

23. To report action taken and progress on all recommendations of insurance inspectors to Kodak Park General Management. To avoid duplication, those coming to the attention of the ECM&U Division should be reported to the Safety Department to be combined in one complete report. Copies of these reports will be submitted to the Insurance Manager at Kodak Office.

GENERAL NOTE:

In general, (with the exception of ordinary routine problems), all matters regarding fire prevention, accident prevention in plans and in normal operations should have the benefit of consultation with the Plant Safety Organization."

The fire department of Kodak Park is a branch of Fire Protection and Safety and actually might better be called an "emergency department" since the fire department is first on the scene at any plant emergency. Its first duty is rescue. The fire department is equipped to render emergency service in case of ammonia or acid breaks, solvent spills and all situations requiring quick response by an emergency crew. Therefore the fire department is as much a safety unit as the safety men themselves and the integration of fire and safety services may be said to be complete.

It is obvious that the safety engineer cannot be responsible for the layout and design of automatic sprinklers or the many other matters of engineering design bearing on fire protection. To do so, would require a large staff of engineers and it is better that these be within the general engineering organization.

It is, however, a responsibility of the safety engineer in this situation to be thoroughly familiar with fire protection engineering so that he may review and comment on designs and make specific recommendations. The safety engineer recommends the type and extent of fire protection needed and works closely with the design engineers, fire insurance inspectors and any other authorities who have some jurisdiction.

The safety engineer has very definite responsibilities in respect to fire and these duties vary appreciably with the general organization of the plant. You as safety engineers should acquire and demonstrate competence in the field of fire protection. This would insure an increasing degree of integration of fire and safety services and lead to a greater degree of freedom from the effects of fire explosion among the plant people. Lastly, this would also place greater responsibility on the safety engineer with a consequent increased stature both within his own plant and within the engineering profession.▲

FIRE CONTROL OF SOME OF THE NEW PYROPHORIC METALS

by HYLTON R. BROWN
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Twenty years ago A. H. Nuckolls, then a chemical engineer with Underwriters' Laboratories, presented to the 1937 National Safety Congress a paper on spontaneous ignition and its prevention. His paper revealed several facts concerning spontaneous heating of oil films and finely divided metal particles. His introductory statement made 20 years ago still holds: "Spontaneous ignition is not as simple as was formerly supposed and much remains to be learned about it."

Scientific progress during the past 20 years might appear negligible, the principal advance being the use of the polysyllabical word "pyrophoricity" — the tendency of certain materials to heat or ignite spontaneously. But a review of current literature and the preliminary results of research projects indicate that an answer to the problem of pyrophoricity or spontaneous combustion may be forthcoming.

TYPES OF SPONTANEOUS HEATING

Mr. Nuckolls made four differentiations in his classification of substances subject to spontaneous ignition.

1. *Oxidation in air with evolution of heat* is a reaction prompted by exposing a relatively large surface area to the oxygen in the air. Mr. Nuckolls referred to the impregnation of a fibrous material such as cotton with linseed oil. This type of heating is rather common, and demonstrations can be arranged for use in classrooms or at lectures by placing the oily, fibrous material in a container where air flow to or through the material can be controlled until ignition occurs.

At first though, structural metals with which we are familiar would not appear susceptible to ignition of this type. Zirconium, however, is an example of what happens when certain types of metal are being handled or processed. In structural form zirconium can withstand temperatures over 3,000 degrees F without igniting, but freshly divided fine zirconium powder exposing a much larger surface area than a solid mass may ignite at room temperature without any apparent source of ignition when it is blown into the air as a cloud.

2. *Microbial thermogeneris* is the form of spontaneous heating commonly associated with fires in agricultural products and the destruction of hay storage barns. Opinion differs widely on the basic causes, the continuity or overlapping of different phases of this reaction. Research has established that the initial heat in stored undercured hay or similar products is due to fermentation or bacterial activity, but it is believed that the known micro-organisms are destroyed at about 180 degrees F, a temperature below the ignition point of the material in which they usually are found. Ensuing action beyond the heat generated by bacteria, enzymes, or oxidases has been attributed to chemical oxidation, the presence of pyrophoric carbon or even pyrophoric iron.

Metals would seem immune to ignition in this way, but recently some interesting studies were made in bacteriological metallurgy to determine the effect of bacteria on the oxidation of metals. It is too early to evaluate any findings, but many theories on the problem cannot be passed by without giving some thought to possible effects of prolonged bacterial action on certain metal powders.

3. *Chemical reactions* in mixing or combining different substances, some or all considered noncombustible, can produce enough heat to ignite nearby combustibles or the mixture itself or cause a violent explosion. Nitric acid and sawdust, activated carbon and chorine, and many other combinations are examples of this form of spontaneous heating. Exothermic decomposition, with or without the evolution of hydogen, can be included here.

In the field of metals there are many known, and probably some unknown, hazardous combinations. Only a few years ago a British chemist mixed some aluminum powder and carbon tetrachloride together with disastrous results. The Underwriters' Laboratories had already warned of this hazard in their Research Bulletin No. 34, "Reactions of Aluminum and Magnesium with Certain Chlorinated Hydrocarbons." In tests reported in this bulletin the temperature of an alumimum powder-carbon tetrachloride mixture increased to 305 degrees F in 53 minutes. Other results showed that methyl chloride in contact with aluminum may form spontaneously combustible aluminum methyl.

Sometime ago an explosion occurred during laboratory corrosion tests to determine the effect of red fuming nitric acid on titanium. Samples of titanium immersed in the acid in glass flasks were examined from time to time to observe any corrosive effects. Evidently some pyrophoric material, probably finely divided titanium, in one of the flasks was disturbed while handled, and a violent raction occurred. Much heat was liberated, resulting in oxidation and even fusion of metal. The strength of the acid is an important factor in such instances.

Dutch metal or tombac, an alloy of copper and zinc, has some peculiar properties, particularly in the form of foil. This material, sometimes referred to as gold and considered stable in air, will ignite spontaneously in an atmosphere of chlorine at ordinary temperatures.

UNUSUAL DIE CASTING EXPLOSIONS

Recently, reports were received of ignitions or explosions of zinc die castings under unusual circumstances. The castings, which contained about four per cent aluminum, had fallen off of a conveyor into a chromate dip tank and remained in the solution for several hours or days. After they were removed and dried, ignitions occurred. It is believed that long exposure in the chromate solution dissolves the zinc-rich phase and leaves behind the finely divided aluminum phase, which, in the presence of the oxidizing agent of hexavalent chromium, combines the ingredients for rapid reaction when heated.

Similar occurrences have been observed with magnesium die castings. Preferential etching in solutions containing chromic acid leaves precipitates such as a magnesium-aluminum compound in powder form. When air-dried, this powdery surface becomes very pyrophoric and will spark or explode on the slightest contact.

4. *Reaction with water.*

Water or moisture is apparently an important contributing factor in many cases of spontaneous heating, and a number of substances react violently with water. Mr. Nuckolls called attention to the action of water on calcium oxide (unslaked lime), which produces enough heat to cause fires when ordinary combustibles are present. He pointed out that one pound of lime with water evolves 124,000 calories (493 B.t.u.). The hydride of phosphorus produced by the putrifaction of damp sawdust may cause ignitions.

Combinations of metals and water that heat spontaneously or produce explosive reactions should be considered under two headings: Reactions that start at normal temperatures and those that occur when water comes in contact with hot or molten metal.

REACTIONS AT NORMAL TEMPERATURES

Substances commonly referred to as "the alkali metals" would be included in the first group. Sodium, potassium, lithium, rubidium, and cesium are generally mentioned in textbooks or technical papers as those that may produce violent metal-water reactions. In the potassium-water reaction the evolved hydrogen is usually quickly ignited by the heat of the reaction; similar reactions can be expected with rubidium. With the others, considerable heat is produced, but ignition of the evolved hydrogen may not occur as readily.

A number of recent fires and explosions in producing, processing, and handling magnesium, titanium, zirconium, thorium, and other metals have been attributed to metal-water reactions. In some instances where finely divided metals or metal powders have been immersed or wet with water, pyrophoric heating, ignitions, and explosions have occurred with apparently no initial preheating and no external source of heat being present. The damage from these ex-

plosions differed from what is normally expected in a steam explosion. These facts have led to the initiation of several research projects designed to obtain more information on metal-water reactions.

No conclusive data are available from the research to determine the different factors that may affect such metal-water reactions, but Russian investigators, have reported some water-metal reactions in which the energy released approached that of high explosives. Their paper, published in the April 1946 issue of the USSR Journal of Applied Chemistry, discusses the possible use of aluminum or magnesium powder with water or certain organic solvents as explosives.

The hazards that exist in metal-melting plants are usually associated with molten-metal spills, and the possibility of an explosion if the hot metal comes in contact with water. Such explosions are attributed to the formation of steam in pockets within or underneath the metal.

ALUMINUM EXPLOSION TESTS

In the May 1957 issue of Metal Progress, George Long, of the Physical Chemistry Division of Alcoa Research Laboratories, reports the results of 880 tests made for information on explosions of molten aluminum in water. Various factors that might affect the explosions of molten metal in water were studied. The size of the opening through which the molten aluminum flowed into the water, the total amount of metal, and the distance the metal dropped before reaching the bottom of the water container had some effect on the explosions. A number of tests with molten magnesium under similar conditions showed that the magnesium-water explosions were analogous to the aluminum-water explosions except for persistent fires caused by scattering burning magnesium.

Several recent explosions in titanium plants have been attributed to contact of molten metal with water when an arc in the consumable-electrode melting furnace punctured the wall of the water-jacketed crucible. The evidence from investigating these explosions has indicated, however, the presence of some unusual forces and damage not ordinarily associated with steam explosions. Research on this phase of the problem is under way to obtain information on possible metal-water reactions, particularly during melting of pyrophoric metals.

A review of some of the conditions under which fires may occur in handling or processing pyrophoric metals shows that no single method of fire prevention or fire protection will be effective in all cases. Likewise, separate treatment is impossible of many individual hazards or combinations of hazardous conditions in handling metals that may ignite spontaneously. One fundamental rule seems to be that pyrophoric materials which, by themselves, are subject to spontaneous ignition in air should be stored and handled under some nonreactive liquid or gas.

ALKALI METALS

The alkali metals in the pyrophoric group can, under certain conditions and with special care, be handled in air, but such handling is usually in laboratory processes where relatively small quantities are used and prolonged exposure from normal storage protection is not contemplated. Elsewhere special protection with liquid or gas is generally required.

Sodium, which oxidizes rapidly in air and reacts violently with water, is usually stored under naphtha, kerosene, or some liquid without oxygen. This method of protecting against sodium ignition introduces a flammable-liquid fire hazard, and the additional hazard presents a serious problem because many fire-extinguishing mediums suitable for oil fires are hazardous if used on sodium. No water, foam, soda acid, carbon tetrachloride, or carbon dioxide fire extinguishers should be permitted in areas where they may be inadvertently used on sodium fires. Under such conditions fire protection is limited to graphite, soda ash, or other dry powders for smothering sodium fires and flammable liquid spill fires. Sometimes storage under inert gases such as nitrogen, helium, or argon will be quite satisfactory, and under such storage conditions it is not necessary to provide flammable-liquid extinguishing equipment.

Potassium, which reacts violently with water and may ignite spontaneously in air, can be stored safely under inert-gas protection. Fire control is extremely difficult. Graphite, soda ash, and other dry powders

can be used on small fires. Ordinary types of extinguishers should be excluded from areas where they might be used on potassium fires. Carbon dioxide may form an unstable or explosive compound if used on a potassium fire.

Lithium is usually kept under an oxygen-free liquid such as kerosene and toluene but can be stored safely under inert gases such as helium and argon. Nitrogen, sometimes used to protect sodium or potassium, is not recommended for lithium. Graphite and some other smothering powders can be used to control lithium fires, but soda ash, recommended for sodium and potassium, should not be used.

Other alkali metals known to be pyrophoric are not widely used in industry at present, and fire protection involves mainly safe storage and handling to prevent small spontaneous ignitions from spreading to surrounding combustibles. Molten lithium will attack glass, but most of the other alkali metals can be stored in glass or steel containers.

Contaminated material, mixtures, and certain compounds of the alkali metals present some unusual fire and explosion hazards. Information on these different phases of the subject is extremely limited because often the experience reported has been one of a kind. For specific planned operations special fire-control methods have been devised. Although powders and smothering-type extinguishers are generally used for fire control, a liquid-type extinguisher has recently given encouraging results in small tests. Trimethoxyboroxine has extinguished fires in some of the alkali metals, and work is progressing to develop suitable extinguishers to broaden the usage of this product.

METAL POWDERS

Laboratory tests with more than 50 samples of finely divided metal powders, including some alloys and compounds, have indicated some of the conditions under which spontaneous ignition can occur and how small fires can be controlled. Particle size is a very important factor. This indicates that the major cause of pyrophoricity is the large amount of surface exposed for oxidation. In an article, "Spontaneous Combustion of Metal Powders" in the February 1953 issue of Metal Progress, Bernard Kopelman and Vera B. Compton state that zirconium powder having an average particle size of 3 microns is very pyrophoric, but similar powder of 12-micron size does not ignite at red heat.

In Report of Investigations 4853 Dr. Hartmann, of the Federal Bureau of Mines, reports ignitions of uranium powder and the hydrides of uranium and thorium within a few minutes after exposure to air. Zirconium and uranium powder ignited immediately upon dispersion in air as a cloud at room temperature. Many other metals, when reduced to very fine powder, become pyrophoric and ignite within a short time after exposure in air. Apparently some powders can be ignited in carbon dioxide and in nitrogen. Dr. Kopelman reports ignitions of uranium powder under boiling water with generation of enough heat to melt the glass container.

Evidently some degree of fire control can be obtained by limiting the relative amount of surface exposure, but even comparatively coarse powder (30-mesh) when dispersed in air will ignite and explode if a source of ignition is present. Zirconium and titanium powders that received a light surface coating of copper in the manufacturing process required more energy for ignition than untreated powders both when dispersed as a cloud and when placed as a layer on a heated surface.

Small fires in metal powders can usually be controlled by carefully spreading graphite, dry sand, or certain other materials on and around the fire. Sometimes the fire can be surrounded with a ring of inert material and allowed to burn itself out. Extinguishing a metal-powder fire can be very dangerous because of a possible explosion if the burning powder is disturbed. These fires cannot be extinguished with water, carbon dioxide, foam, or carbon tetrachloride, and such extinguishing agents may stimulate the burning or cause an explosion when the extinguisher contents are discharged under pressure onto the fire.

Extinguishers, other than those recommended for metal fires, should be excluded from areas where persons unfamiliar with the hazard might use them on burning metal powders. More specific recommendations for the control of different types of metal-powder fires are incorporated in the Na-

tional Fire Protection Association Code for the Prevention of Dust Explosions in the Manufacture of Aluminum Bronze Powder and the Code for Explosion and Fire Protection in Plants Producing or Handling Magnesium Powder or Dust.

METAL SPONGE, CASTINGS, SCRAP

Some of the unexplained metal fires reported in recent years have been caused by spontaneous heating or combinations of metals and other materials having certain pyrophoric characteristics. The ignitions in out-of-doors storage bins filled with zirconium scrap and of zinc die castings, as well as the unusual incidents with uranium and thorium, reported by R. B. Smith and others, all indicate that spontaneous-heating hazards exist and that special precautions are necessary, not only to avoid ignition but to control fires.

To avoid ignitions of zinc or magnesium die castings left too long in solutions containing chromic acid, the parts should be washed promptly upon removal from the solution. For zinc die castings a warm dilute solution of trisodium phosphate to leach or dissolve the chromate film is recommended. Magnesium die castings can be washed in cold water as soon as they are removed from the solution and then coated with a mineral oil.

To prevent explosions of molten aluminum or magnesium in water, George Long, who conducted the tests reported in Metal Progress made some unusual suggestions. Apparently the tests he reported indicated that such explosions can be avoided by greasing or painting the bottom of a metal container into which the molten metal is dropped. Coatings found to be effective were rustoleum, black asphaltum, and black mastic paints.

INERT GASES BEST

Use of inert gases, such as helium and argon, is still the most effective way to prevent ignition of zirconium and titanium during production of processing at elevated temperatures. Arc welding can be performed under inert-gas protection.

Some success has been attained in extinguishing fires in titanium chips and turnings with water sprays, but in other instances reports indicate that the water only intensified the fire. Apparently unknown factors cause metal-water reactions under such conditions. A similar lack of uniformity has been noted in results obtained with different types of fire extinguishers.

Manufacturers and others who have been trying to develop both liquid and powder-type extinguishers effective on pyrophoric metal fires have encountered many baffling problems. For example, a manufacturer of dry-powder extinguishers found his product would readily extinguish fires in titanium sponge obtained from one source and oily titanium chips from another source but failed to extinguish fires in titanium chips produced at another plant.

Encouraging results have been obtained with trimethoxyboroxine on small fires in solid combustible metals. If suitable methods of application are developed, it may be possible to use this compound effectively on larger fires.

Satisfactory methods for the control of fires in heat-treating furnaces at magnesium processing plants have been developed. Boron trichloride gas was formerly recommended for this purpose, but recent tests show that boron trifluoride is more effective. The gas concentration required with the latter product is only about one-tenth that required with boron trichloride. This method of fire control is described in National Fire Protection Association Pamphlet No. 48, Standards for the Storage, Handling, and Processing of Magnesium.

Sludge disposal presents a serious problem wherever combustible metals are machined, ground, or polished and the dust produced in such operations is collected in liquid precipitation-type separators. To avoid possible reactions between magnesium dust, the coolant used in machining, and the water or liquid in the collector, the sludge should be removed daily and burned or rendered chemically inactive and noncombustible by treating it with ferrous chloride. This method of disposal is described in the NFPA pamphlet on magnesium mentioned. Specific chemical treatments can probably be developed for other types of metal sludge.

Research work on many of the other problems associated with the production and handling of pyrophoric or combustible metals is under way in many laboratories and

experiment stations. The Bureau of Mines is developing safe operating methods, and a National Fire Protection Association committee is preparing standards for fire and explosion prevention in plants handling combustible metals. The results of the research work are encouraging, but spontaneous combustion is not as simple as formerly supposed and much remains to be learned about it.

INGENIOUS APPROACHES IN DEVELOPING MATERIALS HANDLING SAFETY

OPERATOR SELECTION AND TRAINING

by ROLAND W. PUDER

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The purpose of this paper is to discuss du Pont's experience in operator selection and training as a means of reducing accidents in materials handling and to point out how benefits in any industry can be achieved through a similar approach.

The analysis of injuries in 100 plants of the du Pont company for a five-year period shows the frequency rate and the total number of injuries on a downward trend. Nevertheless, the number occurring in materials handling activities has been constant over this period. If we hope to continue the downward trend of overall frequency rate, we must give particular attention to reducing materials handling accidents. What is happening in du Pont is also taking place throughout industry. The National Safety Council figures indicate materials handling accidents account for approximately 25 per cent of all industrial accidents.

As equipment becomes more complex, each accident may become more costly, as measured in terms of human suffering and dollars paid in compensation.

People don't argue against safety. They do, however, differ in their methods of achieving safety. We believe that safety is founded on the fundamental concept that any job should be done properly—the first time. To achieve this, people must be made and kept safety conscious.

MENTAL CONDITIONING

Safety consciousness is the mental conditioning of people to respond in anticipation of an unsafe situation. It is not enough to make people aware of hazards; they must be taught ultimately to deal with them effectively themselves.

The broad objectives of any safety program can be summarized as follows:

1. Elimination or reduction of human suffering and personal tragedy
2. Increased productivity as a result of a safe environment and increased knowledge and skill
3. Reduction of direct and indirect costs as measured by lost men and machine time and the costs of care and compensation.

A well planned training program is an integral part of the overall safety program and is a prime means of attaining these objectives.

OPERATOR TRAINING PROGRAM

In our company in every training program, we endeavor to accomplish three things:

First, we try to install safety consciousness in every operator.

Second, safe procedures are developed for all jobs being analyzed in the training program.

Third, all trainees are instructed in these safe procedures.

We endeavor to develop job know-how on the basis of thoroughly planned procedures so that all personnel are mentally and physically equipped to deal with their day-to-day job routines plus any unforeseen and unsafe condition which may arise.

A good operator training program will have the following characteristics:

—Company management must be solidly behind the program and must be kept informed of progress. The training procedures will not be successful if management does not give its support, nor will they be successful if management is not advised of the benefits accruing from them.

—The development and execution of a training program rests solidly upon the capabilities of the personnel responsible. Competent people must be given full authority for carrying out the training program.

—Those responsible for developing the training program must also insure that trainees are selected. Selection doesn't insure successful training but it does make it possible.

—Adequate follow-up must be maintained to insure that training procedures are followed on the job and that the training program is revised as conditions warrant.

The results of the training program must be periodically evaluated in order to determine its effectiveness.

PROGRAM METHODS

Du Pont has used several methods for setting up and conducting training programs.

Some plants prefer the consultant method —a specialist in the field to be covered sets up the training program and actually carries out the instruction required. This method works best in the highly specialized areas, such as those of instrumentation and some phases of materials handling.

The second method is the organization of a training group in the plant which would consist of an instructor or several instructors whose main responsibility is to conduct training programs.

A third method is to have line supervision initiate and carry out the training. This method has two serious drawbacks: in that a technically competent person in line supervision may not be a good teacher; secondly, he may be so absorbed in day-to-day supervisory activities that he cannot devote sufficient time to the training program.

Obviously, combinations of these three methods can be used which lend flexibility so that training can be readily adapted to any local plant condition. For example, a technique which has been highly successful in our organization is the method in which a consultant instructs local plant instructors in the jobs to be covered and they, in turn, conduct the training program for the plant operators.

The local instructors are trained in the best methods of presentation, ease of delivery, keeping trainees' interest, gaining full group participation, answering questions, and giving explanations.

They are provided with articles on training techniques, data sheets on specific equipment on the plant, visual aids, and informed of recommended motion pictures and other visual aids available from manufacturers, governmental agencies, and libraries.

INSTRUCTION MATERIAL

An "Instruction Manual" is furnished to each plant instructor to be used as the basic reference in his training assignment. The increased trend toward higher utilization of mobile equipment in du Pont plants pointed out the need for soundly organized training techniques for operators of mobile materials handling equipment.

Our materials handling consultants had been providing consulting assistance on various plants on specific operating problems with mobile equipment. These problems, coupled with the shock of several accidents, resulted in the development of a program of training for fork lift truck operators.

One accident resulted in an amputated hand. Two employees were attempting to couple an empty coal car to a string of parked empty cars with a motorized car mover. When the cars didn't couple on the first try, one employee backed the mobile equipment away and got out to help the other employee line up the couplings. While the two men were working on the couplings, the car mover operator noticed that his motorized car mover was in motion. He ran back to stop it but, before he could reach it, the other employee's hand was caught on impact between the couplings of the coal cars. Investigation indicated that the hand brake was not fully engaged and the directional shift had been pushed beyond neutral into reverse.

HUMAN FAILURE

In another accident a fatality resulted when the operator of a fork lift truck attempted to straighten an adjacent pulp stock pile by standing on the bed of his truck and reaching between the upright tilting mast and the forward overhead guard bar. As he did so, he inadvertently engaged the tilting lever, apparently with his leg, causing the mast to tilt toward him. His head was caught between the upper part of the mast and the bar.

One result of these accidents was a broad study and concerted effort to improve fork lift truck operations. These operations were designated as a prime region of attack because of the rapidly increasing use of this type of equipment within the company.

A training program was developed by materials handling consultants in the engineering department based on their own experience in various industrial plants and upon the company-wide experience which was available to them. Having developed this training program, it was then necessary to establish certain criteria for the selection of operators.

SELECTING OPERATORS

Certain basic criteria are applicable to any job and these were also applied to the fork lift truck operator training program.

The candidate must have an aptitude for the position. This can be determined through both written and performance tests. The candidate's background must be one which is amenable to the new position. His personnel record will reveal this amenability by an examination of his education, experience, and job preference.

A trainee's ambition and safety attitude are difficult to determine, particularly if the employee is new. However, if he is an employee who has had some prior service in the company, his personnel records and his previous supervisors can usually give assistance in assessing these attitudes.

In our company, certain specific physical criteria have been established for the selection of operators of fork lift trucks, namely, 1. high degree of coordination, 2. good vision, 3. good health, 4. age, 5. hearing and 6. height and weight.

Most of these are self-explanatory. However, the age factor requires special consideration. We prefer an operator who has reached a certain degree of maturity, which usually means in the late twenties and on up. In actual practice this is a difficult obstacle to overcome. Many fork lift truck positions are low paying and are merely stepping stones to some higher position in the work force. Therefore, many times we must hire younger men for these jobs. This gives us the same problem as the insurance companies; the young cowboys tend to penalize our safety records.

We endeavor to avoid extremes in the physical characteristics of height and weight and we tend to select individuals who are fairly agile.

In the complex assessment of the candidate's motivation we try to determine whether the trainee has a definite interest in operating mechanical equipment. We look for people who possess enthusiasm for learning and who sincerely desire a job as a fork lift truck operator. To assess the trainee's maturity, we consider whether he takes his work seriously, accepts responsibility, follows prescribed procedures, makes his own decisions and works well under pressure.

We also require these same characteristics in the general managers of our industrial departments. However, facetiousness aside, many of those characteristics can be determined from a candidate's occupational background and from his personnel records. Also, through examination of the candidate's background, we gauge his intelligence, his ability to learn instructions, and to recognize potential safety hazards.

We also require the ability to read and comprehend and to write and record data in a log book.

Once the operator has been selected, he then goes through a program of classroom instruction coupled with operating practice on the equipment.

TRAIN AWAY FROM JOB AREA

We are firmly convinced that this practice must be away from job responsibilities and hazards. Training conditions are improved when away from the operating area because a classroom or obstacle course facilitates gaining the trainee's individual attention. Practice can be gained without interfering in regular plant operations. An opportunity is provided for complete discussion of the topic while ideas are still fresh in the trainee's mind.

Work in the classroom and on the obstacle course provides an easy means of noting shortcomings which can be corrected before real damage is done in the plant. Lastly, throughout the training, records are kept to screen out unsuitable operators whose deficiencies may not have been apparent in the initial selection. This secondary screening and evaluation would be

more difficult if training were done on the job.

The subjects covered in the classroom instructions are: description of a fork lift truck or trucks to which the trainee will be assigned and a description and practical application of fundamental operations performed by a fork lift truck; also, a description of the types of loads the trainee will be expected to handle on the job.

Both the generalized safety rules for operation of lift trucks and specific rules applicable to the specific job are instilled in the trainee throughout his training.

The operator is instructed in the reasons for careful operation of his equipment to keep it in a safe operating condition and to reduce maintenance costs. He is shown how to carry out simple preventive maintenance procedures using a check list established specifically for the equipment under his control.

Periods of study are devoted to the various truck attachments with which he may have to deal, such as the "Pul-Pac" attachment, barrel grabs, and the like. He is then given further instruction in the more advanced operations which will be required of him.

PRACTICAL LEARNING

All lessons learned in the classroom are put into practice at special sessions held in the plant using his assigned equipment. The interiors of railroad cars and highway trucks are simulated by standing pallets on end and having the trainee maneuver his equipment within these areas while handling typical loads.

Finally, the trainee undergoes both written and actual performance tests to determine the extent of his knowledge both theoretical and practical. At the conclusion of training, each truck operator is furnished with an "Operator's Guide" which can be kept as a handy pocket reference on recommended operating procedures.

The results of a training program should be evaluated. Since training deals with human beings, some persons may feel that a training program must be accepted on faith or because of someone's statement concerning the presumed value of the program.

EVALUATING RESULTS

We feel that whatever the subject matter, some measurements of effectiveness can be devised and the intelligent application of phychological measurement makes it possible to evaluate training objectively.

In the Fork Lift Operator Training program we are keeping records of:

1. The production time required for the job and the number of operators meeting the standard
2. Product damage and the use of consumable supplies
3. The number of accidents
4. Absenteeism
5. Labor turnover

Tests have been developed to measure technical skill and knowledge of company policy.

This program is still too new to permit a significant summary of benefits which can be attributed directly to the program. However, results at the plants where this program has been instituted have shown marked increase in manpower utilization, reduction of product damage, vastly improved housekeeping, and safer operations. As the program increases in scope throughout the company, we expect to present statistical data to show the benefits accrued.

We believe that a concerted attack must be made on the causes of material handling accidents to achieve significant reduction in overall accident frequency. We also believe that this attack can best be made through the application of a well-thought-out operator selection and training program.

ENGINEERING SAFETY INTO A MATERIAL HANDLING SYSTEM

by RITSON H. GRAVES

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Whoever heard of doing such an advanced thing as engineering safety into anything except last year's automobile? And that turned out to be a flop. People keep right on buying automobiles without safety rims, safety belts or foam rubber dashes. If the masses won't go for safety in an automobile do you expect them to act any different in an industrial plant?

I wondered why our plant made substantial gains during the last few years in frequency and severity. It wasn't just because the foreman told Joe to put on his goggles or safety shoes or don't fall over that or don't do this and don't do that. The foreman has been doing that many years with little if any gain because supervision can't be everywhere at once. It was due primarily to having a *real* safety program during the past three years which forced us to engineer safety into all operations.

We are smelters and refiners of most nonferrous metals. This is a dangerous business in general and more so in our plant because we are the largest single consumer of nonferrous scrap material. Every truck and railroad car received contains a new additional hazard. We could operate above the national average in accident frequency and severity and excuse our record by saying, "but we handle scrap." However, we now are operating equal to or below the national average for our business.

PROBLEM AND SOLUTION

It isn't possible to confine this subject to engineering safety into a material handling system. Our overall method is complicated, but in general we have done two main things:

1. We have made operating department heads and their supervisors responsible for safe practices and,
2. We have made these same people also responsible for safe engineering design.

We will omit all discussion of safety posters, protection equipment, on the job safety meetings, prizes and booby prizes for best and poorest departments, safety awards and housekeeping. All are part of our overall plan but are only incremental tools to help the plan along.

We are in business for one reason, which is to make money or a profit. Besides all the heartaches, sorrows and human relations associated with an injury, most companies must weight the cost of a safety program against the settlement costs of injuries. An entire profit could be spent on a safety program without the desired results. We believe that cutting the cost of safety is just as important as cutting the cost of any other operation if you obtain an improved product. The quickest way to cut safety costs is to reduce injuries.

The two things we have done are probably only used by five per cent of industry. How do we make supervision responsible for safe practices and also safe design? You probably will say, "We've tried that and you can't make it work." It is working at our company and accomplishing results we thought impossible a few years ago.

We get safe practices from supervisory appraisal. And it is this supervisory appraisal which forces supervision to insist on safe design.

How can a supervisory appraisal program accomplish this? We tried many rating and appraisal schemes, none of which were worth while. Perhaps what we are now doing would more correctly be called budgeting — budgeting safety.

The final résumé of all of the various increments contains the following subjects and the magnitude of each subject:

Safety	24%
Production	24%
Cost	24%
Quality	8%
Labor Relations	4%
Housekeeping	4%
Operation & Process Improvement	4%
Maintenance Practices	4%
Administration	4%
	100%

DESIGNED BY SUPERVISORS, ENGINEERS

These are the total items which make up the departmental management executives appraisal. It took four years to educate and sell it to those affected. It was not made up just by an expert but was actually designed by the department supervision and the industrial engineering department working together over a long period of time.

The standards, objectives, budgets or whatever one wishes to call them were set up by the people affected. When you set your own objective or goal you don't mind being appraised on the degree of accomplishment. It would be difficult to accomplish this in a plant which doesn't have accurate cost and production standards.

We have done the unheard of thing by making safety 24 per cent of the total responsibility of supervision. This 24 per cent item consists of the following items and their magnitude:

Frequency	6%
Severity	6%
Compensation costs	3%
Reports	3%
Safety Practices	6%

Frequency and severity are standard items. Compensation costs are figured in terms of cents per man hour on the departmental work force. Reports are those things we all have had trouble getting in the past such as accident reports.

Safety practices include many things such as hazards, inspection of equipment, safe working habits, on the job safety meetings and a general continued educational emphasis on the safety program.

From the inception of the program we emphasized that eventually this overall appraisal of supervision will become the basis for part of a supervisor's pay or a bonus plan. It has also been stressed that eventually it might even mean a man's job if he continually showed that he was way out of line.

Starting January 1957 we have paid a quarterly bonus to the top departmental executives strictly on a trial basis. Of course, there weren't any kicks from those receiving quite an amount and surprisingly, the kicks from those receiving a minor amount were very mild. Actually they are beginning to ask for help on how they can raise their appraisal.

I had to discuss our appraisal program and the magnitude of safety because that is the only reason we are able to get safety engineering into a material handling setup.

DEFINITION OF MATERIAL HANDLING

"Material handling" in our plant is any work which doesn't physically or chemically change the material or add to its value. By this definition, more than half the labor in most departments is handling material. We also continually change methods and processes to meet competition. This involves a great deal of engineering and expenditures of large sums of money.

All money must be obtained by the age old method of authorization requests. These authorization requests give us the opportunity to make departmental supervision responsible for producing a safe operation. It works as follows:

1. All during the engineering stage there is a free flow of information and ideas between the department involved and the engineering department.

2. When the idea is written up in Authorization Request Form and all prints are complete it is passed and signed by the chief design engineer.

3. The chief plant engineer then inspects, passes and signs it.

4. The chief mechanical and construction engineer also signs it to prevent any future alibis in planning or other impossible situations from developing.

5. The industrial relations head signs it which should prevent any union trouble in the future.

6. Finally the authorization request must be signed by the department head. It is our rule that a department head's signature on an authorization request is his guarantee that it will function and produce. This is the toughest test for any authorization request to pass. It may take days or even weeks. It must be understood by all supervision and their agreement obtained orally that it will work. Often even hourly paid operators are called in and the whole thing explained to them. If hourly people are in agreement with something new they will make it work.

It is the obtaining of the department head's signature which produces safety in design because an unsafe design can mean 24 per cent of his bonus. After a few years of this type of manuevering it works back to the engineering department people who have been educated to design safely by the department heads.

RESULTS OF PROGRAM

Either we have been increasingly lucky or our program is working. We like to think that the following results of the entire plant are due to the safety program.

				1st Half
	1954	*1955*	*1956*	*1957*
Frequency	17.70	7.24	7.88	8.66
Severity	51.10	37.61	723	275

We also like to think that the recent mild increase in frequency is due partly to New Jersey's constantly broadening scope of compensation payments.

Our experience during the past four years on our three major methods of material handling has been:

1. Standard gage railroad—one man claimed to have gotten a hernia from throwing a switch but this was not proven.

2. Mobile Equipment—one fork truck operator stepped in a manhole.

3. Narrow gage railroad—this thing has been a source of many injuries for half a century. It mashes people's hands and runs over their feet. It always seemed little could be done except tell people to keep their hands out of the couplers and their feet off the track. This hasn't happened in over a year.

We believe our program is working. Recently I heard our chief design engineer ask, "Is it safe?" Have you ever heard that?▲

LOW VOLTAGE—ACTION AND EFFECT

PHYSICAL ASPECTS OF LOW VOLTAGE ELECTRIC SHOCK

by W. B. KOUWENHOVEN

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Low voltages range from 120 to 600 volts. The term "voltage," applied to electric shocks, is perhaps erroneous because the current flows through the victim to produce the physical effect. We speak, however, of low, medium and high voltage shocks, because in our constant potential system the circuit voltage is usually the only parameter known.

When you close an electric circuit through your body, current will enter at the point of contact with the live line and will leave at the point of contact with the other side of the circuit. The fundamental law of electric circuits—current flows to a point flows away from that point—is obeyed. The effects produced by the passage of this current may be harmless, serious, or fatal, depending upon:

1. The points of contact.
2. The value of the current.
3. The duration of the shock.

POINTS OF CONTACT

If contacts are made between two points on the same leg or arm then no vital organs are in the current path and there are no injuries except possible burns. In the majority of electric shock cases the current path is from hand to feet, with two vital organs, the heart and lungs, in this path.

CURRENT

The current that flows through the human body obeys Ohms Law, where E is the voltage and R the total resistance or impedance of the circuit. The resistance of the human body is divided into two parts, of the skin at contacts and of the body tissues. The impedance of the external circuit is usually small and may be neglected.

Most body resistance resides in the outer layer of the skin, the epidermis. The epidermis is thin, but it is horny and contains neither blood capillaries nor nerve endings. Its electric resistance is lowest on the palms of the hands, the soles of the feet, the axillae, the groin and the face. Its resistance over the body surface is not uniform, for example, in crossing the midline of a finger from the palm side to the back of the hand there is a large and abrupt increase.

Although dry skin has a high resistance per unit area, it can transmit fairly large currents when the contact area is large. If the skin is damp from perspiration or washing, its resistance is reduced to a small fraction of its dry value. Wet conditions make 120-volt shocks very dangerous. Cuts, abrasions and blisters largely annihilate the protection offered by our skin.

If the skin is removed and contact made directly with the raw flesh, then the body resistance from hand to feet is of the order of 300 ohms. The same value of resistance has been measured on adults in electrocardiography where excellent contact is made using large electrodes attached to the wrists and ankles.

When an electric current enters the human body it flows in a more or less fusiform pattern since muscles, lungs, heart, liver and kidneys have nearly identical specific resistance, approximately 100 ohms. Bone has a specific resistance of some 900 ohms, and human fat of 5,000 to 15,000 ohms.

With good contacts of normal area the adult resistance, hand to feet, may be as low as 500 ohms, although with average contacts a resistance of 1,000 ohms is probably a more realistic value. With poor contacts the body resistance may reach values of 5,000 to 10,000 ohms.

DURATION

The duration of the current flow is important in determining the resulting effect. If the current flows for a second or longer, its duration covers an entire heart cycle, as our hearts beat about 70 times per minute. The resulting effect is not influenced by the heart cycle. As the duration of the shock decreases to a fraction of a second, its location in the heart cycle influences the result. There may exist a shock so brief to have no effect except sensation. If such a shock exists we have not found it. In our studies we have used shocks ranging from ten microseconds to five seconds in duration.

The portion of the heart cycle most vulnerable to A.C. shocks of 1 100 a second covers approximately 1 10 of the period of a heart beat. As the length of the shock increases there is a greater chance of the shock occurring during this vulnerable period.

These three factors, the path of the current, the value of the current, and its duration and position in the heart cycle, determine the physical effect of an electric shock. We will assume the current alternates commercial frequency, and flows through the body from hand to foot. Low voltages of 120 to 600 volts may send an electric current through the victim ranging from a small fraction to nearly two amperes.

PHYSICAL EFFECTS OF SHOCK

The most common effects produced by electric shock current in this range are:

Effect	*Current Value*
Sensation	1 milliampere
Sharp Pain	4-5 milliampere
Let Go	9-22 milliampere
Lose Consciousness	30-50 milliampere
Ventricular Fibrillation	0.1 to 2 or 3 amperes

Low voltage shocks seldom paralyze respiration, or cause serious burns. Paralysis of respiration generally occurs in shock cases where the current through the body is four or more amperes. An electric burn depends upon the resistance of the skin contact, the current density per unit area of contact, and the length of time the current flows. Low voltage shocks only produce severe burns when the current flows for a considerable time.

Currents producing sensation, pain, and below the "let go" value are not in themselves harmful. Dalziel has defined a "let go" current as a current one can release voluntarily without injury. If the shock current reaches a value that results in a severe muscular contraction that the individual cannot release his hold on the circuit, then the situation is desperate. Blisters will form, the skin protection lost, and the current may rise to values resulting in death.

Occasionally an electric shock case is reported in which an individual loses consciousness or faints without either the stoppage of his respiration or the cessation of his pulse. This phenomena is believed to be like surgical shock.

VENTRICULAR DEFIBRILLATION

Currents of 0.1 ampere sto 2 or 3 amperes, flowing for one second will upset the rhythm of the heart and throw it into a quivering state known as ventricular fibrillation. A.C. currents of 1.2 amperes, flowing for 1/120 and 1/60 of a second during the vulnerable period of the heart, may also result in fibrillation.

In fibrillation the pulse disappears and the circulation ceases. The victim will gasp for breath for about a minute, or until anoxia causes the respiration to cease. The human heart rarely recovers spontaneously and death occurs in a few minutes.

Manual artificial respiration should be applied promptly to save the victim. However, no known method of artificial respiration provides sufficient heart massage to maintain the circulation. For this reason the percentage of successful resuscitation of victims of low voltage shocks is so small.

Drugs are of little or no help in arresting fibrillation: The only reliable method is to send sufficient electric current through the heart to rest the twitching fibres and contract that organ in systole. If done promptly, the heart will usually resume normal beating.

Ventricular fibrillation also occurs in hospitals where the usual practice is to open the chest, expose the heart and massage it to

maintain the circulation while the defibrillating equipment is brought to the site of the emergency. When all is ready electrodes are placed directly on the opposite sides of the heart and a 60-cycle current of 1.5 amperes at 135 volts is sent through the heart for about one-quarter of a second. This will usually arrest the fibrillation and normal beating will follow.

The open chest method of defibrillation is not a field method, and even in the hospital unless the chest is already open it involves a second and a major operation.

SIMPLE DEFIBRILLATION OF HEART

We have developed a safe and simple method which avoids opening the chest and, if applied within less than two minutes after the onset of ventricular fibrillation, the chances of saving a life are excellent. In applying this method one electrode is placed on the sternal notch and the other on the floating ribs at the apex of the heart. When the electrodes are in position, the operator closes a switch sending five amperes at 440 volts through the victim's chest for one-fourth of a second. At the Hopkins Hospital the defibrillators have been used 11 times on human beings whose hearts have been in ventricular fibrillation for periods ranging from one to one and a half minutes. In every case the fibrillation was arrested and the heart resumed normal beatings. Closed chest defibrillation has also been used at other hospitals.

We are continuing our study of the problem with two principal objectives: one to find a method to drive electrically a heart enfeebled by anoxia, and two, to develop a simple equipment for field use.

MECHANICAL ENGINEERING AND SAFETY

FACTORS IN EXHAUST VENTILATION SYSTEM DESIGN FOR THE SAFETY ENGINEER

by K. M. MORSE
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The increasing importance of air contamination to health and in nuisance problems has brought into greater prominence the need for an appreciation of the principles of good industrial ventilation design, as applied to contaminant control. While this has resulted, today, in a higher standard of industrial ventilation, the cost of good plant ventilation has continuously increased as equipment, labor and maintenance costs have increased. Therefore, the need for good engineering design to meet hygienic design objectives economically is paramount.

The National Safety Council, both in its "Accident Prevention Manual for Industrial Operations" and in "Data Sheet D-428," has stated that industrial ventilation for contaminant and comfort control is a responsibility of the industrial hygiene profession and gives recognition to the fact that contaminant-control ventilation has been principally developed by this profession. However, I believe that since the industrial hygiene engineer and the safety engineer have parallel objectives, the paths, through which we are endeavoring to reach our objectives, should be linked by a bridge of co-operation.

PURPOSE OF CONTAMINANT VENTILATION

Therefore, the safety engineer should secure some knowledge, or at least an awareness, of the general principles of contaminant-control ventilation, just as I believe it is necessary for industrial hygiene engineers to have some awareness and information on industrial safety. My reason for this has always been that both our professions comprise a realtively small group to meet the challenge before us, and that working together in an atmosphere of co-operation, where each recognizes the area where the other can best perform, but extends his co-operation to him, should result in benefits to our respective programs.

The ventilation which I will discuss pertains principally to contaminant-control ventilation, as represented by local exhaust ventilation systems. Other types of ventilation systems are important, but time will preclude discussion of them. The basic purpose of contaminent ventilation is the maintenance of health and comfort. The criterion utilized to determine the effectiveness of such systems is whether or not the atmospheric concentrations of the various contaminants have been reduced to below unhealthful or otherwise hazardous limits.

This has been a major activity of the industrial hygiene engineer for many years, and in this work, the engineering standards for contaminant-control ventilation systems were developed. However, in practice, the actual engineering design is conducted by plant engineers, based upon the engineering standards; as for example, the type of hood design, control and transport velocities, and collector efficiency, which are provided by the industrial hygiene engineer.

It is in the absence of the industrial hygiene engineer that the safety engineer should become allied with contaminant-control-ventilation problems to some degree. Good contaminant-control ventilation, therefore, results from integrating the efforts of the plant and industrial hygiene engineers, supplemented by the efforts of the safety engineer.

I shall concentrate on the design principles in contaminant-control ventilation and give practical design standards. In the event that there are those who desire a more complete practical knowledge of contaminant-control ventilation, there are, today, several excellent industrial hygiene and ventilation texts on this subject.

As a practical guide, and one which is extremely low priced, may I recommend the "Industrial Ventilation Manual," of the

Committee on Industrial Ventilation, of the American Conference of Governmental Industrial Hygienists. This has made an excellent addition to the library of the industrial hygiene engineer, would make an equal contribution to your plant engineering library, and to your own.

PRINCIPLES OF CONTAINED AIR FLOW

Certain basic principles are involved in ventilation design as in any phase of engineering design. The thoroughness with which these principles are understood, when integrated with practical experience, determines design skill, and awareness of these principles is required by all who may have a part in the establishment of good industrial-ventilation practices. Knowledge of fundamentals is basic to any understanding. These fundamentals involve the movement of air through ducts and the pressures, velocities and power considerations which are developed.

Pressures

Air flows between two points in a ventilation system because of a difference in pressure between these points. This difference may be induced by a fan; from a difference in air density, as in the case of the draft in a furnace resulting from a gravity stack; or from the wind effect on roof ventilators. In contaminant-control ventilation, as applied to industrial hygiene problems, generally only the first of these methods is of prime consideration.

The motion of air develops a pressure termed "velocity pressure" (VP). The velocity of air in a duct is calculated from this pressure from the following relationship:

$$\text{Velocity (V)} = 4005 \sqrt{VP} \quad \ldots\ldots (1)$$

where

V = velocity, fpm
VP = velocity pressure, in. of water

Equation (1) applies for air at standard density of 0.075 pcf. Velocity pressure is always exerted in the direction of flow and is always positive in value.

Air confined within a duct, whether or not in motion, also creates a pressure, termed "static pressure" (SP). This pressure is generally measured at right angles to the walls of the duct and is independent of the velocity of air. In an exhaust system, this pressure is negative when measured on the suction side of the fan and positive on the blowing side of the fan.

"Total pressure" (TP) is the algebraic sum of the velocity and static pressures which is expressed as follows

$$TP = SP + VP \quad \ldots\ldots (2)$$

These pressures are expressed in inches water gage.

The practical significance of these pressures is that their values must be determined to evaluate the characteristics and performance of a ventilation system, or in selecting a dust collector, fan or motor. These pressures vary from one end of the system to the other, dependent upon the desired duct velocities and the resistance that the air encounters as it flows through the system.

AIR FLOW

Our knowledge of air flow in front of exhaust openings has been largely due to fundamental research. Most prominent in this work has been the efforts of Dallavalle, Silverman, and Hatch.

The velocity of air passing through the hood face is termed "face velocity" while that required at the point of contaminant generation, at a specific distance in front of the hood, is termed "capture or control velocity." The velocity of air within a duct necessary to transport the contaminant through the system is termed "transport or conveying velocity." Tables 1 and 2 at the end of this paper indicate recommended control and transport velocities used in good engineering design.

More detailed information, when required on specific operations and materials, may be secured from any text on exhaust-ventilation design. This information should be provided to your design engineers and utilized in the engineering specifications for ventilation systems.

The volume of air passing through the face of a hood or in a duct, is expressed by the following formula

$$Q = AV \quad \ldots\ldots (3)$$

where

Q = air volume cfm
A = area of duct, or of hood opening, sq. ft.
V = average hood face velocity, fpm

The design engineer must not overlook the fact that exhaust-volume requirements as well as resistance charts are based upon air at 68 F and a barometric pressure of 29.92 in. mercury. When temperatures exceed 100 F or elevations exceed 1,500 ft., corrections are necessary.

Estimation of air flow at any distance in front of circular exhaust openings is expressed as follows:

$$V = \frac{Q}{10x^2 + A} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Q = cu. ft. of air through hood per minute
x = distance outward along axis, ft.
A = area of hood opening, sq. ft.

While this formula is for circular openings, it applies to rectangular hoods when the width-to-length ratio is greater than 0.1.

The velocity at distances in front of freely suspended exhaust slots can be estimated by the following expression when the ratio of hood width to length is equal or less than 0.1.

$$V = \frac{Q}{3.7 \times L} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where
V = velocity, fpm
Q = cu. ft. of air flow through hood per minute
x = distance from slot, ft.
L = length of slot, ft.

Equations (4) and (5) have practical application in determining the required volume of air through a hood, after the control velocity at the point of contaminant generation has been determined.

These expressions for estimating velocities in front of exhaust hoods indicate that the capture velocity depends chiefly upon the volume of air flowing through the hood (Q), and not upon the velocity across the hood face. One who is inexperienced overlooks this vital understanding of air flow.

There have been too many examples of this misunderstanding by reducing hood area to increase the velocity. Suction has very little ability to "reach out" and pull air contaminants toward it. The velocity at one diameter away, drops to 10 per cent of the face velocity, whereas, air can be blown for an appreciable distance before losing considerable velocity.

Air flows toward an exhaust opening from all directions. An appreciable amount of this air is drawn from behind the edge of the opening (edge effect). Such air has no value in capturing the contaminant. The use of flanges can reduce air requirements by as much as 25 per cent by drawing air only from in front of the hood. Flange width need not exceed six inches and, in general, is equal to the hood diameter. Flanging alters the expressions for estimating capture velocities in front of hoods and slots, as shown in Equations (4) and (5), by a factor of 0.75 in the denominator.

POWER

It is necessary to maintain a pressure differential between the inlet and outlet of a ventilation system to create and maintain a flow of air through the system. This is generally done in a local exhaust system by the use of a fan and motor. The power requirement for developing the necessary pressure differential across the system is determined from the following expression:

$$BHP = \frac{CFM \times TP}{6356 \times Eff} \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where
BHP = brake horsepower required for a given exhaust system
TP = total pressure of system, in. of water
CFM = cubic feet of air per minute of system
Eff = mechanical efficiency of fan (for most centrifugal fans, this value is from 0.50—0.65).

Equation (6) provides a means for estimating probable exhaust volumes or estimating the capacity (CFM) of the system for a given motor size.

PRACTICAL DESIGN FACTORS

A contaminant-control system is generally considered to be of local exhaust-ventilation type. Such a system consists of the following essential parts: Hood, ducts, collector and fan.

HOOD

The function of the hood is to create a flow of air past the source of contamination and into the hood, sufficient to remove the major quantity of the contaminant. The shape of the hood, its size, location and air volume are the important design factors. Principle design factors are as follows:

1. Enclose the source of contamination as much as practical.

2. Do not endeavor to collect large dust particles, only those which are of hygienic significance, (under five microns[2] in diameter).

3. Locate the hood as close as possible to the source of contamination.

4. Use flanges in order to draw air only from in front of the hood.

5. Use downdraft or side draft hoods so as not to draw contaminants past the operator's face.

6. Use manifolds, multiple take-offs or other measures to create uniform air movement through the face of large or long hoods.

7. Eliminate cross air currents through the effective zone of the exhaust hood by the use of baffles, shields, or by relocating unit heaters, space fans or other air movers.

8. Position the hood to utilize air movement from hot presses and to utilize the normal contaminant travel (trajectory).

9. Use tapered connections between hood and duct to reduce the rapid contraction of the air stream and the corresponding entry loss.

10. Remember that the required control velocity at the source of contamination and the transport velocity in the duct are dependent on mass air movement (volume) rather than hood-face velocity.

Many suggested hood sizes are available for various industrial operations from the ventilation manual mentioned early in this paper, as well as from other texts. An excellent source of information for guiding ventilation design for open surface tanks is available from the American Standards Association.

DUCT DESIGN

Duct design is based upon sizing the duct for the required conveying velocity after establishing the required air flow through each hood, and the development of minimum pressure losses due to friction, elbows, transitions and branch entrances into the main. Two methods of design are utilized to insure a balanced system in which each hood is drawing the required air volume. These methods are the static pressure and blast-gate procedures. The design technique is a responsibility of plant engineering. Guides for adequate design are the following:

1. Elbows should have a radius of from two to two and one-half times the pipe diameter.

2. Ducts should be sized for the selected conveying velocity or higher.

3. Branches should enter at gradual expansions, (transition) and at an angle of 30–45 deg.

4. Branches should not enter directly opposite each other.

5. Changes in duct size should be gradual; a one-inch change in diameter to every five inches in length.

6. The system should be "balanced," i.e., the hood nearest the fan should not be robbing air from hoods farther away.

AIR CLEANER

Air cleaners are necessary in most exhaust systems handling dust and fume. The need for this provision is based upon good engineering standards and the complications which may arise from discharging heavily contaminated air into the outside air.

Air cleaners remove contaminants from the air. A wide variety of devices is commercially available, but they may be classed into two types; namely, air filters and dust collectors. Air filters are for removing light concentrations of relatively large-size dust particles found in heating, ventilating or air-conditioning systems. They are not designed for local exhaust-ventilation systems where the dust concentration (loading) may be 100-20,000 times that for which air filters have been designed. Collectors, on the other hand, may have varying efficiencies from the low-efficiency large-diameter cyclone to the high-efficiency fabric and electrostatic type.

Table 3 at the end of this paper is a tabulation of characteristics of commonly used commercial collectors from the work of First and Silverman. Kane also has presented important information on the operation, application and effectiveness of dust-collection equipment. Table 3 does not include all types of commercial collectors and the data should be considered liberally, for

instances in which equipment may perform better or poorer than indicated are not rare.

The selection of an air cleaner will rarely be a responsibility of the safety engineer, but there are factors in selection, such as fire hazard, in which he is interested. In selecting an air cleaner, efficiency alone should not be the sole criterion. Performance, as represented by all factors in Table 2, in addition to other factors, such as maintenance, water consumption, and so on, must be considered. Selection also should be based on an evaluation of the following important considerations:

1. Dust loading and particle size of the contaminant.

2. Collection efficiency required.

3. Temperature, moisture content, and chemical composition of air or gas stream.

4. Characteristics of contaminant such as corrosiveness, sticking and packing quality, specific gravity and shape.

5. Combustible and explosive characteristics of collected material.

6. Disposal or salvage requirements.

Efficiency ratings of manufacturers are "weight efficiencies." Such efficiencies are determined from a ratio of the weight of collected dust to the dust in the air entering the collector, on a per unit volume basis. The efficiency, however, in which we are primarily interested is a "concentration efficiency"; namely, one minus the ratio of the dust concentration in the discharged air to the dust concentration in the entering air.

RECIRCULATING AIR

Controversy has developed on the question of recirculating air from air cleaners. While this may be desirable from a heat-conservation point of view, most state regulatory agencies prevent recirculation. Therefore, in view of this fact, the present stage of air-cleaner maintenance, and inability to be assured of foolproof operation, recirculation should not be practiced in exhaust-ventilation-system design, except under a few special conditions involving nuisance dusts.

Each application involving recirculation should be most carefully considered before it is applied. Several factors must be considered, among which are the following: Concentration of contaminant in discharged air, maintenance schedule and provision for outdoor discharge in nonheating seasons.

A word should be said on the application of unit dust collectors. There are many limitations of this type of collector which have been overlooked very often. These low-cost collectors were intended to meet space limitations where recirculation may be practiced. They were developed for light dust loading from intermittent operations evolving nuisance dusts, such as from tool-room grinders.

They are not intended for continuous dust-producing operations releasing moderate or heavy loadings of small dust particles. Since they have limited dust-storage capacity, short-maintenance periods are necessary. In general, when a number of unit collectors are present in an area, their use in preference to a central exhaust system is questionable.

MAKE-UP AIR

Air must be replaced in any building from which air is exhausted, regardless of the method by which the air is removed. If this is not provided in the winter months, a building becomes air-bound. Cold air leaks through cracks, the effectiveness of exhaust systems is reduced and reverse air flow develops in stacks, ventilators and propeller exhaust fans.

The fan and motor combination is the final element in a ventilation system for contaminant control. Fans may be grouped into two general categories; namely, centrifugal and axial flow. Selection of the fan and motor is a plant-engineering responsibility.

Centrifugal fans, because of their ability to operate against high resistance, are principally used in exhaust systems, while axial-flow fans, due to the ability to move large volumes against low resistance, are used for general or dilution ventilation systems. The safety engineer naturally will be concerned with assuring nonsparking fan construction and explosion-proof motors where inflammable or explosive materials are involved.

The selection of the fan is based upon handling the required air volume at the fan static pressure with minimum horsepower. Additional factors to be considered are the following: type of drive, operating temperatures, space limitations and corrosion problems. The fan should be located downstream from the air cleaner in order to protect the fan from excessive erosion and abrasion.

Sharp elbows and inlet obstructions at the fan inlet should be avoided. The fan location should be chosen to allow easy access for service and inspection. The fan capacity, as in the case of the air-cleaner capacity, should exceed design requirements by a minimum of 10 per cent to provide reserve capacity.

CHANGING FAN SPEEDS

Knowledge of fan laws should be known by all interested in contaminant-control ventilation. Too often, the inexperienced will comment "speed up the fan" as the panacea of exhaust-system problems. When a new speed is desired for a change in exhaust capacity, the new operating point will be calculated from the following:

CFM varies directly as RPM

TP and SP vary as RPM^2

HP varies as RPM^3

These laws apply only to a given system when a change in exhaust volume is required without any physical change in the system. Any physical change in the system throws the entire system out of balance and requires rebalancing to insure adequate flow through each hood. Of equal importance, however, is the effect of increasing the capacity of an existing system. A 20 per cent increase in capacity will require a similar increase in speed. This will result in a 44 per cent increase in total or static pressure and a 73 per cent increase in horsepower.

EXHAUST SYSTEM MAINTENANCE

I believe that the safety engineer can best contribute to the effectiveness of exhaust-ventilation systems by insuring the development of an adequate maintenance and testing schedule. In my experience, few machines or equipment receive less maintenance and testing than exhaust systems, despite the fact that such systems are often costly to install and replace. The mere operation of the fan does not insure adequate system performance.

An adequate maintenance program should involve three phases:

1. Design, system sufficiently rugged to withstand the type of use and abuse expected.

2. Provision for the type of installation to insure convenient routine cleaning, inspection, removal or replacement of any part.

3. Establish a routine procedure for inspection and testing, including maintenance of adequate records.

A system is not adequate simply because someone says so. Only performance data can be accepted as indicating effectiveness. Records should include the following data:

1. Operating data. Fan speed, motor load, hood sizes, and volumes, branch and main-duct velocities, fan inlet and outlet velocities, suction and pressure readings at various points in the system and the dates the data were collected.

2. Name plate data and detailed ordering, descriptions of all equipment.

3. Copies of all construction drawings and sketches.

4. Parts list and spare-parts reference drawings.

All the data should be kept in such form that they will not be lost by the maintenance shop and a copy kept in the general file. The safety engineer may desire to secure a copy of the operating data.

NEW INSTALLATIONS

Measurements should be made to insure conformance with design specifications. Data should be secured on volume (CFM) and static pressure in each branch, and all future readings obtained at the location used. The pressure drop across the air cleaner should be obtained and air samples should be collected at the breathing zone of workers engaged in operations for which the exhaust system was installed. These data shall serve as "bench marks" to which to refer future tests.

EXISTING SYSTEMS

Existing systems should be checked to secure the data previously mentioned for new systems. In addition, the following checks should be made:

1. *Hoods.* Condition of hoods should be observed to note damage.

2. *Ducts.* Cleanout doors should be

opened and settling of contaminant observed. Condition of the duct work also should be inspected for leaks, corrosion or abrasion. Condition and setting of blast gates should be noted for evidence of tampering.

3. *Elbows.* Elbows should be observed for excessive wear. This is particularly important when abrasive dusts are handled as in foundries.

4. *Air Cleaner.* A U-tube gage should be mounted across the cleaner for periodic check of pressure drop. The amount of collected material should be checked and a regular removal schedule instituted. Collector efficiency should be checked periodically by determination of contaminent concentration in the entering and outlet air. Checks should be made for holes and leaks in fabric tubes, the adequacy of water supply and water level regulation in wet collectors, and the operation of rapping mechanisms.

5. *Fans.* Bearings should be checked for overheating. The tension or belt drives and the fan rotation checked. Fan blades should be inspected for accumulations and wear.

While not the most exact of methods, a Velometer or the Anemotherm air meter will provide a relatively simple method for the safety engineer to check air flow at hoods, in ducts and to determine static pressures.

For most purposes, it will be adequate to check velocities in circular ducts in a straight run, 5-7 diameters away from any major air-stream disturbance by determining the velocity in the center of the duct. However, the velocity so determined must be multupled by 0.90 to obtain the average velocity.

Either of the foregoing instruments provides a ready means of determining control velocities at the point of contaminant generation. These general-purpose instruments are in need of periodic and frequent checking and the manufacturer's instructions should be followed. In the case of the Velometer, the zero setting and balance should be checked afer each reading.

I have endeavored to provide some of the basic information on exhaust-ventilation systems. Only through the co-operation of our respective interests, together with the plant engineer, can we achieve a standard of engineering design commensurate with the needs of our common object.

Table 1

RECOMMENDED CONTROL VELOCITIES

Method of Generation	Control Velocity (Ft. Per Min).	Typical Processes
Released without noticeable movement	50-100	Evaporation of vapors; exhaust from pickling, washing, degreasing, plating, welding
Released with low velocity	100-200	Spray booths, sorting, weighing, packaging, mixers, barrel filling, low speed conveyor, transfer points
Active generation	200-500	Foundry shakeout, high speed conveyor, transfer points, crushing, screens
Released with great force	500-2000	Grinding, tumbling mills, abrasive cleaning

Table 2

DUCT TRANSPORT VELOCITIES

Material	Velocity (Ft. Per Min.)
Vapors, Gases, Fumes	1500-2000
Fine Dry Dusts	3000
Ave. Industrial Dusts	3500
Coarse Dust	2500-4500
Large Particles, Heavy Loading, Moist Materials, Pneumatic Conveying	4500

Table 3

CHARACTERISTICS OF COLLECTORS

Group Rating	Type	Approx. Particle Size Efficiency 1-5a Particles %	Installed Cost Per CFM of Rated Capacity $	Capacity 1000 CFM	Optimum Dust Loading Grains /CF	Pressure Loss Inches Water	Service Life Years	Limitations
1. High Eff. High Cost	Electrostatic Precipitators	80-99+	0.5 -2.0	0.1 -200	<1	0.2-0.75	5-20	Need pre-cleaner for coarse dusts. Limited to nonexplosive & noncombustible materials unless in inert carrier gas.
2. High Eff. Moderate Cost	Fabric filters	95-99	0.2 -1.0	0.05-200	0.1-30.0	0.2-2.0 (clean) 2.0-8.0 (loaded)	1-10	Only dry materials. Max. temp.—180°F cotton & 200°F wool.
3. Moderate Eff. Moderate Cost	Wet Packed Towers	20-60	0.4 -0.8	0.5 -5.0	<1	1-10	5-20	Not for solid particles
	Cyclones-Small Diameter	10-40	0.35-0.50	0.02-0.1 per unit 4-500 units per collector	0.5-10	2.0-4.5	5-20	Plugs at high loadings. Nonuniform air distribution in collector.
4. Low Eff. Low Cost	Mech.-Centrifugal	10-20*	0.2 -0.35	0.5 -10.0	1-10	—	5-20	Not for caking & sticky materials.
	Wet Spray Collector	10-20	0.1 -0.2	0.5 -100	<1	0.1-0.2	5-20	—
	Wet Baffle Tower Collector	10-20	0.2 -0.4	0.5 -5.0	0.1-2.0	0.2-0.75	5-20	—
5. Very Low Eff. Low Cost	Cyclones-Large Diameter	<10	0.1 -0.35	1-10	1+	0.5-2.5	10-20	Little value for dust of hygienic importance

* Efficiency for 5—10a particulates is 60—80%

MATERIALS HANDLING WITHOUT ACCIDENT

by JERVIS C. WEBB

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While the subject is named "Materials Handling Without Accident" in the official program, what is meant is "Materials Handling *By Conveyors* Without Accident." While this still leaves a large area to cover, it does narrow the subject down to one with which I am more familiar and experienced because of the nature of our business.

This education in safety as related to conveyors is not just happenstance. Today's material handling systems, to receive the approval of an astute management, must not only deliver a predetermined volume of materials faster, more economically and with unimpaired quality, but must do so with perfect safety to employees and others approaching the moving conveyors. So you might say I am an exponent of safety by compulsion!

At this point, perhaps it would be amiss to give you some of the background on this safety movement. The first published Code on this subject came out in 1947, called the "American Standard Safety Code for Conveyors, Cableways and Related Equipment," known as ASA B20.1. Three years later, in February, 1950, I became chairman of a reorganized committee to revise and bring the Code up to date.

COMMITTEE B20

This committee then became known as Sectional Committee B20 on Safety Code for Conveyors and Related Equipment. The program was sponsored by the Accident Prevention Department of the Association of Casualty and Surety Companies and the American Society of Mechanical Engineers. Work on revisions to the Code was divided into four sub-committees:

1. Scope and intent
2. Nomenclature and definitions
3. Portable conveyors
4. Conveyors in general

Rough draft of the proposed revisions was sent to ASME headquarters in April, 1955, and the revisions were sent to members of the B20 Committee for their comments. At the December, 1955 committee meeting in New York, revisions and suggestions were discussed and sent to B20 members, legislative bodies and interested parties in industry. This resulted in further corrections and refinements. However, the Code is now at ASME headquarters, and awaits only sponsor approval.

DEFINITIONS OF MAJOR TYPES

So much for the background on the safety code. In this discussion, I will endeavor to do four things:

1. Give you my definition of the most commonly used conveyors
2. Comment on the overall safety aspects of conveyorized manufacturing versus manual methods, and touch on the desirability of finding the median or most practical point in considering safety measures—neither too little nor too much
3. What manufacturers can do to ensure safey consciousness among employees
4. Some practical suggestions gained from my own experience and that of other manufacturers and users of conveyors

Here are some definitions of different types of conveyors.

BELT CONVEYORS: Continuous fabric, rubber, leather or steel belt of any width or length, traveling on flat steel or wood beds, on flat or troughed roller beds, carrying packages, bags, parts, coal, ashes, salt, chips—almost anything.

APRON CONVEYORS: One or more, usually two, continuous strands of chain between which are suspended aprons, slats, pans overlapping or not overlapping, of almost any width or length, with or without sides, carrying all sorts of materials.

BUCKET CONVEYORS: Continuous belts, chains or chains, to which buckets are attached, carrying many types of materials in bulk—sand, gravel, stone, coal, chemicals and grain. Operated vertically, these conveyors are called bucket elevators.

CHAIN CONVEYORS: This term covers a multitude of designs and styles. Continuous chain or chains running over and driven by sprockets or caterpillar drives, supported by metal or wood track, or roller beds, sometimes called a drag chain. Material may rest on the chain, on carts or trucks fastened to and pulled by the chain. Sometimes the chain itself works and advances bulk materials along by itself operating in a trough.

FLIGHT CONVEYORS: This consists of single or multiple strands of continuous chain to which cross bars or flights are attached for pushing and scraping the material along in troughs.

GRAVITY CONVEYORS: Series of free rollers or wheels mounted on axles set in two or more parallel frames, the supports being so arranged that the materials are moved along by the force of gravity.

LIVE ROLLER CONVEYORS: Series of rollers motivated by belts or chains from underneath, or by sprockets and chain at the end of each roller. Materials are moved along as they rest on the turning rollers.

OVERHEAD TROLLEY CONVEYORS: Picture an overhead I-beam track on which are suspended trolleys, which are spaced and driven by a continuous chain traveling parallel to and beneath the track. Loads of all sorts are suspended on hooks, buckets, baskets or other hangers from the chain, or pulled in trucks or carts by the chain and trolleys.

SCREW CONVEYORS: Consist of helical screws in guide channels whose relative rotations advance the material handled.

In your mental picture of conveyors, bear in mind that in practically every industry one or more of these conveyors are an integral part of manufacturing assembly, are providing continuous mechanized processing facilities, are tied in with storage, warehousing, shipping and receiving activities; or at the least, are transporting raw materials, parts or fuel from one place to another in the plant or from one building to another. These units move powerfully and mechanically, and consequently safety features are as essential to them as to machine tools, power trucks or other mechanical devices.

The safety code treats these and other conveyors and related equipment generally and specifically. It speaks of general design in this way: Guard driving machinery; don't load beyond rated capacity; design mountings in such a way that catching sharp edges or possibility of pinching are minimized.

Keep lubricating points piped out to safe locations; enable adjustments to takeups or drives to be accessible. Use anti-backups and anti-runaway mechanical safety stops on slopes as protection in the event of chain breakage. Use load brakes as overload cut-out protection. Enclose counterweights. Use guard rails.

Interlock conveyors electrically to prevent jamming and danger which occurs when one conveyor shuts down and the one feeding it might still be operating. Watch design of transfer points from one conveyor to another as here lies the possibility of pinch and dangerous free materials. Make sure supports, particularly for portable conveyors, are substantial to support without tipping under loads.

GENERAL SAFETY NOTES

The Code covers clearance and accessibility. Leave space for maintenance and for operators. Provide visibility so oncoming loads may be seen. Up high, provide guarded catwalks. Wherever wall or floor openings occur, guard well with rails—these are dangerous points. Provide inspection doors and peep holes where conveyors are enclosed. Make proper provision for crossovers, aisles, passages, leaving ample clearance and headroom. With paint, signs and/or lights, clearly define these ways of travel.

Under inspection and maintenance, the Code suggests the importance of lubrication on a regular basis. Keep takeups properly adjusted; examine periodically cottered connections and couplings for weaknesses. Replace worn parts.

The Code advises that related structures such as tunnels, pits, hoppers and chutes where conveyors are used should be considered in the overall safety design.

General safety rules might be built around these admonitions: Obey rated load signs.

Mark stop and start stations clearly, and make them easily accessible, and where they provide a clear view of the conveyor. No riding on conveyors; no stepping on conveyors. Don't service conveyors unless on regular maintenance crew. While servicing, stop the conveyor and lock out normal starting push button stations. In case of overload cutouts, locate jam and use lockouts before starting or servicing.

The Code refers specifically to its relation and dependence on other codes. These include those of mechanical power transmission, electrical, elevators, dumbwaiters, escalators, cranes, derricks, hoists, buildings, bridges, walkways, floor and wall openings, railways, toe boards, dust explosions and boiler construction. The ASME, ASA and ASTM code numbers are listed therein.

CONVEYOR SAFETY IDEAS

Turning to specific conveyors, the Code suggests briefly that: A smooth cover should be used under slat conveyors where there is space between slats to prvent shearing hazards; safety provisions for men who must ride on trippers or belt conveyors; totally enclose bucket elevators; hand rails, smooth sides; guard plates along chain conveyors will protect hands, feet and clothing; stops are needed at open ends of gravity conveyors; try to eliminate all pinch points on live roller conveyors; substantial guards with sides under overhead trolley and power and free conveyors are desirable; use solid covers on screw conveyors when possible.

The Code is a good start. The revised edition will be of considerably greater help in minimizing accidents originating from conveyors. Of course, we all know that where the human element is involved, there is always a possibility of accident—through ignorance, carelessness or horseplay. The careful indoctrination of all employees with the provisions of the Code will be of material help in at least reducing accidents.

Now, let's leave the code and discuss the broad aspects of how far we should go in our safety measures . . . which brings us to the second of the four divisions.

We don't fence in our highways and streets so that trucks and automobiles won't hit people; we use traffic lights, signs, curbs and painted lines. Similarly, we can go only so far to protect operators of machine tools. They must use the safety features, be alert and safety conscious. Some elaborate guarding is as economically unsound as fencing the highways or streets. Sometimes the initial cost might be up to 40 per cent of the entire installation; and, further, might greatly limit the advantages and flexibility of the conveyor.

CONVEYORS REDUCE HAZARDS

The problem of safety in industry might be approached in another way . . . by stating that conveyors as a whole mean more safety. Here's why: Materials are brought to and taken away from operators. Lifting, carrying or wheeling is lessened or eliminated. The operator, therefore, need not leave his station and walk into trouble elsewhere; nor need he join that unfortunate group who sustain lifting injuries.

In *Occupational Hazards*, an article entitled "High Cost of Lifting," said the manual handling of objects accounted for 27 per cent of the total accidents in Illinois. Handling by conveyors eliminates this manual handling. Material coming to the operator mechanically eliminates momentary inattention to the machine he is operating.

Conveyors help good housekeeping because they are installed on definite lines of flow, and their continuous operation cuts down piles of subassembly goods in process. Less manual handling lessens fatigue and its tendency toward mistakes. Working along a conveyor at a constant uniform speed, being fed material on an even flowing basis, operators develop a rhythm in their work which makes for sureness and fewer mistakes.

Mechanized coal yards, foundries, paint shops, chemical processes—look at these in comparison to their old unhealthy, back-breaking, dangerous manual counterparts. The conveyor goes where a man cannot, or should not, into and through heat, bad atmospheres, cutting heads of machines—all kinds of conditions. Yes, industry is safer because of conveyorization.

Now we come to the third division. Users and conveyor manufacturers must work together to reach the right balance of safety in conveyor systems. Greater consumer safety consciousness is a must. In any competitive industry, there are those who skimp on safety features to have the lowest price. Users must study proposal specifications and demand that safety features be outlined as specifically as the conveyor itself, and then these provisions must be adhered to. They should consider carefully before they rule out a supplier because he includes what others might call excessive safety features.

Get copies of the Safety Code, and make sure the provisions are incorporated into your conveyor system. In considering the proposal, consider, too, these points: Has the system hemmed in workers too much . . . created fire hazards . . . allowed wide enough aisleways . . . left normal exit facilities? It is also wise to watch wall openings and floor openings as to their effect on the safety of employees on both sides of these walls and ceilings.

Now we come to the fourth division . . . just a few suggestions for safe use of conveyors in general. When you have installed a conveyor, don't start using it for production until it is formally turned over to you by the manufacturer or erector. The systems must be run, the bugs must be taken out of the automatics, clearances between guides and moving parts may need to be relieved.

It's practically impossible to design and build a conveyor system that does not need any field adjustment after shipment, and after the variations in the user's plant are taken into account. By far the most accidents have occurred at this point in our experience as manufacturers.

WATCH WHEN SERVICING

If a conveyor is being serviced and is shut down as it should be, watch that the work is not being done too closely to another moving conveyor. A number of serious accidents have occurred where the serviceman, absorbed in his work, leaned back into another moving conveyor, or a slowly moving load came along and squeezed or pinched him against the stopped conveyor, or to a wall opening.

Watch loading of conveyors. Be sure the hookup is secure if it is a hooking job. If materials are piled on the conveyor, watch that they aren't top heavy.

Remember clearances between conveyors and walls. Clearance for a man to walk through should be based on the largest load carried on the conveyor.

Authorize certain persons to operate certain conveyors just as you would a machine tool. Keep others from starting the system. Speed variations in conveyor lines should be entrusted to one who understands what effect these changes might have on the system as a whole.

CHECK JAMMING IMMEDIATELY

If overload cutouts are continually operating, or shear pins continually shear, contact the manufacturer of the equipment and find out the cause of jamming. Check as to whether the system is overloaded by means of a dynamometer. If the design is light, get it heavied up before trouble starts.

Have a number of push button stop stations along a conveyor line. Insist on electric ground wires, particularly on portable conveyors and systems operating in the outdoors or in damp places. Insist on heavy, high-quality electrical equipment. Stay on the high side of electrical codes.

Conveyors can be used safely, and their use has contributed substantially to the industrial worker's safety. If you set up definite rules, be sure that all are acquainted with them. If you insist that safety specifications be high in the conveyors you buy . . . then conveyors will be safe.

NUCLEAR POWER PRESSURE VESSELS

by CLAIR E. KEENE

vice president, Mutual Boiler & Machinery Insurance co., Waltham, Mass.

The purpose of this presentation is to explain some problems in the safe application of pressure vessels in nuclear power plants. My discussion is confined to general accident prevention in construction and use of pressure vessels.

There are several types of reactors in use or under development for power generation. Pressurized water reactors and boiling water types are favored, although sodium graphite, fast breeder, and aqueous homogeneous reactors are used. These reactors require pressure vessels to contain the moderator or coolant or other liquids or gases incidental to operating the reactor. These vessels are in addition to those usually found in a conventional steam-electric power plant.

Most nuclear power reactors are unique, requiring a steel air-tight container to house the reactor vessel and other radioactive components. The extreme toxicity of the fission products and other highly radioactive substances in the reactor systems makes this essential to prevent any possible release. Every precaution is taken in the design and protection of a reactor, however, a fuel melt-down or disruption of the primary system could occur.

TYPES OF PRESSURE VESSELS

Pressure vessels in a nuclear power plant may be roughly divided into three main categories:

1. *Reactor and primary coolant vessels, including shield tanks inside the final or outer containment vessel or housing.* The contents of these vessels are normally subject to high level neutron or gamma irradiation. Some of these would seldom, if ever, be accessible for internal inspection.

2. *The outer or final containment vessel housing the reactor vessel and primary system components.* This vessel may be subject to gamma radiation because of the activity induced in the coolant system. These containment vessels are not normally pressurized but are designed to withstand the maximum pressure from an explosion or rupture of the primary system in any credible accident. They are also expected to stop flying explosion fragments from penetrating the container.

3. *Secondary system vessels as found in a conventional power plant.* These vessels are not normally radioactive and are usually located outside the containment vessel. They are normally accessible for inspection and maintenance.

DESCRIPTIONS OF EACH GROUP

The first group consists of a reactor vessel with fuel, one or more heat exchangers or steam generators, a pressurizer, primary blow down tanks, and other vessels built for relatively high pressures. The operating pressures for vessels containing moderators and coolants may range from atmospheric pressure to over 2,000 p.s.i. Operating temperatures range from 300° to over 1,000° F.

Some of the primary system vessels are large with diameters from 10 to 20 ft. and 30 or 40 ft. long. This group has thin walled tanks which operate under little or no pressure to provide thermal or biological shielding. Some primary vessels, especially the reactor vessel, are subject to high thermal stresses, corrosion and radiation damage.

The second group operates under atmospheric pressure or a few pounds higher but withstands internal pressures and impacts that occur from a reactor incident without leakage or rupture. Some vessels are an unusual size with diameters up to 225 ft. and cylindrical lengths up to 150 ft. They are designed for internal pressures from a few pounds to 65 or more psig. Attention is also given to design against external pressure to avoid possible collapse. The size and shape of these vessels are determined largely by the equipment contained, the reactor incidents postulated, and economic factors. Both cylindrical and spherical shapes are used.

The third requires no description as it includes heat exchangers, evaporators, feedwater heaters, water tanks, air tanks, and other auxiliaries found in a conventional steam plant.

In my opinion the safety of nuclear pressure vessels under present pioneering conditions depends primarily upon:

1. the suitability and quality of material,
2. the adequacy of the design to meet the service conditions,
3. good workmanship in fabrication,
4. rigid shop inspection and testing.

In other words, for maximum safety we must have well designed and constructed vessels because there is limited access for maintenance and inspection.

Extra care is required to determine the quality of materials. Non-destructive testing must be used extensively. Inclusions or other defects must be kept to a minimum. Local stress raisers should be reduced to the greatest possible extent.

Extra precautions are required to insure sound welds. The mechanical properties of the steel must be thoroughly investigated, not only tensile strength and ductility but also endurance limit, creep-rupture, impact strength, and notch sensitivity properties.

STUDY RADIATION EFFECTS

In addition, the effect of irradiation on these properties must be studied. The effect of neutron bombardment and gamma radiation on some properties of structural materials is not known and pressure vessel designers need further research.

It seems that most conventional steel alloys become stronger and harder when irradiated. One important observation on carbon steels used for pressure vessels revealed that the impact strength was reduced appreciably.

Reduction in impact strength, if appreciable, will increase susceptibility to brittle fracture. In addition, the transition temperature from ductile to brittle fracture was raised considerably.

Radiation damage could seriously affect the safety of operation. The increase in brittleness may be nullified or minimized by the annealing effects at relatively high operating temperatures. Only time will tell the actual effects on a reactor in service for some time. Material deterioration from the combined effects of stress and corrosion also deserve attention. The sensitivity of austenitic steels to cracking at the edges of welds is another possibility.

These three groups of vessels are designed and constructed in accordance with the A.S.M.E. Boiler and Pressure Vessel Code. The Code does not adequately cover the design and material problems presented by vessels subject to atomic environmental conditions so special rulings to cover this new group of vessels had to be made.

DESIGN AND MATERIALS

Most of the pressure vessels in the primary system, particularly the pressurized water and boiling water types use a carbon steel, such as ASTM-A-302B, ASTM-A-201B or ASTM-212B clad with 304L or 347 stainless steel. Code Case No. 1226 requires that containment vessel shell plates be constructed from ASTM-201 or A-212 ordered to the requirements of ASTM A-300. Stainless steel is required to keep corrosion to a minimum.

Oxygen and hydrogen are released by water decomposition and make the water more corrosive. Special precautions are required to keep the water non-corrosive, to prevent a weakening effect on the pressure vessel and a build-up of corrosion products which become radioactive and present difficulties in inspection and maintenance of pressure vessels.

In fabrication close adherence to specifications and tolerances is necessary. The use of radiography, dye-penetrant, and ultrasonic testing of welds is strongly recommended. Stresses other than those due to pressure, sometimes referred to as secondary stresses, require special analysis in the design of nuclear vessels. Thermal stresses are particularly important in the design of the reactor vessel and coolant system.

In a power reactor intense radiation generates heat inside the reactor vessel whereas in conventional power and process equipment the heat is usually applied to the outside of a wall and transmitted through it. The temperature gradient in boilers and vessels is approximately a linear function, having the highest temperature on the fire surfaces and the lowest temperature on the opposite surface. In contrast, the temperature gradient caused by internal heat generation of a

reactor is not a linear function and the highest temperature is close to the outside surface.

Thermal stress problems limit the thickness of shell plates and heads of reactor vessels and thus limit vessel diameter. If the steel plate is too thick the heat generated cannot be reduced fast enough and high thermal stress will result. Thermal stresses increase with an increase in wall thickness. Nuclear vessels may also be subject to thermal stress cycling with the possibility of fatigue if the reactor is subject to frequent load changes. The rate of heat generation can change very rapidly in a reactor whereas in conventional equipment the rate of temperature rise is limited by the rate at which fuel can be supplied and burned.

EXPLOSION POSSIBILITIES

One major source of a reactor system explosion is that the superheated coolant contains much potential heat energy which, if released by a rupture, would flash into steam or vapor and cause a serious explosion.

An exothermic chemical reaction is also possible in many types of reactors under certain pressure and temperature conditions. Internal pressure and exothermic chemical reactions that develop within the containment structure and the missile velocities that are attained by any fragments striking the internal surfaces of the container have been analyzed by several investigators.

It is a relatively simple matter to determine the pressure build-up in a containment vessel from the rupture of a primary system containing water by pressure . . . volume relationships and thermodynamic tables. The pressures developed by metal-water reactions are more difficult to determine but can be calculated or approximated by chemical engineers on the basis of credible assumptions. It is assumed some fragmentation of the pressure vessel will occur.

This is possible, particularly if a brittle fracture occurs, but with the explosion of steel boilers and vessels nearly all failures are of a ductile nature and little or no fragments fly around, with one principal exception. When a head or cover plate becomes detached from the pressure vessel by circumferential cracking or failure of the bolts or other fastenings, the head may travel a considerable distance at high velocity.

In other words, if a rupture occurs in the shell of a vessel, it usually tears with high energy absorption, allowing the contents to escape. On the other hand, if a head or cover breaks loose there may be a considerable displacement of both the head or cover and the rest of the vessel itself.

For this reason we feel the results of the investigation are conservative in missile effects. Excluding a brittle fracture, the top cover blowing off a reactor vessel or other vessel set vertically inside the container presents the chief hazard of a fragment striking the container and here, in most cases, because of the mass, the velocity of impact should be relatively low.

We are most likely to experience trouble with pressure vessels in nuclear plants from cracking in or near welded joints. This cracking may or may not cause leakage of primary system contents into the containment vessel or secondary system. These cracks may result from fatigue, thermal stress, stress corrosion, or locked-in stresses from welding. We would not expect brittle fracture to occur, if suitable materials and design are employed, unless radiation damage is greater than expected. If an explosion occurs, particularly from internal pressure, we would expect a ductile type of failure and not much fragmentation.

TESTING FOR LEAKAGE

Preventing the escape of dangerous fission products and radioactive materials from reactor pressure vessels makes it essential to go to great lengths to assure vessel integrity. Several testing techniques are used to detect leakage. These include mass spectrometry, variations of which are the hood, boot and sniffing techniques, pressure-holding methods, soap bubble tests and, of course, pneumatic and hydrostatic tests. One or more of these tests should be preceded by radiographic examination of the welds combined with dye penetrant or other non-destructive investigation of the welds.

As far as the containment vessel is concerned, present standards do not require stress relieving of the finished structure. Other vessels built in accordance with the Code in the manufacturer's shop are, of course, stress relieved in accordance with Code requirements. The precautions now being taken in the strength and leak-proof testing are reasonably adequate for nuclear pressure vessel safety.

The safe operation of pressure vessels in a nuclear system depends upon many factors. Most reactors well protected against excessive pressures, temperatures, circulation failures, and other conditions which could be dangerous. The protective system for a reactor is elaborate and the safety devices will scram the reactor if an emergency occurs. These safety systems are of multiple design and made to fail safe.

Safe operation depends on keeping the reactor coolant outlet temperature below a safe maximum so that the fuel and structural materials will not be damaged. Safe, simple and reliable methods must be set up for normal start-up and shutdown of a reactor as well as for emergency scram conditions. Accessibility for inspection is difficult in most cases . . . sometimes it may be impossible.

It takes time for radioactivity to decay to a safe point for personnel to inspect and make repairs. From the standpoint of safety of nuclear power pressure vessels in service great dependence must be placed on the supervisory control and protective equipment and indications of deterioration, such as the rate of corrosion product formation or leak detectors, in evaluating the condition of the vessels. We presume that from time to time certain vessels or parts of vessels will be accessible for close inspection or at least methods may be devised for some type of remote examination.

This paper has dealt primarily with some of the principal factors affecting pressure vessel safety and the design and construction requirements. The design and construction of nuclear power pressure vessels, with particular attention to selection of materials suitable for the environmental conditions, is of paramount importance for safety and it is in this field that we, as mechanical and safety engineers, can render the maximum service.

NOISE CONTROL—SOME PRACTICAL APPROACHES

CONTROL OF NOISE AT THE SOURCE

by R. L. YOUNG
noise analyst, industrial hygiene div., Employers Mutual Liability Insurance co., Wausau, Wis.

If there is any phase of the industrial noise problem on which there is rather general agreement it is this—that the ultimate answer or solution is a well conceived noise abatement program. The avenues of approach to this goal are as wide and varied as those of any problem which industry has faced in recent years.

It has been said, and rightly so, that there is no cure-all package solution to this problem. We might go one step further and say, that frequently there is no one right answer to a specific noise problem and here an understanding of acoustic principles as well as a considerable amount of common sense is necessary to achieve the best possible answer.

COMPLEX OPERATION

The control of noise in many cases is a complex and costly proposition and the final solution in such cases may require a long range program of planning and research. In some instances conditions may be satisfied by a single type of treatment while others may require a combination of several methods. It is also true, that certain noise problems will require the services of a qualified acoustical engineer or consultant with experience in designing noise control installations.

On the other hand there are some relatively simple, well-known noise control measures which can produce substantial improvement. I have selected illustrations from a variety of industrial operations with the hope that some of them will give you ideas for similar applications in your own plants.

Muffler—Fountain Pen Manufacturing Operation

This is a small table-mounted air operated machine which performs a degating or trimming operation on molded plastic pen parts. It operates on an air line pressure of about 110 psi. The exhaust air was originally discharged directly into the atmosphere at the rear of the machine producing a maximum overall reading of 114 db. on the sound level meter. The noise produced by the air exhaust was intermittent and of short duration but occurred every few minutes.

A small commercial muffler was installed on the exhaust air outlet which reduced the overall noise level to 88 db. The high frequency noise was reduced to a level where it is hardly noticeable above the ambient noise in the room.

Although few noise sources lend themselves to as simple and inexpensive a control as installing a muffler, the results are particularly gratifying in a plant where they have many air operated machines operating at air pressures of 40 to 110 db. At present they have approximately 150 mufflers installed on machines throughout the plant with individual machines having anywhere from one to six mufflers.

Oil Immersed Chain Drive—Tag Manufacturing

Much of the noise produced by a custom built tag converting machine was contributed by a heavy cast gear train. The machine performs a punching and cutting operation as a narrow strip of paper is fed through. The entire chain and gear drive assembly was replaced with a "Speed Trol" fluid drive transmission and an oil immersed roller chain drive.

Noise level readings taken at the machine operators position showed that the overall noise level was reduced from 95 to 93 decibals. The noise measurements were made while the plant was shut down so that the background noise was well below the machine noise. The transmission noise is now less than the noise produced by the remainder of the machine mechanism. Only one of eight machines has been so modified at present but the remaining seven units will be converted during the next few years.

In a plant which manufactures air conditioning equipment, pneumatic hammers were formerly used to bend and close seams on sheet metal fan housings. The large noise radiating surface provided by a housing such as the one in the picture produced high intensity noise over a considerable area. Noise measurements made in the immediate area showed the overall noise level to be in the order of 106 db. with the highest octave band level being 103 in the 600 to 1200 cps. frequency band.

Pinch roller machines which are commercially available were first provided to perform this operation on the smaller fan housings of about 12 inches in diameter. When it was decided to use similar machines to perform this operation on housings of all sizes, the machines were not available to handle the larger housings. This pinch roller machine which can handle all of the large housings was built by the user and in addition to completely eliminating the high level noise the time required for this job has been greatly reduced.

TUMBLING OPERATIONS

Tumbling barrels are used for a variety of operations in many different industries and they frequently present a rather serious noise problem. Complete individual enclosures have provided a very satisfactory solution in one plant. In one particular case, slotted tumblers are used to separate scrap from the parts. The parts are cup-like objects stamped from either 18 or 20 gauge cold rolled sheet steel. The material is loaded or shoveled into the tumblers by hand. As the tumblers rotate, the thin, washer-like pieces of scrap fall through the slots in the tumbler wall into a pan on the floor. When the operation is completed, the scrap pan is removed and an empty tray is placed on the floor to catch the parts.

The enclosures consist of one-fourth inch tempered masonite over one inch thick fibrous sheathing on the outside of two by four studs and another one inch thick sheathing nailed to the inside of the studs. The studs are located about 18 inches on center and the four-inch space between the two surfaces of sheathing is filled with rock wool bats. The doors are of the same construction.

With tumbling cups four inches in diameter, the overall noise level was reduced from 111 to 88 db. at a point in the aisle about five in front of the tumbler. This was predominantly high frequency noise and reductions of 22 to 24 db. were obtained in each of the four octave bands between 600 and 10,000 c/s.

With tumbling smaller, washer-like parts one and one-quarter inches in diameter the overall noise level was reduced from 92 to 85 db. The noise level with the enclosure is approximately the same as the ambient noise level in this area under normal plant operating conditions. In other words the enclosure in this case is undoubtedly giving a much greater reduction than is indicated by these two sets of readings.

FOUNDRY OPERATIONS

A small foundry shakeout for brass and bronze plumbing fittings was enclosed with fairly good results. Since the shakeout is continuously fed by conveyor at one end and unloaded by hand at the opposite end it was necessary to leave an opening at both ends for this purpose. The openings were made as small as possible and curtains of heavy rubberized canvas were hung over the openings to reduce the noise radiated from them.

The enclosure consists of one-quarter inch masonite over one-half inch fibrous panel. The sides, ends, and top were fabricated as separate panels and can be partially or totally dissembled for maintenance purposes.

The parts are automatically dumped from pans on an overhead conveyor into a chute at the rear of the shakeout. The chute carries them through the rear opening on to the shakeout table. The degator operator removes the parts at the other end.

The greatest noise reduction was found to be at an inspection station about six feet directly to the side of the enclosure. At that location the overall noise level was reduced from 101 to 94 db. and the critical frequency band levels in the 600 to 1200 cps. and 1200 to 2400 cps. bands were both reduced 10 db. from 96 to 86 db.

PAPER MILL PRESS EQUIPMENT

Some of the highest noise levels measured in paper mills are due to the discharge from the vacuum pumps on suction presses. This vacuum pump is rated at 18 inches of mercury when operating at 360 rpm. Originally the pump discharged directly through a pipe into an open sewer under a metal grating in the floor. This arrangement produced an overall noise level of 120 db. at a point three feet directly over the sewer opening.

A commercial separator snubber which separates the water and air was installed in the discharge line from the pump. The separator snubber has the water outlet at the bottom extending down into the sewer and the air outlet at top. This single unit reduced the overall noise level from 120 to 112 db.

Because a greater reduction was desired, an additional snubber was connected to the air outlet of the separator snubber and this reduced the overall noise level from 112 to 102 db. This present noise level is considered reasonably satisfactory since the vacuum pumps are located in the basement pretty well isolated from all regular working stations.

In the same paper mill a separator and a snubber were connected to the discharge pipes of two vacuum pumps rated at 17.5 inches of mercury when operating at 680 rpm. The overall noise level at this location was reduced from 116 to 101 db.

TESTING SUPERCHARGERS

One of the highest noise intensities that I have encountered was in a small building where superchargers are tested. A 150 hp. DC electric motor drives the supercharges under test at 3500 rpm. The room surfaces are brick and concrete. Although workers must be in the immediate vicinity of the test stand for short periods to make adjustments and record certain data, most of their time is spent at a control panel.

A partition was constructed between the test stand and the control panel in an attempt to provide a quieter area at the control panel. The overall noise level at the center of the test area which is about 12 feet from the supercharger is 127 db. The overall noise level at the control panel in back of the partition which is also about 12 feet from the supercharger is 100 db.

Although a considerable improvement, this is not yet a satisfactory solution to the problem and it is anticipated that additional control measures will be taken. For example, further reduction in the noise could probably be obtained by providing a gasket around the door in the partition which is located several feet to the left of the control panel. The workers do wear ear protective devices at all times while in the testing room itself.

WOODWORKING PLANTS

One of the noisier machines in a woodworking plant was a large twin band resaw. As with most woodworking machines there is little if anything that can be done to reduce the noise at the machine itself.

In this case a partial enclosure consisting of plywood and one inch sheathing on two by four studding was constructed around the band resaw on an experimental basis. Only two openings were necessary on opposite sides of the enclosure for feeding and removing the lumber. There are two large hinged doors on opposite sides of the enclosure also which provide easy accessibility for either of the operators when the need arises for them to enter the enclosure.

No noise level measurements were made before this enclosure was installed so the noise reduction obtained can only be estimated. In all probability it has done little if anything for the two operators who are located directly in front of the openings, however, the workers located to the side of the enclosure report a noticeable noise reduction.

Boiler manufacturing has long had a reputation of being one of the noisier industries. A couple of the noisiest operations in boiler fabrication are called belling tubes and beading tubes, both of which are performed with pneumatic hammers. When this operation is performed in a large opening working area it produces noise of high intensity during intermittent by frequency intervals for considerable distances.

To confine this high level noise to the immediate area surrounding the operation a large accoustical enclosure was constructed. The enclosure consists of an outer wood surface and bats of sound absorbing material covering the entire inside wall and ceiling surfaces. It was constructed with large hinged double doors at one end providing the necessary access for small rail flat cars.

Noise level readings made before and after the enclosure at a work station 37 feet from the beading operation showed noise reductions in the 1200 to 2400, 2400 to 4800, 4800 to 10,000 cps. frequency bands of 14 db, 17 db. and 16 db. respectively.

This enclosure is no doubt giving larger noise reductions than those indicated by these values since the final readings with the enclosure were approximately the same as the background noise level.

The foregoing illustrations of industrial noise control are not intended as the only or even the best solution to the particular problems. They were presented rather as examples of control measures that have been applied with reasonably satisfactory results. In most of these cases the amount of noise reduction was substantial and in all cases the results were felt to be worthwhile by the plant personnel involved.

No doubt improvements could be made, particularly in regard to some of the enclosures, where a better selection of construction materials and greater use of sound absorbing linings would have produced larger reductions.

However, these examples illustrate some of the problems encountered with noise and some of the things which can be done to reduce noise at or near its source. The possibilities are unlimited once the problem is recognized. Nevertheless, each of you will have to meet the challenge somewhat on your own, either now or at a later date.▲

NOISE CONTROL BY ACOUSTICAL TREATMENT

by LYLE F. YERGES

merchandise manager, Industrial Sound Control, U. S. Gypsum co., Chicago

CONTROL OF NOISE AT THE SOURCE

The best idea yet developed in acoustical design is to avoid making noise. It's always the most effective, and it's usually the cheapest.

MEDICAL CONTROL OF HEARING LOSSES

It would appear that protecting the individual against noise would be the next best method. However, everyone has had painful experiences trying to get workers to wear gloves, goggles, safety shoes and hats. Imagine the difficulty to get them to wear ear plugs or muffs. Furthermore, it is very difficult to forecast susceptibility to noise damage or to measure hearing loss accurately when it does occur. Hearing losses can be determined only after the damage is done—and that is too late.

NOISE CONTROL BY ACOUSTICAL TREATMENT

So, I'm going to concentrate on controlling the acoustical environment—commonly known as sound control or acoustical "treatment." To most people, acoustical treatment means the application of acoustical tile or absorbents to the ceiling of a room. This is the commonest form of noise control, and its use is widespread.

Like the word "treatment," however, it suggests a "cure" or "correction" of an existing ill. Like most cures, it can be expensive and may not be completely satisfactory. For example, at the 100-plus decibel level of many factories, it is very difficult to remove even five decibels by absorption, whereas a simple process change or machine re-design could reduce the level by 10 or more decibels.

In those cases where the problem is to prevent passage of noise through walls, acoustical absorption is virtually useless, and the so-called "treatment" isn't really a treatment after all.

"Acoustical treatment" refers to the use of materials, constructions, systems, or combinations of all three to:

1. Absorb sound.

Keep noise in the plant?
Keep noise out of the office?
Reduce noise levels in the plant?
Quiet a noisy machine?
Isolate a noisy operation?

2. *Whom are you trying to protect?*
   The operator of the noisy machine?
   The workers in the entire plant?
   A single observer of a noisy operation?
   A few noise-susceptible individuals?
3. *Why?*
   Are you trying to avoid compensation claims?
   Is there evidence of noise damage?
   Is verbal communication impossible?
   Are workers distracted?
   Are operators unable to identify necessary sounds from their own operation?
   Are you trying to make a few neurotics happy?
   Is everyone complaining?
   Are the neighbors complaining?
4. *What are the alternatives?*
   Can you move the noisy machine?
   Can you protect the operator by putting him in an isolation booth?
   Can you move the operator and his controls, dials, and equipment to a quiet place outside of the noise?
5. *Will the resultant improvement be enough to justify the expense?*
   Will a five decibel drop do enough good? For example, will reducing the level from 115 db. to 110 db. be enough?
6. *Should you consider an entirely new approach?*
   Can you use a different process?
   Would a new plant or a new location be the only practical approach?

In a few words:

Identify your problem—THE DIAGNOSIS—then, decide on the proper solution to the problem—THE CURE—and finally, choose the proper materials, constructions, systems, or plans—THE MEDICINE.

Chances are the patient will recover, or at least feel a lot better.

MEDICAL CONTROL OF HEARING LOSSES

by **DR. WILLIAM FORD**
Green Bay, Wis.

The purpose of this presentation is to tell you how our various conservation of hearing programs were established in industry in Green Bay and northeastern Wisconsin and to offer a "how to do it" program which can be tailored to fit your needs.

For years the Wisconsin Manufacturers Association, the State Medical Society and the Industrial Commission have sponsored Industrial Health Clinics in several key areas. To them were invited the safety personnel, top management and interested physicians. Thus a back log of groups interested in meetings of this sort was established.

Green Bay's recent (October 1953) Cause Celebre—the case of Wojak vs the Green Bay Drop Forge resulted in increased awareness of the problem of industrial deafness but in reality only initiated our first efforts in this field. To show how unthinking we were, it was recalled that on many warm summer evenings on an open porch nearly three-quarters of a mile down wind from the Drop Forge Plant the thumping of the hammers was sufficiently loud to be a topic of conversation. In other words, it was not unusual to remark about the noisy hammers at the Drop Forge but no particular interest was aroused beyond noting that "the wind was in the west again."

NOISE CLINICS ORGANIZED

Several industrial noise clinics were then held in Neenah, Oshkosh and Green Bay sponsored by the groups mentioned above. In addition more clinics were planned by the safety committee of the Green Bay Association of Commerce and the Industrial Health Committee of our County Medical Society and held in the city of Green Bay.

These latter groups formulated a series of plans to offer industry which varied with the size of the plant, its medical and safety personnel and its location. A tentative schedule of fees was included with a preliminary report of these meetings.

Probably the best and most interesting part of these rather small meetings was the open-mindedness of the people involved and their willingness to discuss all phases of the problems presented by the various representatives of industry and medicine. In fact these meetings at the county level were most productive of immediate results and enabled us to go ahead with our planning.

HEARING TESTS MADE

In the smaller plants and those with a limited budget pre-placement hearing tests were made consisting only of an audiogram, a graphic record of the ability to hear certain pure tones in each ear under more or less standard conditions. In Green Bay these tests were made in the physician's office by a trained technician. In the smaller towns, if there was a local hospital with a room available, efforts were made to persuade the manufacturers in a nearby area to purchase an audiometer *jointly* and *the hospital to* allow a nurse to be trained in its use.

For example, in Oconto county such a station was established in the western half of the county at Oconto Falls and another in the eastern section. At these two points (in this particular county) the techniques in making the audiograms were similar.

At the other extreme in a small city in Kewaunee county the three local physicians each purchased an audiometer and divided the testing. *Admittedly in this last situation* there is a rather wide variation in the techniques employed but (also admittedly) it is much better than not having any tests at all.

In Green Bay the technician sends a copy of each audiogram to the mill. Somewhere in this procedure it is examined by the otologist and a diagnosis written across the back of the card. Any abnormalities in the curve are indicated and if necessary the employee is advised to have an ear, nose and throat examination. Rechecks are also suggested but the efficiency of the follow up varies.

. . . WITH LIMITED MEDICAL FUNDS

The next type of program is followed in some of the larger mills but ones still having a limited medical budget. These mills have either a part or full time industrial nurse who, understanding the value of the program, will be responsible for the follow ups advised at the time of the first audiogram. It has been found desirable for the consulting otologist to set aside time at regular intervals to discuss the program with the nurse and visit certain noisy areas in the plants.

This, of course, serves two purposes, (1) to further the physician's familiarity with manufacturing processes involved and (2) to stimulate the nurse's interest in the plan. *Thus it is possible to* lay the ground work for further studies in the mill regarding numbers of men working in noisy areas and their exposure time.

In other mills, where the main interest is still one of self protection, that is, from the insurance standpoint, in addition to the pre-placement audiograms, a complete ear, nose and throat examination is performed at the expense of the mill and a written report and recommendation filed in the mill office.

A few of the mills have in addition to the above, yearly general physical examinations which include a complete ear, nose and throat study with an audiogram. Frequent checks are made when an employee is in a noisy area or if there is an indication of hearing loss or unusual sensitivity. Annual evaluation meetings are held with management, engineering, medical and safety personnel, participating. This type of program is not as common as could be desired.

To simplify record keeping a specific sheet is used in the otologist's office. The first test is recorded as an easily demonstrated graph and that space is left for recording the findings of the ear, nose and throat examination.

The history is in two parts—the first, a simple check list of significant points as far as the ears are concerned and a record of the results of a more or less flexible questioning by the physician. A record of *his* previous employers and work done, is as important as the history of exposure to noise or to concussion in the military service, e.g.,

the noise experience of a rigger on jet aircraft differs from that of a rigger in the local shipyards.

On the reverse of the sheet hearing values are listed numerically and space is available for the interval histories.

If the goal of conserving hearing in industry is sought nothing is more helpful than frequent informal plant tours. The local otologists have been told that to understand and treat noise exposure deafness, "you must listen to lots of noises yourselves." To illustrate this point from a case history, an employee complained of ringing ears and deafness following his shift on a slasher—i.e., a circular saw and conveyor system which cuts logs into lengths acceptable to a barker.

On investigation it was found that the operator's area, while not quiet, was not especially noisy. It was decided that the individual probably just wanted a change. However, in later conversation with his foreman, it was found that the saws on that particular machine were changed daily with the diameter varying as much as eight inches. This, of course, would result in a much higher edge speed with an increase in noise level on some days.

FURTHER SERVICES TO PLANTS

The noise produced by most machines in industry has been recorded and evaluated. However, it is particularly true in the paper industry that individual modifications and improvements are frequently made with resulting noticeable variations in the noise level produced.

Acceptance by our industry seems to be at three different levels:

A few plants feel that the whole subject is better left alone. This is illustrated by some tool producers who stated "the men did not complain about their eyes until fluorescent lights were installed." "If we start examining ears and checking hearing they'll all complain about that too."

Some plants have a pre-placement audiogram or audiogram plus ear, nose and throat examination as a purely precautionary measure so that an existing hearing loss incurred elsewhere will not be charged to them. There are no rechecks in these plants. Obviously this is not a conservation of hearing program in itself, but several of these mills have had representatives at further conferences in our valley and at the state and national levels.

The safety glass program in our valley was slow in coming into use in some of these mills. In other words, the mills lagging behind in the hearing conservation program also lagged in the conservation of vision program as well.

Some mills have a good pre-placement program, adequate rechecks and follow ups and a fairly complete study as to numbers of employees in noisy areas and time of exposure.

RECHECKS ON HEARING

In this third group when it is known that an employee is exposed continuously to high noise levels a recheck of his hearing is made in 60 or 90 days. At that time if he shows a significant dip in hearing levels after being away from work for 48 hours or if he complains of ringing in his ears or as has happened occasionally, unusual irritability, the following procedure is instituted.

Following an examination in the otologist's office the nurse and/or safety man, a representative of engineering, if possible, and the otologist will review his record and the noise survey report on his machine or at his working area.

If it is decided that this is rightly a noise-induced problem a transfer is considered to a less noisy area. This usually is impossible due to loss of seniority, lower pay and loss of prestige. An attempt is then made to quiet the machine, meanwhile the man is given ear plugs. "The man is given ear plugs." It sounds easy doesn't it, particularly as noise levels in the majority of operations involved in industry in our areas are such that the wearing of ear plugs will reduce the individual's exposure to a relatively harmless level?

ENFORCING EAR PLUG RULES

Perhaps you will smile at some of our early attempts to "give" the men ear plugs. Obviously we now see that it is impossible to enforce a rule stating that everyone crossing a certain yellow line must wear ear plugs.

Another attempt was made insisting that every worker crossing an anteroom on the way to a noisy area should take his ear plugs from a shelf in this room and put them on before he left the far door with certain penalties if he was found without them while working in the noisy area. Neither of these plans worked.

Here is what we do now. We consider that ear plugs are our first line of defense for the individual employee's hearing and his fitting should be treated with much personal attention. The men have been told about ear plugs subtley and posters are usually on display either on the bulletin board or in the nurse's office. Certain key personnel including the nurse and some supervisors have been familiarized with the protection obtained by wearing properly fitted ear plugs and the man's name is given to one of these people for further indoctrination. Then the man is shown a display of ear plugs usually by the nurse.

DISPLAY OF EAR PLUGS

Psychologically it seems best that the employee should have an opportunity to help choose his own ear plugs at least up to the point of fitting them.

The first step, inserting the plug is much easier if the external auditory canal is straightened by grasping the external ear and drawing it upwards and backwards. Wash the ear plugs when washing up.

It would be well for each one of you contemplating such a program to try several types of ear plugs. Wear them while talking or chewing gum and while in a noisy place.

A well fitted ear plug is uncomfortably snug for a time and conversely if too loose annoying little leaks develop around the periphery so that the vacuum will "make and break" on chewing or yawning. The important point is how well voices can be heard in a noisy place while wearing ear plugs.

The fitting of ear plugs is the most important phase of our program as far as the individual employee is concerned. While waiting for the engineers to quiet a pump or gear box we can fit an employee suffering with ringing of the ears, or a post noise exposure deafness, with a pair of ear plugs which in most cases will relieve his symptoms and make him more comfortable at his job.

ELEMENTS OF SUCCESS

A few unusual elements contributing to the success of the program deserve mention.

▶ Green Bay has the oldest school for the deaf in Wisconsin and one of the oldest hearing conservation programs in the public schools. In counties around us programs similar to ours have been instituted—thus by the time a student graduates from high school in our area he has had three or four audiometric tests. This means that nearly every worker examined knows a little about these tests and does not "view with suspicion" its use as a part of the pre-employment examination.

▶ For nearly 15 years the Children's division of the State of Wisconsin has held hearing clinics in many counties annually where every child with a hearing defect is examined by an otologist chosen by the county medical society from a panel endorsed by the State Medical Society.

This work is done by the panel members on a voluntary basis and it has been considered a privilege to hold these clinics. Thus because of the careful screening given all participants a group of otologists have been trained who know something of the occurrence of disabling ear conditions among our school population and who are accustomed to think in terms of conservation of hearing.

It should then be evident that a labor pool plus the availability of a relatively unselfish and conservation-minded band of otologists has had much to do with the smooth running of our program in northeastern Wisconsin.

▶ Recently a group of Milwaukee industrial physicians supplemented in part by workers from the sub-committee on noise of the American Academy of Opthalmology and Oto-Laryngology, through their research and studies both in plants and at the Wisconsin State Fair have been a considerable source of inspiration and practical help.

▶ The exchange of information and techniques between the paper mills on the medical and safety levels regarding the establishing of hearing conservation programs has been free and complete. Almost the only limiting feature has been inade-

quate medical budgets which do not fit the expanding needs of these programs.

It was suggested that it would be of interest to your group to follow along with us as certain problems came up in the administration of one program. A report from a personnel director follows.

It is titled *A Trip Report to Green Bay Plant on Thursday, July 25, 1957.*

At the request of HN, a local engineer went to Green Bay on the above date and met with HN, RN, Green Bay Plant nurse, M.D., otologist from Green Bay, and Dr. RM, audiologist from Wausau. They discussed a problem which has arisen in Green Bay involving five employees whose follow up audiometric hearing measurements showed losses. These people are working in noisy areas in the converting department.

NO PRECEDENT ESTABLISHED

Since this is the first of such problems which have come to my attention in the company, there was no precedent for any type of follow up when subsequent hearing measurements show less hearing ability than earlier measurements. No Workmen's Compensation claims have been filed or requested by the employees to date.

M.D. recommended that it would be highly advisable to determine whether or not the hearing loss resulted from or followed some condition which might not be occupational. The first step would be a thorough otological examination which might not be the result of exposure to noise.

Dr. RM was of the same opinion. He felt that the first step would be to find out just what the condition was in each of these employee's cases. We might find different things and certainly the record of a complete examination with the doctor's opinion could be of value should a claim be initiated at some later date.

We discussed all of the angles thoroughly and agreed upon the following procedure to apply as of now in these five cases only, with no precedent being created.

These five people were to be sent for an otological examination and he would report to the Green Bay plant nurse on his findings and his opinion as to the man's condition and the causes thereof.

We all felt there was no point in making further plans until we know the results of these five examinations. When we have these we can discuss again any future steps or any plans to handle like situations.

OTHER CASE REPORTS

The Report: MG. This man was 22 years old, single and had three years of military service as a paratrooper. His mother was quite hard of hearing and it was felt that the boy was duplicating her hearing loss. He left his job and did not return so no further follow up was made.

The second 22 year old man DA—had a rather marked high tone hearing loss. He is in the Army Reserve and is going on active duty again in October. He says that his ears are so sensitive that they will ring after "even shooting a 22" and particularly after shooting on the rifle range. He stated that his ears were still ringing after being off work four days. He undoubtedly had rather sensitive ears but he had lost most of what he was going to lose and the remainder of his hearing could be protected with ear plugs.

The next patient is AL, whose audiogram showed a mixed type of deafness which fits with his history of repeated attacks of ear trouble with running ears as a child. There was some scarring of both ear drums and neither moved freely. This would indicate old pathology and might possibly mean that he is now possessed of a sort of "built in" pair of ear plugs; at least, sound is not transmitted very readily through his middle ears.

Patient DK age 24—has a rather marked hearing loss in his right ear for high tones. The only pertinent point in his history is that he has an aunt who is quite deaf and that he hasn't been able to hear a watch tick with his right ear for a long time. It was not felt that this should be treated in any other way but by the use of ear plugs.

Patient KC—has a moderate high tone hearing loss. His history dates back several years when he was in military service and operated a caterpillar and grader. At one time after flying from Japan to Korea in a flying box car his ears rang for sometime and he was unable to hear for three days. He stated that he had worked in the napkin department on a machine whose metal gears just "clanged in his ears." On his return for further study, he reported that he was now on a quieter machine which was run by felt gears and there was no more ringing in his ears.

NO SPEECH LOSS

In analyzing these five cases, not one had any significant loss in the speech range. They all had, it is true, a high tone loss. None of these cases can rightly be attributed to the environmental conditions of the mill and such a report was returned to the personnel director. End of report.

All plant physicians and consulting otologists were agreed that the studies of hearing in the plants had resulted in no new problems. No claims have been filed as a result of this program nor has any particular unrest developed among the men in noisy areas.

The reaction of top management to the conservation of hearing programs has been varied but on the whole has been extremely favorable. One plant manager thought it was the most important of the fringe benefits that labor has obtained saying that "it would help the employees at home—even a pickle packer likes to enjoy music or hear his wife's high pitched voice." A paper mill executive stated that it was working out as a good method of improving mill—employee relations.

FAVORED EXAMINATIONS

Some of the examinees questioned said they never had as thorough an examination before and a few of them even offered to pay for it themselves.

One plant engineer said that through his knowledge of the program he had been (1) stimulated to put silencers on some of his vacuum pumps. (2) He had moved an operator away from a chipper to a less noisy area and he went on to say that purchases of all new machines were made with the noise that they would make in mind. He felt that there was a good program in his plant but he said that the plant itself was not doing enough active research in noise control.

Another engineer said that he had his eyes or rather his ears opened to the problem when a draft curtain was installed around a corrugater to help retain heat. Several other machine operators around this installation, mainly girls, seemed to improve in the efficiency of their operations after the installation of this draft curtain. He went on to say that the mill had given these people ear plugs when the draft curtain was later removed with a 10 per cent improvement in the efficiency of the operation.

Without much question, the plant nurses have been the most interested in the programs. Examples follow:

Memogram written by a nurse—August 9, 1957:

"M.D. is going to speak at one of the general sessions at the National Safety Congress in October. He talked with Mr. W. about gathering some data as to what improvements have been made since we had a noise level survey. Mr. W. said we should give him all the information we could (no companies will be named). He would like some information concerning the converting department and said he could study it over and then be able to ask some "intelligent" questions when he meets with B in converting."

Inter-office Correspondence—August 20, 1957:

"Insulation of equipment for noise is a continuing effort on our part. We do not have a decibel recording unit to indicate the severity of our machine noise, so it is impossible to give figures in noise reduction.

New equipment is installed on insulation pads to isolate the machine from the building. If objectionable air-borne noises are evident, a spun glass type of material is used.

SPUN GLASS REDUCES NOISE

We could write a case history of air-borne noise on what we did on the band knife log cutter. After installation of spun glass material the noise was reduced to the point where it was no longer necessary to use ear plugs. However, we did not stop there, because at a later date we discovered mechanical features in the machine that were at fault which were corrected and further reduced the hazard.

A case history in building-transmitted noise can be illustrated by what was done to the box facial cutting machine. Air-loc

vibration dampening pads, No. 4-17-4, were used to eliminate severe thumping noise that was being transmitted to offices on a lower floor."

This paper has proposed methods of conserving the hearing of individuals exposed to noise levels which may under certain circumstances cause permanent deafness.

The methods outlined are shown to be applicable to plants of various employee populations and containing noise exposure areas of varying sizes and intensity. Summaries are included of the experiences from the standpoint of safety personnel, management, the medical departments and the employees involved.

OFF-THE-JOB — THE BIG TWO-THIRDS

FIRST AID TRAINING — A PERSONAL SAFETY PROGRAM

by EARL H. BREON

director, First Aid Service, American Red Cross, Washington, D. C.

We frequently hear five misstatements, about first aid training, which show that the individual has had little or no personal experience with the program or else his contacts have been bad.

Safety by itself has no content. It is a philosophy, a way of life, a hope. Only when safety is attached to something does content appear. When safety is related to operating a lathe, a drilling rig, a steam shovel, or an automobile it becomes real. It can be seen and even felt. The consumer becomes a part of the operation, thus a degree of success is assured.

Safety or accident prevention follows a clear pattern of CAUSE—EFFECT—PREVENTION. First aid training follows the same pattern but adds the important missing fourth item—CARE. As long as humans perform tasks, accidents will occur. Any safety program which omits the fourth may be hard to explain or defend.

We all recognize the outstanding job safety engineering has done in industry. The record speaks for itself and management supports and encourages the efforts. However, the off-the-job accident record does not reflect this same high degree of efficiency.

In your plant you have certain advantages and certain controls. You have safety directions that even include *who* shall do the job. You can enforce your directives. You can build safety into the operation. The worker can be outfitted with clothing, goggles, masks and other paraphernalia. In fact, you can isolate the man and his work in an accident proof ward for the six or eight hour period he does his assigned tasks. What happens when he leaves his isolated booth?

The protective devices are no longer there. The restrictions on him that made him safe for this period are often resented because they are misunderstood, or the man's cooperation deemed unimportant. We often overlook the ability of the worker to contribute to safety and think safety. This is usually the key. When a worker becomes a partner in safety he feels a sense of ownership and a sense of responsibility. Safety takes on real meaning when the worker contributes.

The battery of first aid skills taught, and above all practiced by the individual, personalizes safety. When the worker translates "falls" in terms of fractures and physical pain, and uses hypothetical problems to practice immobilizing fractures on fellow workers and friends, the association becomes a lasting one. It becomes a sharing experience. It becomes a contribution *to* safety, not passive acceptance *of* safety.

Equally important is the atmosphere of learning, and first aid training lends itself admirably to this atmosphere. In addition the knowledge and skills acquired are "portable," the application universal, and the benefits tangible. Improved judgment in evaluating potential hazards are a natural by-product of first aid training. The remedial solution applied to accidents is of immediate use. Educators say attitudes must be built before behavior patterns will improve.

WHY BOTHER WITH FIRST AID?

First aid training builds better safety attitudes. Eventually improved safety behavior will follow. There are no "short cuts." This takes time. First aid is more than applying a splint or wrapping a bandage. *It is an integral part of safety.* It is not a special subject or activity for the few.

Severe hemorrhage, stoppage of breathing, oral poisoning, and chemical burns, espe-

cially those about the face, can't wait for medical assistance from a remote part of the plant. If the stricken person is to be helped, that help must be on the spot. The best piece of emergency equipment, 500 or 1,000 feet from the accident, is just as useful as an empty fire extinguisher at a conflagaration. Dire emergencies are not the only conditions we must face.

When someone is injured, either seriously or slightly, there seems to be a compelling need for those about him to move him "someplace"—it doesn't matter where—just as long as action is taken. There often isn't a reason for it. Untrained people just feel that action must be taken and they take it. Secondly, the injured person feels a compulsion. He *must get away* from the offending object and unless he is unconscious, he will exert every effort to do so.

Training all personnel, not just "key" personnel, provides an excellent accident prevention program AFTER THE ACCIDENT OCCURS. It teaches each employee to act promptly and efficiently when seconds count, react favorably when people insist on moving the injured for no good purpose, and protect injured workers from their own frightened actions. This training complements and supplements medical and health facilities; it does not replace them. Knowledge of simple first aid principles can save lives, prevent minor injuries from becoming major ones, and major ones from becoming fatalities. There is no substitute for "on-the-spot" remedial and preventive action by fellow workers.

Some people feel training is time consuming and costly. If you agree that first aid training is part of your safety program however, the time and cost factors disappear. But if you isolate first aid training, time and costs are terrific.

Spot training never has been successful. Increased incidences in other accident areas bring repeat performances of such spot training. If at the outset the needed skills are introduced as part of your on-going safety program, the temporary "one shot" costly training programs disappear. The entire safety program is better understood and appreciated, and the worker takes more interest in safety generally. Further benefits accrue when, in addition to life saving skills, common emergencies are discussed, recognition of skeletal injuries taught and the principles of transportation of the injured are practiced. Good industrial safety programs embrace all aspects of accident prevention. Knowledge of what to do when a serious injury interrupts normal operation is both time and money saving.

DO FIRST AID COURSES MEET NEEDS?

The "courses" are those prepared and recommended by the Red Cross. In some instances these courses are used instead of preparing a duplicate "plant" program for more specific needs. There are minor areas where specific recommendations from the medical department represent departures in standard program planning. But these are minor and do not concern hemorrhage, oxygen embarrassment, or external and internal poisoning. Basic care for these injuries follow the same principles. Geographic locations do not alter them.

If there is a difference, it lies in the quantity, type, and quality of materials on hand. Abundant first aid supplies readily available should produce better results than crude improvisions. If we deal with the principles and objectives, our problems in all areas are less. In first aid these principles are simple and well understood. Only when we make them complex do difficulties arise. First aid is pliable, adaptable. Red Cross courses or any other course in first aid can be tailored to fit any special need.

Any course can easily be a "part" of your program. It should not be so forceful that the application of "plant" training is not readily recognized in home and community accident situations.

ARE RED CROSS COURSES TOO SPECIFIC?

There is no first aid teacher who withholds information that may save lives. In his enthusiasm for the subject he may give you heated arguments about teaching only selected portions, but only because he is convinced that to do less is a disservice. Often the requesting group wants employees to receive the Red Cross first aid certificate, but feels when the company's requirements are satisfied, the certificate should be awarded. This is known as "putting the heat on" and causes "back stiffening."

Red Cross chapters are ready and willing to assist with your problems and give help. But when the work is identified by a completed course certificate, it must be done according to our standards. The quality and integrity of the program was built on high standards accepted nationally. To sell dollar bills for ten cents in one state and a dollar and a half in another would most certainly make a mess of things. To follow the same practice with our programs would create a similar situation. Thus when certification is involved, the course must be completed.

Finally our real job is training leadership for you so that your program can be "self-contained." If you will train key people in your plant (preferably foreman) to interpret and teach first aid at safety meetings or other opportune times, you will have added an important and effective step in both your on-the-job and off-the-job safety programs.

A new textbook accompanied by modern teaching outlines has just been published. Short first aid subject films are available to assist you. The American Red Cross first aid program started in industry. We think we can serve you better in 1957 than we did in 1907.

To summarize briefly—

- First Aid training *is* a part of safety and is preventive.
- Prompt remedial first aid given by those at the accident scene may save lives and most assuredly will help prevent aggravation of injuries.
- When first aid training becomes a part of on-going safety programs, cost and time factors disappear.
- First Aid training is pliable—adaptable. It can meet specific or general needs.
- First Aid training is "portable." It inspires appreciation for safety—sharpens the desire for safety. It's good on-the-job and off-the-job insurance. Those trained in first aid have a better appreciation for the total safety program.

VISION IN INDUSTRY

Responsibilities and Limitations of the

INDUSTRIAL NURSE IN THE VISION PROGRAM

by MARGARET S. HARGREAVES, R.N.
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Although an industrial eye program is considered just one of the components of a preventive industrial medical service, it is actually one of the most important. Eighty per cent of all human emotions are controlled by the eyes and our emotions, in turn, influence our state of health.

When a nurse has full time medical direction her responsibilities are lessened and her limitations are clearly defined. Many nurses working in industry today, however, have only a part-time or a consultant physician to guide the medical service.

This industrial nurse has responsibilities in five major areas in setting up and maintaining a vision program.

1—She must plan and sell the vision program to management, the employee and supervision.

2—She must assist in establishing company eye medical policies and procedures.

3—She must assist in providing adequate care using ethical medical direction and modern technics.

4—She must help to prevent eye injuries and diseases through proper testing, referral and eye protection for the employee.

5—She must assist in educating the employee in good eye health habits.

Many opportunities for a good vision program in industry have been lost because the program with its subsequent benefits was not planned, explained and presented properly to management. If the industrial nurse takes the trouble to secure informed, intelligent advice, if she does a survey of her industry to point up the eye hazards and the need for special visual skills, if she shows where spoilage can be reduced through improved employee vision, if she personalizes her examples—i.e., shows an instance where labor relations were improved by better eyesight or, through analysis of her monthly medical report refers to specific accident cases that could have been avoided through the use of protective eye equipment, she will gain the interest and support of management.

BAD SIGHT COSTS MONEY

One nurse convinced management it was losing thousands of dollars in customer claims because of an arbitrary company policy which would not allow waitresses to wear glasses. They were proud of the eye appeal their girls had without glasses but ignorant that, because of uncorrected vision, hot soup often landed in the customer's lap instead of on the table. An eye program introduced by this restaurant chain prevented many other accidents when cooks and kitchen workers found to have impaired eyesight were referred for correction.

Another nurse avoided a situation when an argument ensued over who would have window locations after a whole department moved from one floor to another. These employees were all piece workers and their livelihood depended on the amount and quality of work they produced in a given time. A quiet investigation by the nurse showed that the two complaining most bitterly actually needed vision care. When those two workers were fitted with proper glasses they were able and willing to perform their work in any part of the room.

A recent study of 1,107 ocular cases resulting from industrial injuries showed that of 11 cases of glass foreign bodies in the eye, 9 were caused by flying objects hitting *regular* spectacle glass which broke and scattered bits of glass. One nurse showed this study to authorities in her company and convinced management that prescription less

safety glasses were a good investment in their particular plant where flying objects were a distinct hazard.

Still another case can be described where faulty vision nearly caused a faithful employee to lose his job. This man was a truck driver for a beer concern. After 15 years of not having a single accident, he had three in a row, all costly and serious. He confided in the company nurse and told her of his concern and despair over the possibility of being demoted to a lesser paying warehouse job.

She persuaded him to have a complete physical checkup which was available to all company employees on a voluntary basis and he learned he had serious but correctible vision defects. This man has since completed three years without further accidents and his health, happiness and economic security are all improved.

The industrial nurse must be able to explain to management the difference between testing eyes and examining eyes. She should be able to explain the differences between an eye specialist, an optometrist and an optician.

She should upon request (if she does not have a plant physician) direct management to the county medical society or the local accredited hospital for consultation services and emergency eye care with a competent ophthalmologist. More than one eye specialist should be available in case of emergency. An eye panel should be set up and approved procedures outlined and posted.

One of our leading eye specialists told me about a $60,000 civil suit pending as a result of a claim by a railroad employee who had a pentrating injury of the eye. He was forced to lie in the company medical department without proper care for three hours because adequate emergency arrangements were not available for such a case. He alleges that the delay in treatment caused him to lose an eye.

In making an eye health appraisal to submit to management, the National Society for the Prevention of Blindness, the loss prevention department of the company's insurance carrier, the local or state health department, the Council on Industrial Health of the American Medical Association and private industrial health consultation firms will assist.

Lighting, color contrasts, work methods and work stations should be thoroughly studied as well as the more obvious hazards created by poor housekeeping, dangerous tools, processes and other elements which could burn, injure, infect or affect the eye. Aging processes, visual requirements and present seeing capacity should all be evaluated.

Once the vision program is accepted by management the next logical step is to draw up company medical eye policy and procedures by which this policy can be carried out. In establishing a guide for procedures, statements of policy should be carefully worded regarding the fact that threats to the employee's job security are not included in the program. *All procedures should be approved by a consulting ophthalmologist.*

It is not enough to state, for instance, that all persons with penetrating injuries of the eye must be kept lying down and placed under the care of an eye specialist at once. The method of doing this must be described, i.e., if the patient is to be taken to the physician he must have a sterile eye bandage and must go by stretcher and/or ambulance if necessary.

It is not enough to say visual testing will be done as part of the preplacement examination. The method of testing, what persons will test and what will be done with the results must all be spelled out.

It is not enough to say Dr. Jones will be consulted about emergency eye care, examinations and treatments. Dr. Jones should state what drugs will be stocked, how special eye cases will be treated and what follow-up care may be given. In other words —Dr. Jones will be an eye consultant to treat eye emergencies, to give medical direction for eye care and to indicate preferred methods of treatment before sending eye cases out for further care.

In the third area of responsibility most of the limitations exist for the industrial nurse. Several leading industrial ophthalmologists suggested limitations they would like observed.

- They unanimously disapproved of serious delays between the time they saw the patient and the time the injury occurred. They were not referring to the patient who delayed in reporting his

injury but rather to the persons who do not send a serious eye case to an eye specialist immediately after the person reports to the medical department. They urge that specialist attention be given at once to serious cases in order to lessen the number and severity of complications. They agreed that it would be impossible, impractical and unnecessary for them to see *all* industrial eye cases. But they were emphatic in requesting that serious eye cases be placed under the care of an eye specialist as quickly as possible.

- The second unanimous opinion was that the nurse should not be allowed to use ointments in emergency care. An ointment-filled eye often causes a delayed diagnosis and treatment.
- Next they urge that an eye containing an embedded foreign body in the cornea should have a sterile eye patch applied, and the patient should be sent to an eye specialist. Most of the physicians cautioned about the penetrating wound.
- They urged no suture treatment for a lacerated eyelid. When they were told suturing did not come within the scope of a nurse's duties they said some of them use "butterflies." All physicians emphasized the WATER IRRIGATE, WATER IRRIGATE, WATER IRRIGATE treatment for chemical eye burns.
- Some of the less serious but justifiable complaints were alleged rough handling while examining the eye, use of unsterile technic, failure to take an adequate history, giving the patient a prognosis or diagnosis.
- One physician deplored the use of dirty eye charts in testing and poor illumination in the testing area. He warned about a patient pressing his eyeball with his hand while covering it during an examination. He should be instructed to cup his hand or better still, use a piece of cardboard as a shield.
- Another physician deplored the lack of available modern technics such as plastic irrigating bottles and plastic disposable eye droppers. He said many industries still use outmoded eye cups and argyrol solutions.

The physicians critized medical personnel for failing to sell management on the values of eye testing, eye examinations and eye protection. They said many occasions occur when an adequate eye examination alerted the physician to other health impairments such as diabetes, high blood pressure, and brain tumor. The direct relationship of eyesight to general health is not appreciated enough.

The nurse should have a means to test visual acuity. It is important that *both* eyes are tested during the first visit to report an eye injury.

There are many methods by which an industrial nurse can educate employer and employee regarding good eye health. It is said that 90 per cent of all eye injuries are preventable. If so, it should be easy to persuade people to do themselves a favor by protecting their eyes from injury and maintaining good eye health.

One nurse who worked in a plant with numerous eye hazards made a campaign of assisting the employee in getting proper fitting prescription glasses. Her plant management installed a flashing red sign when dry grinders are in motion. She sets a good example by wearing necessary equipment in stated areas when she is making her rounds. Every morning she has an *extra* pair of goggles placed on each machine so there's no excuse like: "I forgot my goggles today."

She has well marked eye flushing machines in areas where chemical splashing could occur and once a year she conducts a safety meeting devoted exclusively to care and protection of the eyes. Perhaps you think this nurse is over-emphasizing a single phase of an overall preventive medical program. However, she reviewed several years of claims cases and found that the most costly and most frequent cause of injury in her particular plant was concerned with the eyes.

Another nurse worked in a printing establishment. There were daily hazards of close work and the additional hazard of an aging plant population with aging processes affecting the eyes. She sold her management, employees and supervisory men on an eye program. Production has increased, absenteeism decreased, and the economic state of the employees and the community has shown a gradual steady improvement.

The employee will be more apt to give his wholehearted cooperation if he's coavinced that preventive eye health measures will directly or indirectly benefit him.

Supervisors should understand and fully cooperate with the aims, objectives and procedures of the program so that they can answer all employees' questions regarding the purpose, scheduling of vision tests, referral system and use of eye protection methods.

In the eye health education area, the nurse must include all the key groups in the industrial family as well as the individual.

The personnel department is thus assisted in properly placing the employee, the safety department will be interested in reducing accidents of all types—not just those of the eye, the production department will learn that the working efficiency of the employee is directly related to his seeing ability at the work station.

Seeing is a universal and powerful factor in the everyday performance, efficiency, comfort, behavior, safety, health and happiness of every individual. We industrial nurses are in a position to help management build and maintain good eye health.

THE EMERGENCY TREATMENT OF CHEMICAL INJURIES TO THE EYE

by DR. RALPH W. RYAN
M. D., M. S. Ophth., Morgantown, W. Va.

This discussion will concern injuries of the eyes and lids caused by direct contact with corrosive, irritating, or otherwise injurious chemicals.

The type of tissue injury varies with the chemical properties of the substance involved and the effect of that chemical on live tissue cells and structures. The mode of injury for various groups of chemicals will be discussed later.

Whatever the chemical factors, the effects on the injured worker may be:

(1) Temporary, partial or industrial blindness: Inflammation or protein denaturation may make the clear cornea or window of the eye opaque or translucent, or the inflammation may cause so much swelling of the lids as to close the eyes,

(2) Permanent disability, ranging from partial to total, may come from scarring or distortion of the cornea or lids. Scarred tissue may contract or one healing surface may adhere to another.

Damage to the clear cornea of the eye is the most serious. Mild injuries may cause only temporary clouding of the cornea, but when the transparent window of the eye becomes translucent or opaque from scar tissue formation, useful vision may be seriously reduced or destroyed. The cornea may become white with many blood vessels through it. Sometimes the injury is severe enough to cause perforation of the cornea with loss of the contents of the eye. Repair of damaged cornea by corneal transplant is difficult and expensive.

Damage to the lids may be mild, the inflammation causing them to swell shut for a time. Permanent scarring and contracture may expose the cornea to drying, impairing vision. However, lids can more easily be restored surgically than can the cornea.

SEVERITY OF EYE INJURIES

Injury to the eye from chemicals varies widely in severity. The three primary factors determining severity are:

—*Properties of the chemical*
—Concentration of the chemical
—Length of exposure to the chemical

There are hundreds of chemicals which might injure the eye by contact. A large number of these have been studied and many are listed in a manual entitled "Toxic Eye Hazards," available from the National Society for the Prevention of Blindness, Inc.

Consideration of these many substances will be simplified by classification into groups by their chemical properties and hence by their mode of action on tissue cells.

A practical classification divides them into:

(a) Alkalis
(b) Acids
(c) Organic solvents
(d) Detergents
(e) Irritants and allergens
(f) Pharmacologically active chemicals
(g) Radioactive chemicals

Members of these groups exist in solid, liquid, or gaseous form, or can be finely divided into dusts, fumes, or mists in the air. The eye can be injured by any form of certain chemicals. Gases, solids, or mists, when in contact with the moist surface of the eye, may quickly form a liquid solution.

Classification is complicated by overlapping of the groups. As an example, dimethyl sulfate may injure the surface of the eye by its organic solvent action, but its most damaging effect comes from release of sulfuric acid as it hydrolyzes on the moist eye surface. Detergents and soaps may affect the eye by changes in surface tension, but they also have acid or alkaline effects on the eye.

DAMAGE FROM ALKALIS

Alkalis are in general the most injurious of all chemical substances to the eye. This is because of:

(1) Rapid penetration and denaturation of the tissue and particularly the cornea.
(2) Fixation of the alkali to tissue protein so that the burn continues to progress insidiously for hours.

Alkalis cause swelling and break down the skin surface of the eyeball and lids, the tissue becoming soft and jellylike. The alkali then penetrates rapidly through the tissue. Some alkalis have been detected in the aqueous humor of rabbit eyes within a few minutes after being placed on the cornea. The combination of the alkali with tissue substance makes it impossible to remove it completely even with long periods of bathing the tissue in water.

For that reason, alkali burns of the eye tend to become worse, particularly if the alkali was very strong, if it remained in contact with the eye for more than a minute or so, or if it was not irrigated for several minutes with water. The alkali seems to be released slowly from its combination with the cells and can affect other cells.

Fresh cement or plaster are common forms of alkalis which often cause severe eye injuries when not treated properly. Often the discomfort is minimal for hours, but scarring may result later from a deep burn of the cornea or lids.

Common alkalis are:

(a) Lye (sodium hydroxide)
(b) Lime
(c) Ammonia
(d) Fresh cement or plaster

DAMAGE FROM ACIDS

Acids tend quickly to coagulate or denature the protein of the skin covering the eye. This denatured protein does not immediately soften and break down; it thus acts as a barrier to slow further penetration of the acid. Since the acid is not significantly fixed in the tissue, it may be washed out completely enough to prevent continuation of the burn.

Damage from acid burns varies with the strength and type of acid. All cases are likely to show an inflammatory response. If not washed out of the eye promptly, the injury may be severe with much scarring. The effects of acid burns can be determined soon after the injury, if the eye has been well irrigated to rid it of acid.

Examples of common industrial acids are:

(a) Hydrochloric
(b) Acetic
(c) Sulfurous
(d) Nitric

DAMAGE FROM ORGANIC SOLVENTS

Organic solvents may penetrate the skin covering of the eye because it has about 100 times as much fatty material as deeper tissues. Penetration of the deeper tissues by such chemicals is slow. Since the injury is usually painful, it receives attention. Skin of the cornea and conjunctiva grows back quickly with little damage. Eye damages from this group of chemicals are not often severe unless the chemical has other deleterious effects besides its solvent action.

Common solvents are:

(a) Alcohols
(b) Gasoline
(c) Carbon-tetrachloride
(d) Ethers

Damage from Detergents

Detergents and soaps have come into widespread use and are present widely in industrial processes. There is frequent eye exposure to such substances, due to the tendency to consider them harmless.

They not only may penetrate the skin covering of the eye, due to their detergent action, but some have considerable alkaline or acid reaction in solution. Irritation is often marked, but serious damage is not common. There may be temporary incapacitation due to inflammatory reaction.

Common detergents in use are:

(a) Washing powders
(b) Soaps
(c) Zephiran
(d) Sulfonated oils

Damage from Irritants and Allergens

Irritants and allergens act in various ways to cause inflammatory changes in the skin and underlying tissues of the eyes and lids. Congestion, itching, and swelling may be caused, leading to lost time in industry. Long continued irritation of the eyes may lead to changes such as pterygium (a growth on the edge of the cornea) or spastic entropion (a turning inward of the edges of the lower lids). These conditions require surgery for correction.

Some of these substances encountered in industry are:

(a) Acrolein
(b) Formaldehyde
(c) Tobacco dust
(d) Wool dust

Damage from Pharmacologically Active Chemicals

The cornea of the eye readily absorbs significant amounts of many chemicals, the material passing through the cornea to the aqueous in a matter of minutes. These chemicals may commonly cause such changes as dilating or constricting the pupil and increasing or paralyzing the accommodative ability of the eye. Some of the more common chemicals of this type are:

Atropine
Scopolamine
Homatropine
Belladonna
Pilocarpine
Eserin
Phosphate ester insecticides
Di-isopropyl-fluorophosphate (DFP)

Damage from Radioactive Chemicals

This category, while relatively new, is likely to assume more importance yearly. Handling of radioactive materials has been extremely cautious, but as the use of isotopes becomes more commonplace, our carelessness is likely to increase. Chemicals which also have other injurious properties or are irritating are likely to be noticed and the injuries treated.

Non-irritating chemicals which are absorbed by skin of the eyes or which come in contact with the eye frequently would be expected to cause insidious damage. We have little actual experience to evaluate the extent of this hazard. The mining and processing of radioactive ores may lead to long exposure of the eyes to radioactive dusts and mists.

Damage from radioactive substances will vary with the type and amount of radiation emitted and the length of exposure. The effect is cumulative. Damage to the eyes would involve primarily the lens, retina, and optic nerve. Radiation cataract from lens damage is well known. Loss of lashes and brows might occur from radiation exposure.

Some radioactive substances that may be encountered industrially are:

(1) Dust from uranium ore
(2) Mists from uranium ore concentrates
(3) Radioactive luminous paints
(4) Pharmaceutical radioactive isotopes

TREATMENT AT WORK

First treatment of the employee suspected of having a harmful chemical in the eye must necessarily be at or near his place of work. Severity of the injury can be lessened by minimizing the length of exposure to the chemical. The loss of extra seconds before the chemical is being washed out with water may mean loss of useful vision in the eye.

Water is the universal solvent and is the most universally available irrigating material. Therefore, employees exposed to harmful chemicals should be trained in recognir-

ing the quickest means of washing an injured eye. Whatever the source of wash fluid, employees must know in advance the difficulty of opening an eye burned by chemicals.

Rather than merely flushing water on the eyelids, often a piece of paper towel or a pocket handkerchief will enable the fingers to pull the lids apart so that the water reaches its objective. If available, a few drops of such topical anesthetics as 0.5 per cent ophthaine or pontocaine remove lid spasm and greatly improve the effectiveness and ease of irrigation.

Almost any means of applying water may be used in an emergency. The commercial eye irrigating units, safety showers, jet drinking fountains, and shallow basins are best, however. Irrigating hose connections can be improvised along small cold water lines near working places if provision is made for controlling pressure of the stream of water.

In locations where hazards are great, a bottle of sterile water with siphon rubber hose connection may be arranged above a bench or low table where the injured worker may be laid on his back for eye irrigations. Pouring water in with a clean glass is better than use of eye cup. The principal objective is to keep clean water passing over all the exposed eye surfaces to remove the chemical as rapidly and completely as possible.

Effective irrigation should be carried out for at least 10 minutes, without stopping to move the employee to another location. While cleansing the eye, all available information should be obtained as to the exact nature of the chemical involved and all other pertinent details of the injury.

TREATMENT IN FIRST AID FACILITY

The person administering first aid may instill two or three drops of a topical anesthetic such as 0.5 per cent ophthaine or pontocaine in the injured eye. Irrigation can then be continued for 10 minutes under more favorable circumstances, while a history of the accident is pieced together. The eye should be carefully examined under magnification and any solid particles of chemical carefully removed. Fluorescein is then applied by one of the satisfactory techniques. If green staining results or if the chemical is suspected of being an alkali, another 10 minutes of eye irrigation should be carried out.

Disposition of the patient from this point will depend on whether the history and appearance of the injury warrant immediate referral to a physician. Any case showing fluorescein staining should be seen by a physician. The first aid nurse may instill topical anesthetic drops and place a tight eye pad over the closed eye. If not sent to the physician, it should be explained to the employee that pain-relieving drops were used. He should be required to return within 24 hours for removal of the eye pad.

TO RELIEVE PAIN

If "standing orders" call for further treatment in the first aid room, a combination of a pain-relieving ophthalmic ointment such as phenacaine or pontocaine and a bacteriocidal or bacteriostatic ointment containing sulfa or suitable antibiotic drugs may be applied before the eye pad. Penicillin ointment is not desirable because of frequency of allergic response.

Corticosteroid drugs such as cortisone or prednisone should not be used unless ordered by a physician. This is because of the danger of aggravating undiagnosed herpes simplex (fever blister) virus infections of the cornea. These sometimes may be increased greatly in severity even to loss of the eye by corticosteroids.

Handling all severe chemical burns of the eye should be left to a physician after the first aid treatment.

The use of buffered irrigating solutions has been considered for years. The purpose of the buffer is to neutralize any alkali or acid in the eye and restore normal pH. The idea is logical, but all attempts at such treatment have shown it to be impractical. The newest neutralizing buffers advertized commercially for industrial use share the disadvantages of the old.

First, all such solutions are designed for alkalis and acids, whereas it is often impossible to know quickly what chemical may be in the eye. Chemicals may have many injurious properties besides being acid or alkaline.

In the second place, buffered solutions cannot be made as universally available as water to the person who suddenly finds his eyelids clamped tightly shut after a splash of strongly irritating chemical.

THE PRESCRIPTION SAFETY GOGGLE PROBLEM

by DR. E. J. SCHOWALTER
medical director, Western Electric co., Chicago

The objective of a prescription safety goggle program is to facilitate wearing well-fitting, optically precise safety goggle lenses and frames selected for on-the-job needs of all industrial workers exposed to eye hazards.

To accomplish this objective to the complete satisfaction of employees, management, and the optical profession is the purpose of the prescription safety goggle problem. The various aspects of this problem differ within an individual plant, between plants and in various parts of the country.

Eye accident data, and job analyses by safety experts furnish the information to determine which workers are exposed to eye hazards.

Prescription safety goggle frames must have the same advantages as Plano safety goggles. They should be strong enough to withstand trauma and especially selected to protect the worker against the specific hazards of his job.

They must be rigid to achieve and maintain correct positioning of the lenses. Therefore, frames for round lenses, with flexible bridges and temples which can't be adjusted are not satisfactory for prescription safety goggles.

Management should select prescription goggle frames in accordance with the above principles not because of cosmetic reasons. However, safety frames need not be cosmetically unattractive. After all the requirements have been met, selecting cosmetically acceptable frames will promote wearing prescription safety goggles.

Prescription safety goggle lenses must meet the same standards for safety as Plano safety lenses.

The American Standards Association issued specifications for lenses in order for them to be "safety" lenses. Those lenses which meet these specifications must be marked with the manufacturer's trademark, so each safety processed lens can be identified.

It is good practice to test safety lenses on a "spot check" to insure they meet the American Standards Association standards for safety.

Workers needing safety goggles whose unaided vision does not meet a predetermined standard need prescription goggles. Our standard is as follows:

Snellen Equivalents			*Jaeger (12-14")*	
Far:	Both	20/25	*Near:*	Both .50
	Right	20/30		Right .75
	Left	20/30		Left .75

In addition workers needing safety goggles who have eyestrain complaints with Planos should have prescription lenses. If an employee complains of eyestrain when wearing Planos, check the Plano lenses to be sure they meet the American Standards Association Standards for Plano lenses.

If a worker needs safety goggles and his job entails special visual demands he needs the help of prescription lenses. The following information must be supplied to the refractionist:

1. The actual distance (measured) from the eyes to the visual surface of the job.

2. If more than one seeing distance is required, each should be measured and recorded.

3. Any job requiring out-of-the-ordinary visual positions should be carefully described, and if necessary, the refractionist should be requested to observe personally the job. In addition to prescribing single vision lenses and regular bifocals, it is sometimes advisable to prescribe inverted bifocals, or trifocals with one segment above and one below, or other combinations. If workers do not provide all visual requirements for the job their safety goggles should be refracted.

Deciding who should do the refracting is a problem. The overlapping interests of optometrists, ophthalmologists and opticians could hinder public relations unless company policy is carefully conceived and admin-

istered. Refractions for prescription safety goggles should be done by either:

A. An ophthalmologist interested in refractions (Most, but not all of them, are.)

B. An optometrist who is well trained in refraction techniques and has adequate training in recognizing the presence of eye disease.

An optometrist must work in collaboration with an ophthalmologist or a medical director, referring all cases of eye pathology to him.

The employee can be sent to his own refractionist especially if the employee pays for his own refraction. This results in the best possible public relations between management and the optical professions.

However, the employee can be refracted by a company employed refractionist. In my opinion this facilitates the best possible control over the prescription safety goggle program and is the most convenient program to administer. The "vision for the job" concept is easier to obtain, and results in fewer unsatisfactory prescriptions, and hence fewer lens replacements. Thirdly, the employee can be referred to a *panel* of refractionists.

Safety lenses should be fabricated from ophthalmic quality glass or plastic with the same optically desirable qualities as top grade prescription ophthalmic lenses. In addition, safety lenses will be thicker and must be heat treated.

OBTAIN OPTICALLY PRECISE LENSES

An optical supply house should be selected which can consistently turn out a quality product matching the refractionist's prescription.

False economy should not be attempted. There are many technical problems in fabricating top quality prescription safety lenses and only the best lenses will prove satisfactory.

A necessary step to insure optically precise lenses is routine inspection of lenses by the dispenser or refractionist.

To assure well fitting prescription safety goggles, there must be a correlation between frame and face measurements. Either the refractionist or dispensing optician must incorporate into the order the P.D., lens size, bridge size, and temple length.

When dispensing the goggles, he must give strict attention to the alignment of optical centers, distance of lenses from eye and fit and comfort of bridge, nose pads, and temples.

The final step is to send the employee to the refractionist for a final checkup, to assure all necessary requirements have been met. *This is desirable for public relations as well as for technical reasons.*

An employee could have the best goggle in prescription and safety, and it would be useless unless he wore it all times when exposed to eye hazards. The very provision of a quality product does much to insure the wearing.

The more acceptable goggles are cosmetically attractive. After all safety and refraction requirements have been met, the acceptance rate or "wearing" rate is higher with good looking frames. Goggle wearing must be enforced.

WHO PAYS FOR REFRACTION AND GOGGLES?

There are three possibilities — management, the employee, or the cost can be divided between them.

A. There are advantages if management assumes the entire cost.

1. There can be no resistance towards the program by the employee because of personal expense, either at the time the original goggles are supplied or when replacement becomes necessary because of job transfer, or a change in prescription needs.

2. Management can chose the method or plan for refraction, i.e.—own refractionist, outside refractionists, or panel.

3. This practice assures the quality of the goggles and the "eyes for the job" concept can be maintained.

4. Management can insist that goggles remain at the work location if this seems desirable.

B. There are advantages of the employee assuming the entire costs.

1. Best possible public relations between *management and the optical profession* because employee will choose own refractionist.

2. Some companies claim employees take better care of own personal property.

C. If the cost is divided between management and the employee, there will be a compromise between the advantages listed in "A" and "B" above.

If the goggles are paid for by employee, he should be allowed to use them outside the plant if he wishes. If paid for by management, management can control their use.

A. Advantages of keeping the goggles in the plant:

1. Many prescriptions are only satisfactory for the job and are not proper prescriptions for use away from the job.

2. Prescription goggles will always be at work—not left in the other suit, on the dresser, or lost.

3. There can be no adverse public relations reactions from optical professions who might believe they lost business because the company provided the worker with goggles he can use as personal glasses.

B. Advantages of allowing employees to wear goggles away from the plant:

1. Many eyes have been saved because men wore safety prescription goggles away from the plant.

2. If this practice is allowed, the employee must be given a note with his goggles which states his prescription is proper for vision at work, and not necessarily correct for use away from his job. He should consult his own refractionist before using goggles away from the job.

When employee leaves the company there is no advantage for management to keep the goggles, other than the slight value of reclaimed frames. Lenses cannot be used by others. We allow employees to keep prescription safety goggles when they leave, and hope we may occasionally save an eye.

Our plant began a prescription safety goggles program in 1925. There were approximately the same number of exposure hours then as now. Our plant had 522 disabling eye injuries in 1924. We have had no disabling eye injury since November 1954. The last eye lost due to an accident in our plant occurred in March 1952.

Certainly many eye accidents have been prevented as a result of improved job safety engineering. But as many have been prevented by our prescription safety goggle program.

VISUAL AID TRAINING

FLANNEL BOARD DEMONSTRATION

by D. D. MATEER
supervisor, safety & welfare dept., Jones and Laughlin Steel corp., Pittsburgh, Pa.

A few years ago, our general office safety department issued a revised edition of safety rules for electric overhead traveling crane operators, crane directors, hook-up men and repairmen (cab operated). We at the Pittsburgh Works division felt that a special course should be devised to explain step by step how to apply the various rules as they pertain to the operations and minor and major repairs.

As we pieced the course together, it became apparent that we needed unique visual aid materials to give our presentation a boost. It was decided that beside a blackboard and a flip chart for presentation of the material, we would construct a model crane and crane runway and assemble it piece by piece in front of the students.

LIKE JIG-SAW PUZZLE

Realizing that several sets of material would be needed because we had 5,000 people to train, the flannel board presentation was developed. We painted a crane scene with crane, crane runways and operating personnel on cardboard and then put them in sections to represent the various parts of the crane, crane runways and positions of personnel.

As we discussed the rules, we could make the full assembly similar to putting together a jig-saw puzzle. Of course, the main advantage of this flannel board presentation is that it enables us to put together a crane in front of all the group. We construct everything from the building columns to the crane indicator lights.

Naturally, the parts of the crane—hoist, indicator lights, etc., are made more familiar to the students, especially new employees. Besides this, we feel our flannel board visual aid is economical. The crane visuals were made by our sign shop at Pittsburgh Works for a moderate cost of $25 a set. The flannel boards may be home-made or purchased from a supplier for about $50.

Perhaps the main limitation of the flannel board is that it loses its effectiveness as the size of the group increases. As a group gets larger, students will be farther back and it is impractical to enlarge the pieces and the flannel board because they become cumbersome to handle. We suggest the group not be greater than 25 in number.

FLIP CHARTS

by T. F. WICKORD
safety supervisor, Commonwealth Edison co., Chicago

The printed word or picture tells the the story. Many pieces of hand-out material used at safety meetings or for safety instruction might be made more beneficial if the important points are emphasized. The safety story needs to be emphasized, and flip charts can give it that novel, yet positive, emphasis. Flip charts are eye catching and they simulate the thought provoking processes. There are various types and designs of flip charts.

The Safetygraph is a package job developed and sold by the National Safety Council. It has very fine acceptance because it tells a story, adds color, humor and stimulates thinking.

The cost of the safetygraph is about $9.50 per copy and about $4.00 for the easel. Volume printing permits this very liberal price schedule. About 30 different subjects are covered by safetygraphs.

The secret of the safetygraph is the audience participation that develops as the story unfolds. The audience sees the large, well drawn, colored picture while the one conducting the program stands behind the safetygraph looking at a similar, but smaller picture with prompting questions and a discussion outline printed with the picture. With just a little practice an interesting session will reward the discussion leader. The safetygraph is a simple but effective visual aid. It is easily transportable and the story is as good a year from now as it is today.

Safetygraphs are excellent for small groups of people gathered around it. This would be one of its major limitations.

SPECIFIC FLIP CHARTS

One type was used in conjunction with "Instructors Handbooks" to train 200 instructors and then used to carry to 16,000 employees, in various areas, the story of the new "Back Pressure Arm-Lift Method of Resuscitation" which our company adopted as the standard method.

It was a silk screen job with 18 charts bound and placed in an easel. This necessitated a different type of easel than the safetygraph because of the size of copy desired. We used about 150 copies at about $15 a copy. The chart is still being used for refresher courses to new employee groups.

SPECIAL CHARTS

This is an interesting type of flip chart to tell the story of "Attitudes." A single copy put together by a local show card writer ran about $12. This chart was used in 80 scheduled meetings around the company system and can be reused for new employee groups.

Charts used for management groups and for basic supervision courses are necessary to show where and what action must be taken by members of these groups. The charts portray the seriousness of the accident situation in their respective areas and also company-wide. It reminds them that a safety problem is one dealing with human beings and it also shows the terrific cost these people and their company pay for these accidents. The charts remind them that the hidden costs may be two to four times greater than the direct costs.

These charts were used in more than a dozen management personnel meetings. They were made by a local show card writer at a cost of $30 per set.

GOOD PLANNING, GOOD THINKING

A type of flip chart designed to embellish the printed story of material published by organizations such as, the National Safety Council, the Edison Electric Institute, and others, makes a perfect visual aid. The charts can be used to explain recent accidents or as a job training media with safety being keynoted.

If planning is discussed, and to a degree there is some, is it *good* planning? When thinking is discussed, is it *correct* thinking on the part of the foreman and members of the crew or the individual involved? If there is—what caused the accident? There is usually a lot of talking on the job. But, as a means of preventing accidents, we need more talking about the job.

All of us hear about *defensive driving*, being on the alert, watching the others, anticipating movement of others. What we need is more defensive thinking on our jobs as a means of preventing accidents.

This material published on the three R's of electric utility safety by The Electrical World—on Routine—Risk—Remedy—can be utilized in many types of meetings. Every job has its routine but there are risks involved in these jobs. But, by using the proper safety techniques, the remedy is made known and followed to prevent injury.

These charts were used in more than 50 meetings and can be used in training meetings for new employees. This set ran about $20 and was put together by a local show card writer.

PICTURE STORY

Another type of special flip chart is the "Picture Story." It was used in conjunction with a written script entitled "He Used to Be—," given below, which also covers attitudes. This was used as a windup to a safety meeting in this manner. We have used two sets of these cards to cover our company areas. A set of seven cards ran from $40 to $50, depending on the amount of copy required from the show card writer.

These are a few applications of flip charts which we feel have been used successfully at many meetings. We would, however, vary the use of flip charts with other media for other meetings during the year.

"HE USED TO BE . . ."

He used to be a real "hurry-wart." First one off the truck—first out of the plant. First one out of the yard. First one through the intersection . . . but there's no rush now. He's got lots of time—an eternity of time.

He used to be a great grumbler. Griped about all the stupid people he worked for. Griped at safety meetings about all the "dull guff" he had to listen to . . . but there's no grumbling now. He's quiet, real quiet.

He used to be the super-aggressive type. Bulled his way through. Pulled disconnects and cut wires without bothering to look or think . . . but there's no blind motion now. No motion at all.

[illegible] no jittering now. He's calm, real calm, and still.

He used to be the absent-minded kind. Forgot to signal. Forgot to look over the job. Forgot to check his rubber goods and ropes . . . but there's no forgetting now. No remembering, either.

He used to be the chip-on-the-shoulder type. Had all the answers. No foreman or crew leader could tell him what to do. He'd do it his way . . . but there's no back-talk now. No talk at all.

He used to be the real dare-devil. Loved to risk his neck. Loved to take the dangerous shortcut. Got a real kick out of taking chances . . . but there's no chance-taking now. No taking anything, not even a breath.

"He used to be . . ." A sad story that will be written again and again and again. As long as we don't eliminate our serious faults, there's an excellent chance that they will eliminate us . . . there's no exaggeration about that now. It's right. It's dead right.▲

COMPANY MADE FILMS

by A. F. HANS

assistant manager of safety, Standard Oil co. (Ind.), Chicago

Motion pictures are generally regarded as the most effective media in the field of training. However, the high cost of professionally produced films, which run between $1,500 and $2,000 per minute of finished production, has resulted in little use being made of this type of training aid by industry in dealing with subjects relating to specific company operations.

By application of the "do it yourself" principle so popular today, any company or group can produce a quality film for an amazingly low cost. As proof, the employee relations department of Standard Oil company (*Indiana*) produced "Blind Spot," a nine minute, 16mm color with sound motion picture for $1,500. The film deals with a specific problem, backing accidents, the most common type involving some 4,500 vehicles engaged in home and farm deliveries.

Here's a brief account of how the film was made to encourage others to attempt a project of this kind.

WRITING—FIRST STEP

The first step was writing the screen story. A straightforward approach was used, covering five typical situations most commonly involved in backing accidents. Human interest was added by opening with a dramatic example of the worst possible outcome of a backing accident — running over a little girl playing behind a truck which had just finished delivering fuel to a private home.

enthusiastic and competent amateur photographer. Although he had no experience in filming a complete sound production, he was willing to take on the job of shooting footage for this company picture. He worked out a detailed shooting script and planned long, medium, and short range shots in connection with each scene sequence.

The importance of this phase of planning cannot be overemphasized because it spells the difference between an amateur and a "professional" finished product.

Finding suitable locations was also done with care. Consideration had to be given to camera angles, shadows, and natural light density.

CAST SELECTED

Selecting the cast was not difficult. Home owners who were approached were easily persuaded to cooperate even though they were not Standard customers. People who lived in the neighborhood agreed to play the parts of the mother, the child, and other roles. Of a cast of 12, only the three main characters were Standard employees. The others volunteered, receiving only the basic $1 fee for their signed release, plus, as a

hours; 700 feet of film was exposed. Photographic equipment was a Bell and Howell 70DL three lens camera. Kodak Commercial Kodachrome was used to maintain color quality through production prints.

There were 55 scenes in the script as finally revised before shooting. A blackboard was used to identify each scene to facilitate editing. Final editing and laboratory work was handled by a professional film laboratory. Their technical services included preparing the rough and final cut, recording, mixing, and preparing the answer and release prints.

The film uses some short lip sync sequences, with the truck driver acting as the commentator throughout the picture. To place him in character immediately, an early shot shows him in the cab of his truck looking into the camera and talking. The sound was dubbed in at the laboratory with a professional commentator supplied by them.

"Blind Spot" has been well received by those whom it was intended to reach. The employee relations department is pleased with its first entry into movie making and is planning to produce another.▲

STAGETTE USED IN "THE DESTREHAN STORY"

by J. B. HAMBLEN

safety director, American Oil co., New York city

The stagette used in presenting "The Destrehan Story" enables the speaker to change quickly to either of three types of visual aids without distracting the audience. In fact, the change from one medium to another holds the attention of the audience and is the chief advantage of the equipment. Interest is never allowed to sag and attention is stimulated by changing smoothly from peg board posters to flannel board strips, to color slides in any order desired. The four hinged sections fold compactly like a "W" and fit into a case for easy portability and shipment.

Lights concealed back of the headboard illuminate the peg board and flannel board and are operated by remote control switch and cord by the projectionist. The projection screen also is concealed back of the headboard and is raised or lowered by the speaker as required.

The speaker wears a lapel microphone and has both hands free for removing peg board posters, changing flannel board strips, or lowering or raising the screen as called for in the script. Both the speaker and the projectionist have scripts marked with cue words for the color slides. There is no waiting for slides or saying "Next slide please"; the correct slide is there when the cue word is spoken; the lights in the stagette are snapped on or off when the speaker

raises or lowers the screen. All instructions for lights and screen and the slide numbers are marked in the right hand margin on the script.

CONSTRUCTION OF STAGETTE

The stagette is made of wood and masonite. The headboard is in two sections bolted together at the center, and the length is such that the two peg board wings are held at sufficient angle to the flannel board sections to make the stagette self supporting on the table. The flannel boards tilt outward at the bottom and are held out by the hinged 10" by four inch by three-quarter inch blocks.

The peg board chart "Safety" hangs on the top left of the board. The left half of the flannel board, bearing the strip "Safety Committee" is hinged at the top to another piece which is screwed to the front of another piece. The parts for the right half of the stagette are symmetrical with those on the left.

The screen is an ordinary commercial screen removed from the stand. The screen case is fitted with two slotted pieces of strap iron which hook over the two screws back of the headboard. The screen rolls up into the case when not required.

This equipment is not available on the market and the cost of construction will depend upon local conditions. A plant carpenter or a member of the staff with a home workshop will find it easy to build.

DO-IT-YOURSELF SOUND SLIDEFILMS

by C. F. SCHEER

public relations director, Zurich-American Insurance co., Chicago

Nearly everything is relative—even the effectiveness of various visual aids. Each visual medium has certain advantages and disadvantages, but the sound slidefilm has more important advantages than most other media:

1. Its educational effectiveness is greater than that of any other visual aid, according to independent, carefully-controlled and authenticated research.

2. It is flexible. It can be used equally well with large or small audiences.

3. It is relatively inexpensive to produce—four or five films can be produced for the cost of one movie.

4. Projection equipment is compact, portable, and more simple to set up and operate than a movie projector.

5. The scenes portrayed can be controlled rigidly (with art work if necessary) so that all attention is focused where desired with no possibility of distraction in the background.

6. Sound slide is superior to silent strip, slides, overhead projection, or demonstration, because the narration is carefully-predetermined and is convincingly delivered by a skilled professional speaker.

However, the sound slidefilm does have a few disadvantages:

1. It won't do an adequate job in cases where motion is essential.

2. It may disappoint some people who expect motion, having been brought up on movies and TV.

3. The need of special projection equipment will not appeal to those who have already invested several hundred dollars in a movie projector.

4. There is a possibility of "human failure"—failure of the operator to change frames on cue.

5. Rewinding of the film—a manual job—is a chore.

Comparatively, the advantages of the sound slidefilm far outweigh the disadvantages.

But there is one shortcoming common to all films, movie as well as sound slide: the lack of films dealing with the specialized problems of specific industries or companies.

You undoubtedly have met this obstacle. However, at a small cost it is possible for you to produce your own sound slidefilms on specialized subjects, using the talent and facilities available in your own organization. To show you how it can be done, the public relations department of the Zurich-American Insurance companies has prepared a home-made demonstration film which follows.

"DO-IT-YOURSELF" SOUND SLIDEFILMS

Title Card	MUSIC (Musical powder box)
Credit Card: Pertinent production pointers prepared by public relations department, Zurich American Insurance companies	MUSIC
Cartoon: Person wrestling with filmstrip	Narr.: Are you wrestling with a visual aids problem? Well, brother, relax. Quit worrying. If you really want to, you can make your own sound slidefilms.
Drawing: filmstrip & record: prize ribbon pinned to record	They may not win prizes in professional competition, but they will deal with your own special problems in your own company surroundings. And . . .
Hand emptying piggy-bank	. . . a small budget will swing them. How do you go about it? Obviously, the first thing you need . . .
CU of page of script	. . . it is a good script—and that means: Be selective. Don't try to include all known facts on the subject. Be content to discuss one problem—or one phase of a problem.
Split frame: Clock showing 12:15 (Title: "100 Frames"); Clock showing 12:05 (Title: "35 Frames")	If you're planning a full-length 15-minute film, it should have at least 100 frames; a five-minute film, about 35 frames.
CU of script. Title at left: "Describe picture." Title at right: "Explain picture."	On the left side—describe each picture, diagram, or cartoon. On the right side—explain the pictures clearly by means of the dialog or narration.
CU of paragraph of script as per dialog, with section blocked out to indicate that a long sentence was deleted.	Keep the frames short—no more than 35 to 40 words at the very most. The surest way . . .
Cartoon: Audience dozing. Only tops of heads showing.	. . . to put an audience to sleep is to keep the same frame on the screen while the narrator's voice goes on . . . and on . . . and on.
Man with eye-shade, working at cluttered desk. Desk-sign: "Editor."	The editor of your company publication should be able to help you write the script, making sure it says what you want it to say—in everyday shop terms. Also . . .

"DO-IT-YOURSELF" SOUND SLIDEFILMS—(*Continued*)

Drawing: *Pretty girl typing.*	. . . you may need *help in getting* a neat readable typing *job. When the script* is finished, test it.
Drawing: Man *reading;* dog slinking away, tail between legs.	Read it aloud to someone who'll give you an honest reaction. Remember, safety isn't interesting to everyone. You have to make it interesting. *Now* . . .
Rube Goldberg type of machine, script going into one end; film and record coming out the other.	. . . how to transform the script *into* a film and recorded narration. Your plant *may have* . . .
CU: Person with camera. Bird perched on end (of camera).	. . . a camera club—or at least a few good amateur photographers who can take *the* shots you need and give you . . .
4x5 photo mounted on *drawing of* frame-card, with punch-holes indicated *on card.*	. . . 8x10 blowups, like this—mounted *on 10x12* stiff cards. For your cast of characters . . .
Stock shot or stock drawing or stock cartoon.	. . . you can use the men on the job. Or, if you have to do your *shooting after working* hours, your plant may have . . .
Stage scene: Couple of actors in togas. (Or *indoor production-still* from one of our films.)	. . . a dramatic *club—or some* other organization that will *gladly* cooperate in providing your actors.
Repeat shot of Editor.	Another visit to your plant publication office may pay off *in* stock photos that will fit in with your film. *Then, too* . . .
CU washroom *wall with* drawing on it (Maybe a *frame from* "Disorderly Conduct.")	. . . you may *find a frustrated* cartoonist or artist in your plant. If so, get him to use his talent *constructively* . . .
Montage: *Title* cards, cartoons clipped from *SZ Bulletin* and pasted down on frame card.	. . . *preparing the 8x10* art cards, cartoons, and title cards you *need. Now* that you have *your pictures,* you will need the help *of a commercial film studio* . . .
Drawing of animation set-up.	. . . to "*animate*" *them.* This simply means *re-photographing* them—one frame at a time—*on a strip of* 35mm motion picture film. The cost of such a filmstrip negative will run . . .
Sections of old negative pasted on frame *card. Title: "75c* to $1 a Frame."	. . . *from 75* cents to a dollar a frame if your photos are *all* one size—8x10-mounted as we have shown you; about $2 a frame if your mounted photos are of different sizes.

"DO-IT-YOURSELF" SOUND SLIDEFILMS—(Continued)

Sections of bromide print pasted down. Title: "10 to 15c a foot. $3 to $5 Lab Charge."	Finished prints of your filmstrip should cost 10 to 15 cents a foot in small quantities —and there will usually be a minimum laboratory charge of $3 to $5. Don't make the mistake of thinking . . .
Paste-up of various 35mm cameras from catalogue.	. . . you can use a 35mm camera for your original photography and wind up with a filmstrip in one easy step. Remember . . .
Bromide print of strip from 35mm camera; bromide print of 35mm animated strip.	. . . nearly all 35mm cameras produce pictures horizontally on a filmstrip; but a standard sound-slide projector requires pictures arranged vertically on the filmstrip. Of course, you can shoot with a 35mm camera and present your show . . .
Small contact prints from "Winter Wise" pasted on drawings of slide mounts.	. . . with 2x2 individual slides. Remember, though—slides do have some drawbacks. Even with an experienced projectionist, there is always a chance that they'll appear . . .
Repeat any shot upside down.	. . . upside down—or in the wrong order. And . . .
Drawing: Tall stack of slides being knocked over by a hand.	. . . a mere slip of the hand may cancel the whole show. Therefore the cost of professional animating is a worthwhile expenditure. Now . . . what about . . .
Drawing: Person at microphone—*CU.*	. . . recording the voice? The most practical method is to use . . .
Paste-up: Clipping from ad for tape recorder.	. . . a tape recorder—because if you fine your fluffs . . . (all your fines . . . that is, if you fluff your lines—*which* is very easy to do—you can erase and correct your mistake. A word of caution:
Frame 49 from "The Right Combination."	Talk slowly. Most of us talk much too fast, and . . . (speed-up of tape a la Donald Duck). Well, maybe not that fast. If you, yourself, *don't* have a good speaking voice . . .
Frame 45 from "The Right Combination."	. . . get someone from the shop—or office —or sales force—to do the recording—someone with a convincing voice.
Paste-up of ad clippings: Tape recorder and filmstrip projector.	Your finished tape can be used directly with your filmstrip—or you can transfer the narration from tape to a home-made record—or you can have a recording studio do a professional job.

"DO-IT-YOURSELF" SOUND SLIDEFILMS—(Continued)

Title card as per underscored dialogue.	And there you are: Get 1. A good script (pre-tested). 2. Photos that tie in with the script. 3. A good recording. And you've got it made. Easily, too, if . . .
Title Card: As per dialogue, underscored words only.	. . . You spread the work. Get all possible help from the qualified people around you. You can plan, supervise, coordinate. Then, when the job is done . . .
Cartoon: Person with tremendous smile; chest puffed out.	. . . you can sit back and say proudly: "Isn't that a swell film we produced?"
	(MUSIC IN)
End card: Safety Zone Seal and Zurich-American logotype.	(MUSIC UP AND OUT)

Now that you have seen the demonstration film, you probably want the facts of production. Did we practice what we preach? Yes, we did.

Our total out-of-pocket expenditure was less than $50. We used talent and facilities available in our own organization, and we spread the work.

The narration was done on tape, but we went to the expense of having a record made, assuming that the projectionists here would be more accustomed to handling records with this type of presentation.

The "bells"—signalling a change in frames—were sounded by striking a length of wooden dowel against a large water glass. Opening and closing music was taken from a hi-fi record—but you can have "live" music just as easily if you can play the guitar or mouth organ or harpsichord. In a pinch you could even use the musical powder-box on your wife's dressing table.

With a little imagination, a little planning, and a lot of help from cooperative members of your own company, you can make presentable, effective sound slidefilms to fill a long-existing gap in visual aid facilities—films that will deal with those unusual but important problems that seem to exist only in your own plant.

OVERHEAD PROJECTION

by E. P. MARCONI

manager, safety branch, ARO Inc., Tullahoma, Tenn.

The chief advantages of overhead projection are:

1. The speaker remains face-to-face with his audience.
2. The discussion can be carried on in a well-lighted room. Usually it is well to reduce illumination in the vicinity of the screen.
3. The audience gets a big picture, as contrasted with the picture seen on flannel boards and charts.
4. As contrasted with sound slide or movie films, the speaker has an opportunity to express his individuality in the presentation.
5. The speaker is the sole operator and there is no chance of confusion between the speaker and a second person—the projectionist in the case of slides, for example.
6. The presentation can be selective. Frames may be interchanged to suit the audience.
7. By means of various devices, the attention of the audience can be focused on one part of the illustration at a time. This is done by the use of a pencil with which the speaker may write on the frame, point, or diagram. These writings can readily be erased. Furthermore, he may use simple devices such as lift-offs to concentrate attention on one point at a time. He may use successive overlays with which to develop a point progressively.
8. This form of projection provides for either black and white or color. Frames can be hand-drawn with ink on cellulose acetate in black or in color. Or, color may be obtained by using the ozalid machine or by the use of photographic color transparencies. The latter are, however, rather expensive.
9. It is possible to make novelty presentations such as those shown during this presentation. Objects may be moved across the screen; a wheel may be made to rotate on the screen; a dense black sheet may be scratched upon with pencil to produce white lettering on the screen.

DISADVANTAGES ENCOUNTERED

There are some points to consider in the use of the overhead projector which may prove to be a disadvantage unless watched. For example, the speaker should be careful not to place his body in the way of the projected illustration. He must learn to make movements with the pencil slowly lest they become distracting.

He must set the screen somewhat high so that the picture may be seen over the speaker's head, since the speaker normally stands beside the machine. If the screen cannot be set high enough and the speaker's head and shoulders obstruct the view of members of the audience, he may find it desirable to sit down beside the machine.

In such a case, he should vary his position and rise, occasionally, when obstruction of the picture is no longer significant.

During this presentation examples were shown of the use of diagrams on an overhead projector. For example, a diagram of the ear can be shown and the speaker can discuss dimensions, point to parts of the ear, and write on the frame as required.

USE OF PHOTOGRAPHS

Photographs may be used. The transparency must be made from a negative. The photographer who develops the positive transparency must make sure the positive is not too dense. This takes some skill in the beginning but once learned there is little further difficulty in getting a transparency just right. It is well to start from good contrasting photographs. Starting with a bad photograph almost insures that the transparency will be bad also.

The projector can be used as a blackboard. A clear frame of cellulose acetate is placed on the projector and the speaker may build up an organization chart or write data —all this while standing face-to-face with the audience. The use of the overhead projector as a blackboard is common in modern bowling alleys.

Cost: The cost of overhead projectors which use approximately seven inch by seven inch transparencies is around $350. The machine weighs somewhere around 30 pounds and unfortunately the box is somewhat bulky for handling.

The cost of slides varies considerably depending upon the subject matter. Pen and ink diagrams, etc., can be made for whatever it costs to furnish the time or professional skill. We frequently make our own amateur frames and have found them very successful.

The cost of simple frames in black and white, furnished by companies which specialize in this type of visual aid, may be obtained for around $1.50. The use of overlays will increase the cost depending on their complexity and number. As for lift-offs, which are simply card paper placed over the transparency and removed in sections—this can readily be installed by the amateur. In our company I have been told that the cost for a transparency statistics chart having a base matt, grid, and three overlays, mounted on the frame, including art work is about $3.50, when processed on the ozalid machine using the diazotype method.

TWO VISUAL AIDS USED IN BUREAU OF MINES SAFETY DEMONSTRATIONS

by G. M. KINTZ

district supervisor, Health and Safety, District G, U. S. Department of the Interior, Bureau of Mines, Dallas, Tex.

The two visual aids for demonstrating flammable limits of gasoline and ignition sources are "pop guns." These simple "pop guns" are merely thick plastic tubes, one with toy airplane engine spark plugs and one with a spark gap formed by two balls on rods. A Model-T Ford spark coil or a similar source of high-voltage current is used with the spark plugs, and static electricity with the other tube. Spark plugs cannot be used to demonstrate ignitions by static electricity in these tubes.

The top of each tube or gun is sealed with a paper diaphragm. We first used a cork but abandoned its use because the cork blown out could damage or spot a ceiling or an overhead light fixture. Once the cork landed in a pan of gasoline on the demonstration table, causing a serious fire. If the cork is inserted too tightly, the explosion may break the plastic tube.

The visual aids are developed and used to reproduce fundamental conditions that cause accidents, especially fires, explosions, or asphyxia, in the mineral and allied industries, including the petroleum and petrochemical.

The following are some of the methods and stories used in presenting the Bureau of Mines "Magic of Fire" demonstration.

"EMPTY" CONTAINER EXPLODES

The dangerous container—the one that does explode—is the so-called EMPTY container. . had gasoline in it, has been emptied, and perhaps has been on the shelf for six or eight months.

Once a railroad gasoline tank car had been on the side track for several months with dome cover and valve at the bottom of the car open. Yet it exploded when they started to weld on it.

To demonstrate we take an empty container, and move a cleaning brush in and out so the audience can see that it is clean. We place one drop of gasoline in this empty container, seal it with a paper diaphragm, and allow it to vaporize. Air is already in there. We add fuel and get the heat through the spark plug near the base.

Connect the spark plug to the spark coil, turn on the current, and—an explosion occurs. This depends on gasoline and other conditions. One drop may not explode. If this happens, say "You have seen what one drop will do; let's see what two drops will do," and add a second drop.

Pick up gallon can of gasoline. In this gallon can there is more than 155 thousand times as much gasoline as in the tube. You can imagine the tremendous noise if we had been able to amplify that explosion one *hundred and fifty-five thousand* times.

COMPARE DYNAMITE, GASOLINE

Dynamite and gasoline are not the same thing. The same laws controlling one should not control the other. However, they are both manufactured for the sole purpose of exploding. It is interesting to compare the energy in the two.

If a gallon of gasoline could be turned into dynamite, there would be between 13 and 95 pounds of straight 40 per cent nitroglycerin dynamite. That would be between 26 and 200 sticks of dynamite. Yet many people keep a glass container filled or partly filled with gasoline in a garage, bathroom or closet where it could be broken and vaporize. But they wouldn't keep one stick of dynamite in such places. However, dynamite will remain in place while the gasoline vapors will migrate.

Often when inspecting laboratories or other places where distillation tests are run or around filling stations where gas-heated tire-patching outfits are kept on work benches, the personnel are loath to accept the recommendation that they should not smoke. They say why shouldn't they smoke, they have a Bunsen burner on the table or they have a gas flame on the bench.

To show them why they shouldn't smoke, put the one drop of gasoline into the tube and seal it. Be sure that the spent gases have been swabbed out of the tube before starting this experiment. Do not shake the tube; allow the drop to strike as far [illegible] on the side of the tube as practic[illegible] The spark plug at the top of the tub[illegible] ill represent a Bunsen burner.

Apply electric current to the spa[illegible] ug, and no ignition will occur. Then light a cigarette and drop the burning match on the floor.

Have the lower spark plug on the tube represent the floor. Apply the spark through the plug, and an explosion will occur. This illustrates that the gasoline vapors, which are heavier than air, hang along the floor.

You know what one drop would do. Put in one, two, three, four, five drops, insert the paper diaphragm, and allow the gasoline to vaporize. Air is already in the tube: the fuel was added; apply the spark. To make this appear hazardous, leave the gallon can of gasoline on the table and then just before applying the spark, move the gasoline can to the floor and set the glass of gasoline aside. Nothing will happen.

To be sure it is an empty container, reseal it, shake out some of the vapors, apply the spark, and an explosion will occur. Sometimes the vapors may be so strong that it will be necessary to repeat the shaking two or three times, or even go so far as to place the brush in the tube and pull it out once.

Actually to have a fire, there must be AIR, HEAT and the ratio of the fuel to the air must be within certain definite proportions called flammable limits.

FLAMMABLE LIMITS

For gasoline to explode, 1.4 and 7.6 per cent volume-in-air is necessary; dry natural gas—or rather methane—needs between five and 15 per cent and butane needs between 1.8 and 8.4 per cent.

Percentages of gas below the lower flammable limit will not explode or propagate flame. One drop and the spark at the top of the tube did not explode—because the vapors present were not enough to bring it up to the explosive range.

Percentages above the upper flammable limit will not explode or propagate flame because with five or seven drops in the tube you had too much and had to shake the vapors out until they were down within the flammable limits. Speaking generally, the closer the percentage of ordinary fuel gases approaches the midpoint between the upper and lower flammable limits, the more violent the explosion will be.

GAS VAPORS REMAIN

Often a person thinks that because there has been an explosion in a tank, a building, a confined area, mine, or elsewhere there is no gas left and that it is safe to go in.

To demonstrate this replace the seal of the tube, apply the heat, and an explosion occurs. Just because there has been one explosion does not mean that there won't be two explosions. Sometimes as many as five explosions occur.

Generally speaking, any mixture that will burn, will explode. As a matter of fact, there is no difference between the gases that burn and those that explode. To demonstrate that blow out the Bunsen burner and allow the gases from the burner to fill an explosion tube.

Extinguish Bunsen burner and place it over the top of the cylinder; allow gas from the Bunsen burner to feed into the cylinder, leaving enough space so that it is free to flow out of the tube. Sometimes difficulty may be experienced in getting just the right percentage in the cylinder.

Often when visiting machine shops and other places, workmen are heard speaking of oxygen as air. Oxygen is not air, and it should never be used as such. Workmen have used cylinder oxygen to put tests on a gas piping system because they did not have compressed air handy. Welders who did not like the atmosphere in a vessel in which they were working released oxygen into the working space.

Oxygen is not air, and it shouldn't be used as such. To show this blow the tube out with oxygen, place in it one or two drops of gasoline and seal it. Use two paper diaphragms. If you use a cork, be very careful not to insert it too tightly in the tube, especially if you are using a plastic tube because plastic is pliable. When ignited, an instantaneous explosion occurs. You can see that oxygen is not air, and it should never be used as such.

SKITS FOR SAFETY SAY SCAT TO ACCIDENTS

by DR. EARLE HANNAFORD
safety engineer, Long Lines dept., American Telephone and Telegraph co., New York city

It's only natural for people to react to skits that re-enact or portray living situations, for life is something we all experience. We identify ourselves with the roles played and in so doing, a lasting effect is made upon us.

We learn best by seeing. We learn most permanently when seeing is reinforced by the senses of hearing, touching and even smelling and tasting when possible.

Since time began the impact of role playing or "play acting" has been known and used. Its effects are dual in nature and it is felt deeply by the role players as well as those viewing the skit. Emotions and reactions to them are far older in human experience than reasoning and logic. Safety skits make the fullest possible use of this fact.

Facts to Remember About Planning Safety Skits

Safety skits don't have to be super-colossal productions. All that's required are a few people, a script and, in some cases, a few props which are usually everyday tools.

The most effective skits are those done by employees themselves since they have more identification for both the audience and the role players. Naturally they won't have the perfection of professionals but just getting a group around a table to read the parts has a tremendous effect on those playing the roles.

It's surprising what a little practice can do. There's an unsuspected amount of "ham actor" in all of us and a great deal of talent for living life-like situations or we wouldn't be here!

SUCCESSFUL SAFETY SKITS

Success depends upon—

1. Skit must be life-like—not over-serious or over-humorous.
2. Not too long.
3. Can be merely conversation or include actual performance of work and safety operations.
4. Minimum of memorizing of parts by rote by using properly prepared notebooks.
5. Sufficient practice to put role players at ease.
6. Use of suitable aids and a good setting.

Since we will use a section of the demonstration of "Useful and Usable Safety Meeting Techniques" as our skit, large cards and easels are used to show what techniques are being used in the discussion.

Last and by far the most important is the type of script and notebook used by the leader and the participants. We use a "flip-over" type notebook which lies flat before each participant. Each player's notebook contains the whole script but each individual's notebook has his part typed in capitals and underlined in red. It takes only a little practice, three or four practice sessions through the script, to become familiar with the parts and the use of the notebooks.

I will give a section from the demonstration "Useful and Usable Safety Meeting Techniques." To set the stage, let me tell you that this is a construction line gang safety meeting with the foreman leading the discussion. Our subject is "Are on the Job Safety Meetings Worthwhile?"

Suggestions for Presenting the Skit

The skit illustrates by actual discussion the practical methods and steps in conducting on-the-job safety meetings. It requires 15 minutes for presentation.

If possible, participants should be selected with their particular parts in mind for a more natural presentation. However, a little coaching and assistance during practice sessions will work wonders in adjustments of participants to their parts. Spontaneity can be developed even though the nature of the demonstration requires close adherence to the script.

Practice Sessions

Advance practice is vital to a smooth, natural presentation. The first step should be a purely "reading through" session with each participant merely reading his part with no attempt at dramatization, since the purpose is to gain familiarity with the script and cue phrases. Following the "read through" session, an average of six to eight actual practice sessions will give sufficient "carry" to the demonstration without attempting to memorize the parts. After the third or fourth practice, attention can be given to developing spontaneity, naturalness and dramatization.

An important point is to make certain that participants speak at a level and volume to be heard and understood by the listening group. This is particularly important in small groups where a public address system is not used. Also of importance is using a rate of speech that is neither too fast for the audience to follow nor too slow to maintain interest.

SETTING AND ARRANGEMENTS

The participants should be seated at the table with the open or unoccupied end facing the audience and the skit leader at the end of the table farthest from the audience. This permits a view of the faces of all participants. Where possible, it is suggested that two small tables be used to form an open "V" with the opening facing the audience, with a small reading table for the skit leader at the point of the V. This permits a better audience view than with a single table. A lectern can be provided to one side for the use of the leader while he is presenting the material which is not actual group discussion, as this aids in separating the two in the minds of the audience.

Each participant should have an individual "flip over" ring type binder approximately seven and one-half inches by four inches in size, with the rings at the narrow end. All of the script should appear in each binder; however, the binder for each participant should have his own part typed in capital letters and underlined in red. Since the other parts are typed in lower case each participant can identify his part quickly and at a glance. Only one side of each page should be used and typing should be double spaced for each participant's part.

Display cards should be prepared as required in the text, with lettering large enough so that the cards can be easily read by the audience.

It is best to have two assistants, one who displays the cards in accordance with the directions of the other who is equipped with a script and signals for each card by number. The numbers are placed on the back of the cards in accordance with the numbers placed on the script used by the leading assistant. The leading assistant can use hand signals to indicate the length of time each card is to be displayed. These two assistants should participate in the practice sessions to insure proper coordination.

For large audiences or unusual room arrangements, two sets of display cards and three assistants may be necessary. In addition, individual table microphones should be supplied for the participants with a harness or lapel microphone for the leader.

Alternates

To avoid difficulty due to sickness or unavoidable absence of a participant, it is recommended that the leading assistant in displaying the cards be trained as a replacement. This can be done by selecting the assistant with this in mind and having the assistant actually act as a participant in a few practice sessions. In addition, the alternate should read all parts thoroughly, since it is best to have regular participants take only their own parts, leaving all "fill in" duties to the alternate including substitution for the skit leader.

USEFUL AND USABLE SAFETY MEETING TECHNIQUES
(A Skit)

DR. EARLE HANNAFORD

INTRODUCTION

Safety meetings are a time honored way of selling safety to individual employees. In recent years many people have been saying, are they worthwhile?—Do we really sell safety?—What are the things that make safety meetings click?

All too often safety meetings develop into a "selling them" with the group playing a passive rather than an active part in the meeting. We who hold the meetings are talking when we should be listening. Once the problem has been clearly stated there must be participation by those in the meeting. Without it there isn't much chance of convincing anyone. And yet, time is of the essence also. On-the-job safety meetings just shouldn't take forever.

This morning we will demonstrate for you some of the useful and usable safety meeting techniques. These techniques have been developed and learned the hard way through actual experience. We are not going to smother you with a lot of words and technicalities. We are going to tell you briefly what we are going to demonstrate and then do it right here before you.

During each discussion large placards will be displayed, pointing out just what technique is being demonstrated at the moment. (Hold up a placard.) In addition, on the easel to the left of the platform, a large card will show the subject under discussion during the duration of each discussion.

In all of our demonstrations we will assume that the necessary preparation has been made by the leader—which I assure you is the case. Thus, the safety meeting techniques we will demonstrate deal solely with the conduct of the meeting itself.

Our skit is designed to show the following things:

1. The value of group participation and how to get it—in other words, getting the gang in on the act.
2. The use of illustrative personal experiences of the group members—helping them sell themselves.
3. Getting reasoned voluntary group acceptance—checking to make sure they have bought the bill of goods.

We will now discuss the subject: "Are On-the-Job Safety Meetings by the Supervisor Worthwhile?" using group participation, illustrative personal experience of the group members and voluntary reasoned group acceptance. (Have assistants show placard using the three techniques.) (During the course of this skit the assistants will hold up card on each side of the stage with the appropriate item on it as that item is being demonstrated in the discussion.)

LEADER: I've just been making out the time schedule for the next month. Since we've been holding these weekly safety get-togethers on the job for quite a while now, I want to get your ideas about them. Should we keep on with them or lay off of them for a while? What do you think?

HRDLICKA: You mean you want us to tell you, boss—that's a switch.

LEADER: Yeah, Bill, I'd like to find out what you fellas really think about these safety meetings. Are they doing you any good?

(Hold up Group Participation card)

DALTON: Doing us any good? What do you mean GOOD?

NAUGHRIGHT: Aw, Ed, I know what the boss means and you do too. He means, does it help us to work safely to kick these things around now and then.

LEADER: Yeah, that's it, Amos, that's just what I mean. Work at it fellas.

KELLY: Of course, I'm new around here and can only say how it looks to a young sprout, but I think it has helped me a lot.

LEADER: Just why do you think that, Ed?

HRDLICKA: Yeah, Ed, what's so hot about it? Right now I've got that rush service order waiting for me to get at it.

LEADER: Ease off a bit, Bill, let's give Ed a chance to have his say.

KELLY: Well now, let me see.

(Illustrative Personal Experience card)

LEADER: Ed, have you got anything particular in mind where it helps you. Tell us about it.

KELLY: Yeah, I remember something. You probably don't remember it yourself but we had one of these safety get togethers just after I came on the job. I was helping Ed here. You remember it, Ed?

DALTON: Yeah, I remember your helping me, but what are you talking about?

KELLY: You remember Ed. At that meeting we discussed wearing safety goggles when soldering. Seeing as how I don't wear glasses I thought it would look kind of silly. I left them off one day and the gang jumped me about it, and just a short time after I put them on there was a little flash of hot metal and it lit on the goggles instead of my eye.

HRDLICKA: Yeah, but it wasn't the meeting that did it. We jumped you about it. We always jump a guy who breaks a safety rule.

NAUGHRIGHT AND DALTON TOGETHER: Now wait a minute, Bill, wait a minute.

NAUGHRIGHT TO DALTON: You tell him, Ed, I think we both are going to say the same thing anyway.

(Group Participation card)

DALTON: Maybe we'd jump him and maybe we wouldn't. Having these safety get-togethers sort of refreshes our minds and keeps us on the ball.

LEADER: Anything you want to add to that, Amos?

NAUGHRIGHT: Sure, just this. At these meetings we've been making it our plan to talk about the safety angles of the job at hand. I've been around here a long time; sometimes I think too long, but I've never seen the day when taking time to talk over the safety angles of the job didn't help me.

HRDLICKA: Yeah, in the meantime I still got that service order staring me in the face.

LEADER: That's right, Bill, but let's go on and make sure about how we feel about these safety meetings.

DALTON: Wait a minute fellas, I've been thinking maybe Bill has something there about our not needing these safety meetings.

LEADER: What do you mean by that, Ed?

DALTON: Well, just figure it out. After all we are a pretty small crew and we work together all the time and you are right here with us most of the time. Why do we need special meetings anyway? We can keep up with what is going on.

(Illustrative Personal Experience card)

KELLY: Maybe you old hands can, but I sure can't.

NAUGHRIGHT: Well, Ed, there may be something to what you say but I was just thinking about the times when getting the job done seems so important we forget some of the safety angles. It gets to be a habit with us, so much so that the wrong way seems like the right way. If we discuss the safety angles now and then it gets us back on the track.

HRDLICKA: You are right, Amos, about the job being important. Now I got that service order—

LEADER: Wait a minute, Bill, wait a minute. Let's see just what Amos has in mind, Amos?

NAUGHRIGHT: Well now, yes. I remember one and you were mixed up in it too, Bill.

HRDLICKA: Yeah, that so, what was it?

NAUGHRIGHT: You remember when we had that emergency call about the exchange cable being out and tests showed it was in the manhole at the corner of Washington and Lincoln streets.

HRDLICKA: Yeah, I remember it. It was about six months ago. The boss had been called into the office. You, Ed and me rushed out there.

NAUGHRIGHT: Yeah, that's right.

DALTON: Yeah, I remember it, Amos, now that you mention it.

NAUGHRIGHT: Remember, Bill, you rushed out and we got the cover off and in our hurry we sort of forgot to make tests for gas before entering the manhole?

DALTON: Bill should remember it. We sure had to get him out fast. Lucky he wasn't done in.

HRDLICKA: Yeah, I guess you fellas sort of got me. We did forget to make those tests.

(Reasoned Voluntary Acceptance)

LEADER: Well, we can all be glad that it worked out OK. What about these safety meetings though—do we want to continue them or not?

DALTON: Well, I guess we do all right. I take back my crack about being together on the job every day taking the place of these meetings.

NAUGHRIGHT: Yeah, that's the way I feel about it, too. Having been around here a long time I have seen these things come and go and we have always done a better job when we had these safety meetings.

LEADER: Ed, how do you feel about it?

KELLY: Well, there's no question that I'm new and need all the help I can get, and I'm aiming to be around here a long time like Amos.

LEADER: Well, Bill, you got anything to say?

HRDLICKA: Yes. I'll go along with these meetings, I guess. Maybe we do need to stand off and look at what we are doing now and then, just to make sure we are doing it safely. But I still got that service order staring me in the face.

LEADER: Well, fellas, are we all pretty much agreed now that we want to continue with these safety meetings on the job each week?

NAUGHRIGHT: Yeah, let's go ahead with them.

DALTON: I'm for it.

KELLY: I sure want them.

HRDLICKA: OK, OK, count me in.

LEADER: All right, next week let's talk about wiping joints the safe way. Ed, supposing you be ready to talk about it and show us some of the angles and have Ed Kelly help you.

DALTON: All right, we'll be ready, won't we, Ed?

KELLY: Sure will.

LEADER: Well, I guess that just about wraps it up for the day. Maybe we better let Bill get at that service order.

HRDLICKA: OK, boss, I'm on my way now.

I doubt if anyone in the audience missed the way in which group participation made the safety meeting really click, as compared to the first discussion in which the leader tried to carry the ball himself; also obtaining reasoned voluntary group acceptance really sells the ideas under discussion. People like to "get in on the act" and the selling power of being in on it yourself is tremendous when compared to just listening to someone else's logical presentation.▲

WIDENING HORIZONS IN OCCUPATIONAL SAFETY

THE OPPORTUNITY FOR STATE ASSOCIATIONS AND STATE AGENCIES

by CHARLES H. FULGHUM*

secretary, Mississippi Manufacturers Association, Jackson, Miss.

Most state associations represent special interest groups and are constantly involved in controversial issues. Even though we are convinced the cause we champion is right, we sometimes have a hard time getting this across to the public.

It's a nice feeling for a change to promote a non-controversial cause. Safety is the perfect answer. Our members love it. It takes some of the sting out of the public accusations that we are a self-serving bunch of "so and so's."

Every association must render a public service in order to survive and be tolerated by society. Safety promotion gives us an opportunity to go outside our membership and render public service.

As a result of this attitude by our Association, our governor appointed a citizens committee composed of a cross section of the state's citizenry. When the committee met, the Mississippi Manufacturers Association, because of public recognition of safety leadership, was called upon to do the formative and organizational work in forming the new Mississippi Safety Council.

Because of our leadership in safety promotion, we are consulted on proposed safety legislation. We are thus in a perfect position to head off ill-conceived safety legislation at the state level before it is introduced.

People are inclined to look on industrial associations as green-eyed, forked-tailed monsters out to suck the blood out of "the little man." Once people get to know us, they find that this "just ain't so."

Thus, safety promotion outside our own membership opens up an entire new "public" for us. It has placed us in the midst of practically every organized group in the state. Our public safety promotion has won us many new friends, influenced many new people.

When civic groups, women's clubs, town boards, chambers of commerce, police agencies, school groups and trade organizations start coming to the state industrial association for guidance on anything—Well, that is really something! That is precisely what is happening to MMA in the safety field.

All these things are "fringe benefits." Our basic motives for our safety program are the same as those of a business firm which has a good safety program. In addition to those motives, we have the same motives as the National Safety Council in its great program.

Over and above this, we are in a perfect position to reap numerous "fringe benefits." All combined and neatly packaged, they make up a very attractive and worthwhile program for any organization.▲

*(*Charles H. Fulghum replaced John E. Gregg, who resigned from the association shortly before the Congress.)*

OPPORTUNITIES FOR COOPERATION BETWEEN INDUSTRIAL ASSOCIATIONS AND INDUSTRIAL SECTIONS, NSC

by DONALD H. WORKMAN
executive vice president, Gray Iron Founders' Society, Inc. Cleveland, Ohio

This subject is a broad one—because there are so many opportunities for cooperation between the trade associations and the National Safety Council.

In our own safety activities—almost from the start—we have leaned heavily on the Safety Council, and particularly in the last few years during the initial stages of an expansion in our own safety program. Bob Currie of the Small Business and Associations Section of the Council has attended all of our safety committee meetings during the first year of the expansion program and he was of invaluable help to us in matters of modern safety techniques and in programming safety activities. Also, Al Baltzer, head of this section, has attended a number of our meetings and has given us much of his time.

We recognize that the Council is most prolific and generous in the production and distribution of fine safety literature, posters and films. The only shortcoming, and I can't reasonably call it an objection, is that most of this material unfortunately does not meet the specific safety needs of each and every industry—foundries in our particular case. In our industry 200 tons of material must be handled to produce one ton of castings. Here is where the industrial associations have their first opportunity—they must pick up the ball and tailor good safety programs to their own industry's needs with the help and encouragement of the Council.

PROVIDES MEETING GROUND

An important function of a trade association is to provide common meeting grounds for the exchange of good ideas among its members. As in the case of our own membership—no one executive or any one association has all the good ideas. Here then is the opportunity the Council has to increase its service as an industrial safety trade association so that more communications can be channeled to and fro and so that more good ideas can be exchanged between trade association safety men. This thought is not new—nor has it gone untried—witness our session today—but I believe special regional or national safety meetings for trade association safety men only would be welcomed and supported.

Here then is the second opportunity for all industrial associations—all we have to do is speak up, the Council will take it from there because they know that safety must be a two-way street. The Council realizes that it is easier to reach an industry through its association, and it has demonstrated this well by helping its many association members to help themselves in safety matters.

I was asked to review briefly our society's safety program, which can best be done by illustrating some of our safety publications and materials:

1. We publish a 15-page manual called *How You Can Work Safely*, designed for the foundry employee. Approximately 85,000 copies are now in use.
2. One booklet *Sight Conservation in Gray Iron Foundries*, published by National Association for the Prevention of Blindness is based on a survey of our member companies, which we helped to carry out.
3. Our Monthly Statistical Summary carries two columns on safety, 1) Number of Lost Time Injuries and 2) Injury Frequency Rate covering approximately 35 different industrial foundry centers from coast to coast.
4. To find what our safety problem really was, our society surveyed the industry two years ago. Only information indispensible to the safety committee was collected, and it has formed the basis for our present program and it will be a bench mark to measure future progress.
5. To augment survey data for our program, our committee held a brainstorming session and developed 134 good ideas for safety contests, cooperation with other organizations, project development, publications, safety publicity and training.
6. Step six, now in process, is the development of an Industry—Management Safety Manual.

Last week I was chatting with a representative of Pressed Metal Institute, an association which won a Safety Council award in the third year of its five year old safety program. So far they have helped reduce their industry's rate from 23.7 to 9.0. They insist that each year at least one of each of their regional chapter meetings be devoted to safety.

IKE, IDA AWARDS

A serious gimmick used by PMI is the creation of two little figures named Ike and Ida. These two figures, clothed in working dress, are presented each year to the district having the best safety record. The presentation ceremony is quite formal. If the winning district is overtaken the following year by another district another solemn ceremony occurs at a meeting when Ike and Ida are carefully laid away in a handsome mahogany casket for shipment to the other district.

In PMI, and at a member's expense, a sub-committee of their large national safety committee is invited to inspect the member's plant—the outside viewpoint. They also place industry suppliers on their committee—more of that "outside look." These suppliers carry good safety ideas from plant to plant and have an ideal opportunity and motive to look for the unusual in safety.

Also we can pick the brains of industries which have done the best job in safety—invite their own experts into our factories to look for things our experts can't see.

American Trade Associations have contributed greatly to the tremendous economic growth of this country. It is a matter of record that associations have been credited with furthering American industry's ability to lick any problem. Why then can't we use this ability and power to lick both traffic and industrial safety problems?

Therefore, our greatest opportunity is to turn safety from a problem into an opportunity in our respective industries. I am always distressed when I hear safety called "old stuff" or "shopworn." An association giving lip service only to safety can harm its industry and we are failing our industry if we don't go all out in this regard.

If we are to reduce the high cost of accidents and if we are going to prevent human suffering, all of us must work harder to make safety efforts more attractive and a must to all concerned.▲

THE OPPORTUNITIES FOR LOCAL SAFETY COUNCILS AND CHAPTERS OF ASSE

by JOSEPH M. KAPLAN
manager, Greater Los Angeles Safety Council, Los Angeles, Calif.

Too few chapters of American Society of Safety Engineers and local safety councils give themselves the opportunities to promote safety activities among small businesses and trade associations.

Our observations in this field show that such opportunities do exist, and that the time to do something about them is now. The potential is tremendous, for the field is virtually untouched. Studies have shown that the smaller businessman has a higher accident frequency rate and higher insurance rate than his bigger brothers. This extra cost not only narrows his profit but often makes the difference between operating at a profit or a loss.

A considerable portion of the time and effort of the industrial division of the Greater Los Angeles Safety Council is being exerted to take advantage of these opportunities.

CONTEST BEGINS PROGRAMS

We consider our annual business and industry safety contest as one of the mainstays of the entire industrial safety program, not only because it sustains interest in the program the entire year but because it is a tremendous influence in interesting new businesses, large and small, in the field of safety. Our contest started nine years ago and has grown to a present enrollment of 470 companies, employing more than 650,000 workers, and aggregating more than a billion and-a-quarter man-hours yearly. In 1949 the frequency rate was 10.41 and last year it was reduced to 5.98.

Approximately one-third of all the entries in this contest are small businesses with less than 100 workers. Obviously, since most of the large plants are already safety-minded, having their own programs and since a majority are already entered in the contest, the opportunity to secure new entries lies almost exclusively in the small business field. We have found, however, that, as the size of these potential participants gets smaller and smaller, it is becoming more and more difficult to get them started.

We believe that the contest is an excellent method for making an initial contact with the smaller plants, and helps many of them launch their own safety programs. Time after time we get telephone calls or letters from participants who remark: "We had only five accidents in our entire plant last year; I thought we had an excellent accident record. Now, when we compare it with other businesses in the same category, we find that it is quite high. What can we do to reduce our rates?" Then of course, we are off to launch a new program for such people.

The overall accident frequency rate of all our contest participants, as well as the individual rates of most of them is gradually going downward, slowly but steadily, year after year. This must indicate that the contest is exerting some influence on the rates.

Certainly, the contest is an excellent way of stimulating interest. Our annual Award Banquet, at which we present the annual plaques and trophies, is one of the Council's major events. In addition to the first, second and third place awards and perfect record winners, we give a sweepstakes trophy to the company with the best overall safety program and record.

STRESS SMALL BUSINESS

Two years ago, we added a junior sweepstakes award to this list of awards. This trophy is awarded to the company of less than 250 employees with the best overall program and record. The interest and competition for this recognition is just as keen as in the senior division, and shows another way in which the interest of smaller companies and agencies can be stimulated.

Another major factor in our program is the annual Western Safety Congress and Exhibits, held for a three-day period every March. In addition to the usual programs on general industrial safety, traffic, fleet and home, we offer separate sections for small businessmen. This year we are placing considerable stress on this phase of the program and anticipate an upsurge in interest and attendance in this section. Two new approaches that we are taking in this field are:

1. We have found that many businessmen who suddenly blossom from small 2, 3, or 4-man operations to 25 or 50-man plants practically overnight, no longer regard themselves as small businessmen in their own eyes. They no longer are interested in activities of small business, and actually resent the term *small business*. For this reason we are discontinuing the use of the term *small business*, and substituting the term *management* instead. We expect to attract both small, medium and large operators to these section activities.

2. We have found that small businessmen won't come out to hear safety men talk on safety, but they will come out to hear other businessmen talk about their own experiences. Consequently, we are scheduling only management speakers to speak at these management sessions. Both large and small business speakers will be programmed as another concession to the needs of smaller business.

SERVICES OFFERED

In addition to these major activities, we also have a number of routine services, such as a technical library, staff consultation service, visual aids library, and the resources of many committees. In checking the monthly activity reports, we find that an ever-increasing proportion of telephone calls and letters are from the smaller size businesses. Such requests are beginning to filter in from trade associations also, something unheard of in the past.

We also publish several magazines and newsletters each month. In addition to *Safetyscope*, which is general and all inclusive in its scope, we have separate newsletters published by the industrial, fleet and home and off-the-job divisions. Not only are the names of small businesses added to these mailing lists—as soon as any interest is evidenced by them—but our industrial newsletter has been devoting a page in each issue to small business and trade association safety news items of general interest. We feel certain that these activities are responsible for these new inquiries.

Our specific promotion in the field of association safety is really just getting under way. The association newsletter published by the National Safety Council has repeatedly stressed the fact that the smaller companies have higher rates than they realize and urged that associations heed this situation and do something about it. We consider this another opportunity to challenge us.

FIND LACK OF INTEREST

When we decided to systematize our association safety program, obviously the first step was to find out what such groups were already doing. We first prepared a list of associations, and sent them a short letter and brief questionnaire in which we asked them to outline their present program, needs, and interests in the field of safety.

The response to this preliminary questionnaire was somewhat startling. We received only a limited number of replies. A few of them indicated a vague interest in diversified subjects mentioned, several failed to fill out the questionnaire portion and two came right out flatly and said they were not interested.

It was quite apparent that, if we expected to accomplish anything worth while, we would have to revise our strategy. We screened the combined lists of many business and trade associations—1,000 in all—and created a new list of 266 associations which we now regard as our "potential contact" file. These groups represent associations whose activities should logically include safety, and with whom we hope to do business.

We have been personally contacting the managers or executives of these associations. The response to this personal contact technique has certainly been more encouraging. After a few contacts, one striking fact became apparent—trade association executives are not interested in generalities; they are interested only in specifics.

Merely outlining our services and leaving them a copy of the service guide, with a request that they select their own items from those available, does not produce results. We have yet to have a single follow-up from this approach. These men simply do not have the time to do this job.

They agreed they had a need of such services, and could use the services if the programs were tailored to the needs of their

individual members. Obviously, we do not have the staff time to perform this function.

Another opportunity thus presented itself. We redesigned the entire association program to fill this particular need and organized a special committee, the business and industry liaison committee.

Essentially, this committee consists of the executives or other officially-appointed safety representatives of the many separate associations concerned. The committee surveys the individual and collective needs of its members and reports these needs to the council. It communicates to its members the council's regular or special activities or services which may be of interest to them.

We just started this program, but already have 16 members on this committee. It is active in several different fields and we expect it will grow into possibly an 80 or 90-man committee. It should become a major factor in meeting this opportunity to serve trade and business associations, as well as to attract them into other activities.

SMALL BUSINESSES INTERESTED

We are attacking the problem of individual small business in much the same way. We already have a fairly comprehensive list of the larger and intermediate sized companies who have their own safety programs, but lately we have been making a concerted effort to add to this list the names of the smaller businesses. Occasionally, they call for information, or write for it.

Friends suggest their names or safety engineers or inspectors learn of their interest or need and advise us. As soon as we know, we make a file card for them and put them on the mailing list of the industrial newsletter, *Safetyscope* or other publications.

We have an active chapter of ASSE in Los Angeles who has been helpful in many phases of this program, particularly through its numerous standing and special committees. Certainly there are many opportunities offered for it to continue this fine service.

Their placement committee has secured trained safety engineers for many organizations. The ASSE speakers' committee assisted in supplying speakers for smaller plants having their first safety meetings or organizing committees.

Through its educational committee, there have been numerous safety courses offered in the Los Angeles area. At the present time there are five such courses and practically the entire attendance is comprised of plant managers, foremen, supervisors and others concerned with plant operations, rather than safety men. Safety is definitely making its way into many small plants through these courses.

Traditionally, too, the safety engineering sessions at the annual Congress have been sponsored by the ASSE. To conduct such programs a professional staff member is needed to handle this phase of the council's activities. Thus far there are only a relatively few councils which have employed their own industrial safety directors or engineers. I would recommend that many more consider such an addition to their staffs for these programs will be limited only by the knowledge and capacity of the man directing them. Without a program director to administer such a program, you will have no program to sell.

Let us reiterate that word SELL, for safety must still be sold. The pioneers in safety had to sell it, and we have to sell it. Small businesses and associations are interested in safety to a small extent. There is definitely an opportunity to get them activated in safety work BUT they must still be sold to take the desired action.

MUST SELL PROGRAM

They are not standing in line waiting to grasp at any safety program or suggestion that comes along. They will grasp only at suggestions, devices or planned programs designed to fit their needs. We must plan these programs and also the selling campaigns, in the same way we would plan a campaign to put a new soap, automobile or new perfume on the market.

The opportunities are there, if we but grasp them. If we don't, there is a good possibility that some agency will come along and grasp those opportunities which rightfully belong to our system of free enterprise.

OFFICERS OF THE

AMERICAN SOCIETY OF SAFETY ENGINEERS

NATIONAL SAFETY COUNCIL 1957-58

President—JOHN F. JULI, safety manager, Consolidated Western Steel div., U. S. Steel corp., Los Angeles, Calif.

First Vice President—ROBERT CLAIR,* assistant vice president, Liberty Mutual Insurance co., Boston, Mass.

Second Vice President—DONALD G. VAUGHAN,* manager, engineering & inspection dept., Aetna Casualty & Surety co., Hartford, Conn.

Secretary and Managing Director—J. B. JOHNSON, American Society of Safety Engineers, Chicago, Ill.

Treasurer—GEORGE F. NUERNBERGER, safety department, Kaiser Steel corp., Fontana, Calif.

Members-at-Large

Term Ending 1958—MICHAEL F. BIANCARDI, manager, safety services department, Allis-Chalmers Manufacturing co., Milwaukee, Wis.; H. W. HEINRICH, chairman, Uniform Boiler and Pressure Vessel Laws Society, Inc., New York, N. Y.; FRED H. KOBELY, manager, Safety & Casualty, Columbia-Geneva Steel div., U. S. Steel corp., San Francisco, Calif.

Term Ending 1959—FRED CLAIBORNE, safety assistant, Pan American Petroleum corp., Tulsa, Okla.; FRANK E. LADERER, associate director of safety, Nationwide Insurance, Columbus, Ohio; E. P. MARCONI, manager, Safety Branch Aro, Inc., Tullahoma, Tenn.

Term Ending 1960—GEORGE M. KINTZ, chief accident prevention & health div., U. S. Bureau of Mines, Region VI, Dallas, Tex.; CLYDE F. SCHLUETER, accident prevention manager, Employers Mutuals of Wausau, Wis.; VIRGIL L. WOMELDORFF, safety director, Illinois Power co., Decatur, Ill.

Regional Vice Presidents

Eastern Region—ARTHUR H. CHRISTIAN, corporate safety engineer, American Viscose corp., Philadelphia, Pa.

Northeast Region—WARREN J. PETERS, engineer, The Travelers Ins. co., Rochester, N. Y.

Southeast Region—P. W. LOGAN, division manager, Engineering department, Liberty Mutual Insurance co., Atlanta, Ga.

Central Region—JOHN F. JONES, safety supervisor, Commonwealth Edison co., Chicago, Ill.

East Central Region—MYRON L. MILLER, supervisor of safety, Westinghouse Electric corp., East Pittsburgh, Pa.

*ROBERT CLAIR resigned due to illness. He was replaced by DONALD G. VAUGHAN on Jan. 14, 1958. JOHN F. JONES, safety supervisor, Commonwealth Edison co., Chicago, Ill., was made second vice president.

West Central Region—HOLLEY P. BRADLEY, supervisor of safety, Service Pipe Line co., Tulsa, Okla.

Southwest Region—EDWIN B. LOCKE, manager engineering department, Texas Employers Insurance Assn., Dallas, Tex.

Western Region—S. KIRKLEN COLLINS, superintendent, accident Loss & Prev. Dept. Fireman's Fund Group, San Francisco, Calif.

Past Presidents: W. N. COX, JR., Professor of Safety and Industrial Engineering, School of Industrial Engineering, Georgia Institute of Technology, Atlanta, Ga.; EDWARD B. LANDRY, Benjamin Franklin Station, Washington, D. C.; HENRY B. DUFFUS, administrator, Accident Prevention, Westinghouse Electric corp., Pittsburgh, Pa.

Standing Committee Chairmen

Committee on Awards & Honors—PIERRE E. DERY, supervisor of safety, Dominion Rubber Co., Ltd., Montreal, Quebec, Canada

Committee on Chapters—OTTO C. HAIER, safety director, Standard Oil Co. of Ohio, Cleveland, Ohio

Committee on Cooperation with Engineering Colleges—FRANK E. LADERER, associate director of safety, Nationwide Insurance, Columbus, Ohio

Committee on Cooperation with Engineering Societies—JOHN V. GRIMALDI, consultant in safety services, General Electric co., New York, N. Y.

Committee on Finance—GEORGE F. NUERNBERGER, safety department, Kaiser Steel corp., Fontana, Calif.

Committee on General Publications—FRED H. KOBELY, manager of safety and casualty, Columbia-Geneva Steel div., U. S. Steel corp., San Francisco, Calif.

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Volume 15

GREEN CROSS FOR SAFETY®

LABOR SAFETY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

LABOR CONFERENCE

This volume is a record of the sessions held at the 1957 National Safety Congress by the Labor Conference. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Labor Conference carries on in behalf of its members, and for the benefit of accident prevention work in the labor force. This section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of labor.

The activities of this Conference are under the direction of its executive committee, the members of which are listed at the close of this volume.

ACCIDENT INVESTIGATION

by JOHN GRUDEN
director, health & safety dept., United Auto Workers, Dearborn, Mich.

I am a representative of Ford Local 600, UAW, the labor organization which represents all hourly-rated employees of the Ford Motor company's giant Rouge Plant. My specific duties are to handle problems and complaints relating to health and safety which arise in that plant.

Before speaking on "Accident Investigation," which is my subject today, I should like to familiarize you with the physical composition and operations of the Rouge Plant, the Union's functions in the plant, and our health and safety grievance procedure.

The Rouge Plant divided up into 18 units. Our total membership is in the neighborhood of 37,000. Approximately 250 full-time Union committeemen represent these people. Each of those 250 representatives is authorized to handle matters pertaining to health and safety, however, each of the 18 units has a health & safety director who deals almost exclusively with health and safety.

PLANT UNITS

The 18 units in the Rouge plant, the number of members in each, and their principal operations are as follows:

1. Dearborn assembly plant—3,030 members—assemble cars.
2. Dearborn engine plant—2,624 members—machine cylinder blocks and assemble motors.
3. Dearborn iron foundry—3,462 members—make cylinder blocks, etc.
4. Dearborn specialty foundry—687 members—make valves, tappets, crankshafts, etc.
5. Dearborn stamping plant—4,472 members—stamp car bodies and weld them together.
6. Ford central parts depot—610 members—store Ford parts and ship to dealers throughout the country.
7. Frame plant—3,437 members—make car and truck frames.
8. Glass plant—1,185 members—make windshields and door windows.
9. Mercury parts depot—283 members—store and ship out parts.
10. Maintenance & construction—5,486 members—do all maintenance work throughout the Rouge plant.
11. Miscellaneous unit—1,123 members—coke ovens, blast furnace and by-products.
12. Motor plant—398 members—work on government project.
13. Open hearth—734 members—make special steel.
14. Rolling mill—1,933 members—roll out sheet metal.
15. Standard transmission & radiator plant —1,647 members—assemble transmissions and radiators.
16. Steering gear plant—179 members—assemble steering wheels.
17. Tool & die—4,000 members—do all types of tool and die work.
18. Transportation—1,245 members—trucking, railroading and portable cranes.

This gives you an idea of the variety of safety problems that can and do arise, and each must be dealt with individually. The Union recognizes that health and safety are management's responsibility; also that plant managers should provide leadership. However, Unions should assume the responsibility of protecting their members and seeing to it that the policies set up by the company are carried out. Unions should also establish some safety policies of their own.

We know that industries are not in business to kill people, however, as the old adage goes—"An ounce of prevention is worth a pound of cure." It is for this reason that plant inspection is important.

INSPECTION TOURS

The Union makes tours of inspection throughout all units of the Rouge plant whenever it deems them necessary. The members are also urged to report any and all problems pertaining to health and safety,

as well as potential hazards. Listed below are the things we watch for and check during our inspection tours; housekeeping is at the top of the list because management can be judged by its housekeeping.

1. Under housekeeping we look for—
   a. Loose material and objects underfoot.
   b. Loose material and objects overhead.
   c. Pilling.
   d. Projecting nails.
   e. Disposal of scrap and waste.
   f. Tool housekeeping.
   g. Marked aisle lines.
   h. Window cleanliness.
   i. Painting.
   j. General cleanliness.
   k. Orderliness.
   l. Fire hazards.
2. Material handling.
3. Adequacy of aisle space and working space.
4. Guarding of transmission machinery.
5. Point of operation guards.
6. Maintenance.
7. Hands tools.
8. Ladders and portable steps.
9. Hand trucks, power trucks.
10. Floors, platforms, stairs and railings.
11. Lighting.
12. Cranes, hoists, derricks, and plant railways.
13. Electrical equipment (particularly extension cords).
14. Elevators.
15. Other personal protection equipment.
16. Dust, fumes, gases and vapors.
17. Pressure vessels.
18. Exits.
19. Yards, roofs and roadways.
20. Eye hazards.

Speaking of eye hazards, I would like to relate to you an interesting experience we witnessed when, some time ago, management wanted to institute a 100 per cent eye protection program. The Union leadership in this particular plant objected to a 100 per cent program; in their opinion it was sufficient to have the men on the jobs wearing goggles. Management, however, insisted that everyone who entered the plant should wear protective eyeglasses.

Management called in representatives of the Local Union and asked them to help put the program over. After reviewing the program the local Union representatives felt it was a good one and then attempted to convince the Unit leadership that this was being done for their own good.

EXPERIENCE BLINDNESS

In an effort to get their idea across, the company asked the Union leadership to cooperate in an experiment where they would experience just what a blind person goes through. Each person was given a "Let's Pretend Kit" which contained a blindfold, a toothbrush, tooth powder, suit material, braille reading material, cigarettes and matches.

Each person then went through a routine such as a blind person must go through daily. He first went into the bathroom to brush his teeth. Believe me, the tooth powder went in all directions—everywhere except on the toothbrush. After breakfast he would want a smoke; he would pull out a cigarette and try to light it—there were many burned noses. He then attempted to read his newspaper in braille and later, when getting ready to go out, had to select his suit by touch.

As a result of this experiment the Union leadership in this building supported the eye protection program 100 per cent.

I shall now get on with my subject, "Accident Investigation." The purpose of accident investigation is to discover the causative factors, the hazardous conditions and practices which brought the accident about so that proper action may be taken to prevent a recurrence.

FIND CORRECTIVE CAUSES

It is important to obtain complete information as to the causes—all the corrective causes that led to the accident, not just the major cause.

This point brings out the importance of eliminating the factor of fixing blame. If part of the purpose of the investigation is to fix blame or if the workers think that is the purpose, vital information will often be withheld or the facts distorted.

The use of even the milder term "fixing responsibility" is questionable unless it is made clear that the purpose is to find out whose performance should have been better and in what way so that he may be helped to improve and not again contribute to an accident.

When an accident occurs and someone is injured, the first concern should be for the injured individual. He should be placed in the proper hands for treatment. Usually his condition is such that immediate interrogation should be avoided so as to give the doctor or first aid man an opportunity to make him comfortable, treat him for shock and take care of the injury. It is a mistake to run the risk of upsetting the victim by pressing him with questions. It is much better to wait until he has had a chance to collect his thoughts and get his nerves under control.

In a complete accident investigation report—made by men who report honestly, impartially and frankly—the word "carelessness" should not be used because it has little or no meaning. In one of our plants the "who-when-where-how" idea is used on the accident report and it simplifies matters.

We have a health and safety agreement with the Ford Motor company which provides for the following procedure to be used to correct complaints:

In the first stage, the committeeman who may have a health and safety problem in his district tries to correct it by discussing the matter with the foreman. If the matter is not satisfactorily settled in this step of the procedure, he turns it over to his unit safety director who tries to correct it through zone labor relations and the company's safety man.

If he fails at his level, the grievance is appealed to the second stage in which the local Union tries to correct the problem with the central office of the Ford Motor company. If it cannot be rectified at this level it is appealed to the International Union who takes it up with the top brass of the Ford Motor company.

If the problem cannot be resolved in this stage of the procedure, the Union then gives the company a 12-day strike notice. I am happy to say that we have thus far never had to resort to this last step of the procedure. The Ford Motor company cooperates with us very nicely in matters pertaining to health and safety and our relationship is excellent.▲

THE UNION'S ROLE IN SAFETY

by AL E. BROWN

vice president, United Papermakers & Paperworkers, Portland, Ore.

The majority of workers know little about labor union activities prior to the early 30's. Truly there are some within the movement who took active part in the struggles during and since the turn of the Century. However, by and large what most people know about the early history of the labor movement they have read and of course people's impressions about the labor movement are impressions gleaned from the newspapers.

The good deeds are not reported principally because they are not news. The pride and loyalty to one trade union which existed in the heart of the members in the past have passed away. The member is now demanding that his trade union constantly seek means of giving him service to protect his welfare and improve his economic position.

In the early 30's, the labor movement with which we are familiar, was born. In a number of instances the organizing was on a voluntary basis. However, we must remember that in the major industries organizing was difficult and was extremely time-consuming and costly. The first fight of workers and their unions was to gain recognition from the employers. Once this was accomplished the struggle was to regain the wages which the employer had taken away during the recession when organization was at a minimum.

SOUGHT FRINGE BENEFITS

After this the regaining and the betterment of working conditions became a focal point for activity. Upon being partially or totally successful the demands of labor turned to the so-called fringe items. Recently, the fight to stay ahead of the rising cost-of-living has demanded the attention of the worker and his trade union.

We have passed over rather hurriedly the general bargaining history of the labor movement since its rebirth in the early 30's and of course a number of items which have been important have not been mentioned.

During this time most unions had little time or energy to devote to protecting the safety of the members. In all fairness, however, there have been some outstanding jobs done by the unions in some industries and in some segments of industry.

The best job by the unions has been done, as far as safety was concerned, in those industries deplorable with safety records. This was accomplished principally because safety was foremost in the mind of the worker. He saw his fellow worker injured and killed and as far as he was concerned protection of life and limb took precedence over other demands.

UNIONS WROTE SAFETY CODES

A number of unions have devoted a great deal of time and effort in formulating and promoting safety codes to reduce fatalities and lost-time injuries. Safety codes are extremely important and worthwhile, however, without proper policing the expedient employer and employee can enjoy a field day. Each effort, put forth by the union, regardless of size, is important in the overall effect of preventing injuries to the wage-earner.

Each International Union has an obligation to make known to its affiliated local union that the union has an obligation to represent its membership in the field of safety whenever it can effectively do so. The International Union has a responsibility of encouraging local unions to affiliate with the National Safety Council to promote a united front for labor in the field of safety, irrespective of International affiliation.

International Unions should encourage local unions to participate in plant, community and state sponsored safety programs. Each International Union should establish a department headed by a competent director to assist in promoting safety within its local unions. International Unions with training departments or educational departments should add to their curriculum a course to prepare the plant union safety committeeman to do his job.

USE PUBLICATION MEDIA

Publications such as newspapers, journals, magazines and bulletins can most effectively be used in promoting safety in the mind of the membership. Usually these organs find their way into the home of the member, where not only he, but others can read them. The International Unions should enthuse their local unions with a desire to promote adequate industrial compensation laws so that the injured member will receive adequate care and compensation.

Many employers had little time for accident prevention as long as the community and charitable organizations took care of his injured and maimed worker and the dependents of his fatalities. When industrial compensation laws were enacted and the employers had to assume an additional cost burden, the employer usually became interested in his accident frequency. It is true there have been and there are employers who have been genuinely interested in the safety and the welfare of their employees. However, it is regrettable that in the past there have not been more, because there would be fewer people working at a reduced income because of an injury and there would be fewer widows working to support their families because of a fatality.

EMPLOYERS' ATTITUDES CHANGED

Generally speaking the attitude of employers regarding safety has been changed. This change has come slowly in some instances and rather fast in others. Some employers have the attitude that safety is the problem of management and the carrying out of safety programs is a sole function of management. Others have taken a realistic approach and have felt that a program of accident prevention within a plant must have the support of both labor and management and have created joint labor and management safety programs, giving labor the opportunity to assist in determining what an effective program should contain.

Some of the top management people in the Pulp and Paper Industry of the West Coast have in recent years stated that the most valuable asset this industry has is the people who work in it. Another industrialist stated that safety was on the same level of importance as production. They must have meant what they said because these managements and their unions have established a joint safety program and in a period of the past 10 years have reduced the frequency figure for mills in Washington, Oregon and California, a total of 45 mills with approximately 20,000 workers, from an average in 1945 of 38.99 to 6.04 in 1956.

OCCUPATIONAL HEALTH CONTROL THROUGH ENGINEERING

by FLOYD A. VAN ATTA

industrial hygienist, United Auto Workers, Detroit, Mich.

The engineering part of the occupational health program is concerned with the control of those aspects of the work environment which may have an adverse effect upon the health of the workers in the area. The most obvious conditions are those concerned with the temperature, humidity, lighting and ventilation of the place of work.

One tends to think of these items as concerned with comfort rather than with health but it should be quite obvious that if the temperature is excessively high, or excessively low it can be rapidly fatal and this is indubitably an effect on health, although not a chronic one.

Somewhere between the normal room temperature and humidity at which we are comfortable and efficient, and the temperature and humidity at which we die rather abruptly, there is a limiting value at which men can work, probably not in comfort but without permanent harm. It is part of the business of the industrial hygienist to determine this point and to arrange the working conditions so that the limit is not exceeded.

Sometimes the control of heat and humidity problems is through ventilation and it is always the first idea, when a man is working on a hot job to turn a fan on him. It always helps some but on most hot jobs it is only a part, and often only a small part, of the total control which is needed. To control properly the man's thermal environment it is necessary to consider and often to control both the humidity and the temperature of the air which surrounds him and the sources of radiation which are within sight of his working position.

INDUSTRIAL POISONINGS

The major interest of the industrial hygienist in ventilation comes in the control of industrial poisonings. There are a few cases in which industrial diseases are contracted as the result of swallowing some material or as the result of contact of some materials with the intact skin. But they most commonly arise from the inhalation of dusts, vapors, mists, gases or some other form of material in the air. The reason for this is clear after a moment's thought.

Such materials as the phenolic compounds (carbolic acid, cresols, resorcinols and so forth) and the aromatic amines (aniline, toluidines and so on) are easily and rapidly absorbed through the skin but the undamaged skin is designed to protect the body from attack and is a complete barrier against the vast majority of materials.

Because people do not make it a custom to eat the things which they handle in industry, industrial diseases caused by ingestion are also uncommon. They can and do occur, people do eat occasionally with their hands contaminated with toxic materials and eat as much as is required to produce industrial

disease. I recall one plant where the employees of a heat-treating department had discovered that they could have nicely toasted sandwiches by floating them on a piece of steel on the lead pot. This is one of the better methods for developing chronic lead poisoning by ingestion of lead.

Since this sort of thing is rather unusual, the major problems in the engineering control of occupational disease have to do with preventing various kinds of dusts, vapors, gases, or mists from getting into the air in a place where men can breath them. There are a variety of methods available.

SUBSTITUTE MATERIALS

It is sometimes possible to substitute a less toxic material for the one which is being used and avoid the problem. A rather common example would be the substitution of a water emulsion paint for a lacquer made up with solvents. This solves the problem of control of solvent vapors with no further effort. It does not necessarily solve the whole control problem since the pigment may also be toxic.

Occasionally, it may be possible to avoid the hazard by putting it somewhere where people do not go in the normal course of work. It should not be overlooked that isolated operations almost always require supervision and maintenance and the people who do this work must be protected. An isolated operation which is a serious source of air contamination is very apt to become a neighborhood nuisance.

A more generally applicable device is the enclosure of the process. This is most readily seen in the chemical industry where many processes are carried out in a completely closed system from the raw materials' tanks at one end of the packaged product at the other. When thoroughly carried out enclosure of the process unquestionably provides the most complete and most fool-proof protection for the workmen.

The type of control which is most common is removal of the contaminant, either from the general atmosphere by ventilation or at the source by local exhaust ventilation or by other means, such as wet operations which will prevent contamination from being dispersed into the atmosphere.

The industrial hygienist will generally consider protective equipment to be pretty far down the line as a primary method for controlling a hazard. It is useful as a primary means when the hazard is of short duration or occurs infrequently. The main use of personal protective equipment is as a second line of defense after the hazard is pretty well controlled by engineering means.

The main problem, in a great many instances is to recognize the exact nature and extent of the hazard. When this has been done, the appropriate means of control are apt to be fairly obvious. The fact that the particular condition has never been controlled by a particular procedure which looks correct is not an adequate reason for deciding that it never can be.▲

SAFETY—A MORAL RESPONSIBILITY

by DR. CAMERON P. HALL

executive director, National Council of the Churches of Christ in the U. S. A., New York city

Like the two bit coin in your pocket, safety has two sides. One side deals with what we do when safety fails; the other side concerns what we do to promote safety. Specifically, we are to dig beneath the program and method, beneath the device and technique to the moral basis for why we should do even more than we are in pushing our safety record higher and higher. At this safeguard-end of the safety problem religion has a place as significant as at the breakdown-end. A concern for safety measures is fed by a lively sensitivity to the welfare of the individual that is at the heart of the religious life of this nation. Judaism and Christianity are together in affirming this living truth: the individual is of worth because he is of worth to God. What we as a people do to express in practical terms the worth and dignity of the individual is a moral responsibility upon each of us as an individual and together in groups.

We are intimately involved in all the concerns and interests of organized labor. Safety is one of these, but it is not isolated from other issues which are also moral responsibilities. So before I plunge into the moral responsibility, I want to stress that safety is part and parcel of other labor programs which are also shot through with moral responsibility.

For instance, safeguards against unemployment are an accepted moral responsibility. We have the Full Employment Act of 1946, which makes the avoidance of unemployment a public policy. That a man should lose an opportunity to work is a moral issue; that industry, labor and the public have an obligation in putting a floor beneath the chance to be employed is a moral responsibility. When technological advances, such as automation, are introduced which threaten the availability of jobs, counter measures are promoted by labor, and receive a good hearing among us. Why? Because dealing with threats to unemployment is accepted as a moral responsibility in our American way of life.

UNEMPLOYMENT—A MORAL ISSUE

But whence come major threats to a man willing to work being unable to work? Cyclical, technological, and other causes, to be sure, stand out. But men are [illegible] too often—out of a job because [illegible] been hurt or maimed or disabled as well as fired because of some overall economic or technical squeeze. Loss of job [illegible] is due in large part to failure in safeguards against accidents. Safety is a moral responsibility because assuring the opportunity for employment is a moral responsibility.

Again, ethical practices by both labor and management are recognized as a moral responsibility of both. This phrase—"ethical practices"—has taken on specific reference to the right of the individual union member to protection against the misuse of union and welfare funds. But certainly he is equally entitled to protection from unnecessary accidents—through education and training, on the one hand, and through physical safeguards on the other hand. Blindness by a union toward, or tolerance by an employer of, any carelessness in safety measures is an unethical practice toward union members and other workers—it is a failure in moral responsibility.

SAFETY PROMOTES FREEDOM

And thirdly, American labor is out in front in helping bring the strength of the United States into the free world. A sense of moral responsibility for safety is at the heart of what the free world stands for—the worth and dignity of the individual. Many tests that we Americans have to meet before world opinion have to do with safety—tests that we are far from passing with the grade that we can always be proud of. Last fall, we had to expose to the world the hazard to their safety of nine Negro children in going to an Arkansas school. That kind of hazard to safety is a failure in our moral responsibility toward the worth of a child.

But turn to another aspect of our national life. Our march to ever greater abundance, ever greater productivity, ever greater technological prowess is impressive, even breath-taking. But we should be equally concerned with the pace we are setting in on-the-job, occupational safety. And beyond this we now stand on the threshold of the nuclear energy industry, with its reactors and isotopes, its fissionable fuels and their radio-active wastes. The hazards of radiation in this new industry give to moral responsibility for safety a new dimension and urgency.

Let me just mention three characteristics of the potential harm there is in radiation: 1. when you are hurt by over-exposure, you do not know it at the time and so start caring for it; you learn of it—later; 2. the harmful effects are not transitory; instead, they add up—accumulatively; 3. radiation can reach into the human reproductive system and hence blight later generations. While these dangers are near the surface in the use of radio-active materials, they can be kept under control by vigilence. Certainly safeguards against these risks should have top priority in a safety program.

When a stranger, say from the relatively underdeveloped countries in Asia and Africa, or from behind the Iron Curtain, should ask of us, "In your impressive rush toward mounting economic prosperity, and now into

the age of nuclear energy for industry, how expendable is the individual—his fingers, his limbs, his lungs, his very life?" That is a fair question in the light of what we profess as a free world. We had better make sure that the answer we can give at any time will also sound impressive.

These past few moments we have been seeing that safety does not stand off by itself as a moral responsibility; rather it stands inside many of today's moral issues. I want now to point out that by itself the preservation of safety is one of these great moral issues.

ACCIDENTS ROB INDIVIDUAL

For one thing, accidents hurt the individual. They rob him of his God-given life, or his God-given right to full growth as a person through health of body. "Thou shalt not kill" is the moral basis for any decent society; and a man may be killed not only by a gangster's bullet but through blindness or carelessness by others, including ourselves as citizens, to safety protection.

"Thou shalt not kill" means that directly or indirectly we are not to kill another's chance for personal development because he has been made a cripple or invalid through an accident. Of course we know of maimed or chronically ill persons whose spiritual poise and courage and cheerfulness put to shame many who carry no such handicaps. Resources for living are not, indeed, tied to hands or feet or even eyes. But the truth is that God has made men with capacities of the body for the protection of which the community as well as each person is morally responsible.

The promotion of safety is a moral issue, in the second place, because of the family. The family is, in a way, a spiritual and social body; and what happens to any of its members affects all of them. The price paid for accidents is paid by the family—often a high price. I am not thinking here only of the drain upon the family budget, although that can be important. A child and a wife and a mother are as much a victim of any accident as the husband and father himself; and with 22 million women now constituting 33 per cent of our labor force, the immediate victim may be a wife and mother. The drain upon the family at the time of the emergency, or throughout the convalescence, and in some cases extending on into an indefinite invalidism makes safety a moral responsibility.

Again, safety is just that because an accident weakens or deprives society of its greatest economic asset, the productive worker. We live in a God-given world of vast and still unimaginable natural resources; but what good are they for meeting human need apart from the work of men! An injured worker is a double drain upon our economic health. For one thing, a worker hurt becomes less of a worker or even a non-worker. His productive capacity, in part or in full, for long or for short, is lost to the work force. For another thing, a worker hurt becomes one upon whom the product of other workers has to be spent.

The resources of society have to go not to building on his strength but in salvaging his weakness. To be sure, God's world is richly endowed with the resources for healing; and we can take much pride in the doctors and nurses, in the hospitals and medicines which are a sign of our technical skills and our humanitarian ideals.

But at best these simply make up for men being hurt through ignorance, carelessness, inhumaneness, or man's other frailties as a human being. If we could cut, say in half, what we as Americans spend for the doctors, the buildings, the medicines and the other costs for healing those hurt through accidents, what riches we would have for schools and teachers, for housing and recreational programs,—yes, for the healing needs in underdeloped countries! Because of the costs of accidents to a nation's economy, their prevention is a moral responsibility.

Of course it is said that the prevention of accidents also costs, and perhaps we cannot afford this item of expense. I am reminded in this connection of the oft repeated assertion that slum clearance, for example, is so costly that we cannot afford it.

But the truth is that slum areas cost too much to be tolerated. With their overcrowded dwellings, their over-crowded classrooms, their pitiful recreational opportunities, these areas lead to economically wasteful costs—such as added police to enforce laws, added medical facilities to deal with the above-the-average sickness, added court programs to deal with broken homes and juvenile delinquency. Society saves money by spending it on neighborhood rehabilitation. The same principle works in regard to the prevention of accidents.

We have been counting up the human costs of accidents—the cost to the person, to his family, and to us, his neighbors and fellow citizens. To come at this thought from another angle, progress in accident prevention is important for the conservation of our human resources. In our best moments, we know that "this nation's greatest resource is its people, and that what we do on behalf of our human resources is the test and promise of a democracy."

CONSERVE HUMAN RESOURCES

What does it mean for a people like we Americans to take seriously our human resources? I suggest it means at least these four things. First, it means opportunity for the fullest development of each individual through education. Any society that proclaims to the world its worth of the individual owes each individual an adequate opportunity to develop his capacities—and by doing this for him we enhance our own human resources. Provision for free education, now all the way into the university, is our way of enhancing our human resources through helping each individual to become as much of a person as he can.

A second is provision for freedom of religion. Where men place their highest loyalty, and where they look for their deepest strength for the living of life, is a personal thing for each man. His choice must be a free one, uncoerced and unintimidated. The provision for freedom of religion in our Constitution, and the strengthening of our religious institutions—churches and synagogues—through voluntary action by our people enhance our human resources.

A third element is the employment of people according to their own choosing. Free labor we believe offers a better chance for men to give of their best in their work than a regimented or unduly restricted labor force. Not only full employment but freedom in the choice of employment is a means in the best use of our human resources.

Through our educational and religious institutions we work for the development of our human resources; through a free labor market we seek the best employment of our human resources; and through the safety program which this Congress represents we seek the fourth major pillar in a national policy on human resources—namely, their conservation.

Not only is a safety program a moral responsibility, but in its meeting the challenge from hazards to life and limb, this program shows a high level of moral responsibility. It stands for a maturing of our long efforts to deal with the threat in accidents. When we look at the road we have come, I see this safety program as being the third stage.

The symbol of the first step is the hospital. It was not so long ago in the story of mankind, that when men were injured, they were left to die, or to turn beggars, or to be cared for out of the meagre resources of their family or neighbors. But some centuries ago, elements in the community took compassion on those hurt or otherwise ill, and hospitals were started. Later on the social conscience of our communities did not leave this only to private channels of compassion; the provision of free medical care became a moral responsibility of citizens working through their levels of government. However, this kind of concern did not focus on the cause of accidents but rather on doing something for the victims of accidents.

The second step has its symbol in workmen's compensation laws. This was truly a large step ahead. These laws make at least part of the cost of industrial accidents a charge on the employer in whose work place the accident occurred; this, among other things, puts a premium on safety measures. These laws also set up a careful and orderly procedure for assuring that the injured worker does receive the care which he not only needs but to which he is entitled in the name of justice.

LAWS RELIEVE HARDSHIPS

These laws also recognize a most important fact about accidents: a disability means loss of work, and loss of work means loss of income—with all that that means to the worker, his family, and the economy. Hence these laws provide for not only taking the cost of accidents from off the person, but in at least some small measure they take off the economic hardship from the loss of income.

This is sheer gain, but these laws still focus on doing something for the man who has met with an accident, rather than on driving full steam into eliminating causes for accidents. When a ship is sinking, then the whole weight of responsibility rests on manning the life boats and getting the passengers and crew off the vessel. When an auto has gone hurtling off a thruway then the weight of moral responsibility is to rush medical care.

But neither life boats nor ambulances are the full measure of moral responsibility that rests upon us today when ships still sail the high seas and cars ride the highways. Our moral sense has grown up beyond that level of moral satisfaction. In its modern concept moral responsibility stresses preventing the worst from happening on the oceans and on our roads rather than being content with picking up the pieces after the worst has happened.

Total security is a goal that is beyond our reach, but great progress can be made when men of competence and good will and devotion join together to help each other in every way possible to promote safety measures against accident hazards. The symbol of this step is, I suppose, the National Safety Congress itself. It stands for moral responsibility toward these hazards at its best, for our deepest responsibility toward the victim of accidents is to see to it that all is done to keep him from becoming a victim. And that is a worthy cause for all of us, wherever we are—in labor and in management, in education and in government.

LABOR'S STAKE IN SAFETY

by A. J. HAYES

international president, International Association of Machinists; vice president, AFL-CIO, Washington, D. C.

I don't intend to stay within the limits of this title because I am certain little new information could be said about "Labor's *Stake* in Safety. It is obvious that no one could have a greater stake in industrial safety than the men and women who are the direct victims of industrial accidents.

To an employer — matters of industrial safety, occupational disease, accident prevention and workmen's compensation—are all tied up with economic considerations. They are important insofar as they affect—and can be made to reduce—insurance costs, training costs, and material costs. But these are all money costs—cash costs—costs that are measured in dollars and cents.

To a worker, on the other hand, an industrial accident is a matter of something that is even more tangible than money. It is a matter of a man's blood, bones and sinew—of tragedy, suffering and sorrow. And sometimes, in fact, more than 50 times a day—on every working day—it is a matter of life itself to someone, somewhere, in this country.

That is why I say that labor's stake in safety is pretty obvious. Therefore I will touch upon aspects of the subject that are not often discussed—aspects that are somewhat controversial. Perhaps they are not discussed because they are controversial.

ETHICS IN SAFETY

Since my views and public statements on the "corruption in unions" issue have been as frank and honest as I can make them, I see no reason to be any less candid in stating my views about matters of industrial safety. I assure you, however, that I am not injecting controversy for its own sake, but because these are matters that concern the men and women who run the daily risk of being injured, diseased or killed on their jobs.

Safety—and accident prevention—have an ethical as well as an economic side. I think none of us—whether we represent labor or management—would disagree with certain basic ethical principles in the field of industrial safety. We would all agree, for example, that the objective of industrial safety should be the preservation of human life and the protection of human health. We would further agree that an employer has a moral responsibility to protect his workers against disease, accidents, mental stress and infections from the conditions of employment.

We all profess to agree that human life is not cheap; that man is not something to be sacrificed to a machine. And yet, these ethical principles are not always applied in day to day life nor are they self-enforcing. In practical application they come into conflict with individual economic interests, and thus must be enforced either through group action, or by society as a whole through political action.

As a rule, society does not move as fast as the need would indicate. We all know, for example, that the first industrial revolution had run its course for more than 100 years before society got around to adopting and enforcing rules and regulations of industrial safety. For more than 100 years industrial workers were given no legal protection against the risks and hazards of industrial employment.

Here and there, a lone individual employer might attempt to provide decent and healthful working conditions for his workers. But on the whole, the story of factory employment in the 19th century—and through the early 20th century—was a pretty ghastly one.

I don't need to go into the details that are indicative of the cold indifference with which human life was held in American mines and factories. Suffice to say, it did not seem to matter how many men, women and children were killed or crippled in the course of a day. There were always more waiting at the gates the next morning—driven by raw poverty to plead for a chance to jeopardize their lives and limbs.

SOCIETY BROUGHT CHANGES

The point I am getting at, of course, is that change—when it came—was not the result of any regeneration of moral and ethical conviction on the part of employers. It came rather because society as a whole was thoroughly revolted. It came because the American people were finally shocked enough to correct a condition that had prevailed—and grown worse—for 100 years.

So we finally got factory laws—and workmen's compensation—and an organized effort to make mines, factories and mills safer places to work. But of all the legislation aimed at this objective, workmen's compensation was the key. For until employers were made directly and financially responsible for the results of workers' accidents, they had no economic reason to prevent accidents. The whole pattern and fabric of our industrial safety program throughout the nation rests entirely on how good and how effective our workmen's compensation and our occupational disease laws are.

ECONOMIC REASONS

Oh, of course, you can point to many other good economic rationalizations for industrial safety. You can say industrial accidents add all kinds of direct and indirect costs to production. You can point to the cost of hiring and training a new employee, of equipment damaged in a work accident, of the time lost by other employees when an accident occurs.

But I will throw them all right back to you and say that these considerations were present long before we had industrial accident programs—and that it wasn't until accident prevention was reinforced with workmen's compensation and occupational disease legislation that employers really became safety conscious.

So it seems that the thing that counts here is how good our workmen's compensation and occupational disease legislation really are.

And that's a good question! I've spent my whole adult life in the labor movement. As a matter of fact, I was projected into it by the very thing we are talking about here today—an industrial accident. I went to work at 17 years of age because my father was totally disabled by a work injury—an injury that eventually killed him.

In the course of many years of studying and dealing with the problems of my union —which are, of course, the problems of the members of my union, I realized that our present system of workmen's compensation and occupational disease legislation is completely and wholly inadequate to meet the needs of our complex industrial society.

I am not alone in that conclusion. There are, in fact, many men in the labor movement today who feel even more strongly

than I do—men who are firmly convinced that workmen's compensation has been a gigantic swindle on the American worker.

This nation has tried to deal with a national problem by having 48 seperate, conflicting — and in a sense — competing state statutes. And there is no doubt but that workmen's compensation is one kind of labor legislation that states use to compete with one another to attract industry.

In fact, whenever we go into the state legislatures to get improvement or expansion of existing laws, we invariably meet employer counter-arguments to the effect that any further improvement in coverage or benefit structure will shove industry into the waiting and sympathetic arms of states which are more concerned with payrolls—than with the people on those payrolls.

SAFETY INTEREST LACKING

Certainly the health and safety of the nation's work force should not be a pawn in any state's bid for new industry. But that is just what it is under a system that allows Mississippi or Arkansas or Georgia to compete for industry by offering low workmen's compensation benefits and a minimum of safety regulation at the plant level. Why should an employer pay $40 a week for a temporary total disability in Illinois—when he can go to Arkansas and pay $25 a week for the same injury?

The situation in workmen's compensation legislation is so bad, in fact, that the Secretary of Labor, Mr. Mitchell, although speaking for an administration that normally follows a hands-off policy in state legislation, has been constrained to speak out and to plead with the states to bring their laws into line with modern conditions.

But because employers can play off one state against another in this matter, the results have been somewhat negligible. There is no indication that the remedy will ever catch up with the need, until there is broader recognition that industrial accidents are a national problem—one that is truly solvable only on the national level.

The lack of a strong and equitable workmen's compensation system leads to a corresponding lack of interest in enforcement of safety codes and regulations. In many states the Bureau of Factory Inspection—by whatever name it goes under—is little more than a sop to the conscience of the state legislature. In fact, the inspection service in such states is not only understaffed, but the staff is underpaid, untrained and technically unqualified to do a competent job in a field that needs a high degree of competency.

But as bad as the situation in workmen's compensation and factory inspection may be, the situation in occupational disease coverage verges on the criminal. And this is a matter of more than just poor legislation. It is incredible to think that in the second half of the 20th century 20 states still either have no coverage or limited coverage of occupational disease.

But the greater problem is that there is too little understanding of the nature and complexity of occupational disease. The range and source of occupational disease in modern industry is practically limitless. None of the ways by which man makes a living is completely free of some hazard to physical or mental health. The risk of occupational disease grows greater every day as industrial processes become more and more dependent upon and saturated with toxic dusts, fumes, vapors, gases, acids and alkalies.

Every day thousands of workers are exposed to everything from arsenic to mercury poisoning, from benzine compounds to magnesium poisoning, from sulphuric acid to chromium poisoning. Thousands have no physical or legal protection whatsoever against the chemicals and poisons that are slowly killing them.

UNAWARE OF RISKS

In fact, many are not even aware of the risk. They will find out when it is too late. In many states they will also find out that they have no right to compensation under the occupational disease law. I wonder how you tell a man who has contracted carbon tetrachloride poisoning, for example, that he isn't entitled to benefits under the occupational disease law because the legislature of his state hasn't seen fit to recognize that carbon tetrachloride poisoning is an occupational disease?

I recently read a statement to the effect that "the scope of occupational disease is vast almost beyond calculation" and "it comes, in fact, unpleasantly close to being the major public health problem of our time."

If that is so—and I for one am inclined to believe it—it is tragic commentary on our time—on the ethics of a business community that has done so little about it. It is even more tragic in view of the fact that we are now entering a new phase in our industrial development—a phase of such sweeping change that some commentators have referred to it as a new industrial revolution. Think of that—we are entering a new industrial revolution without ever having fully solved the problems that attended the old one.

I wonder if it will again take us 100 years to make even a decent start on the health and safety problems that will arise out of automation and atomic energy. These problems are not a part of a distant tomorrow but are already a part of the world today. Now more than 1,500 industrial plants are using atomic materials in one form or another—in 1,500 establishments American workers are already exposed to the hazards of atomic radiation.

Can we say the state laws in existence today—indeed can we say that any system of state inspection and compensation — are adequate to care for the workers who will get leukemia or bone cancer because of exposure to atomic radiation?

DON'T KNOW PROTECTIONS

Personally, I feel somewhat discouraged about the prospects. How can the states protect and care for victims of industrial radiation when they haven't yet learned to protect and care for victims of occupational diseases that have been prevalent for generations? We need only look at silicosis and pneumoconiosis to see the failure. And failure to provide adequate treatment and compensation for these dreadful dust diseases is paralleled by the failure of industry to finance programs of research that would lead to their prevention at the source of exposure.

Related to the problems of occupational disease and radiation is another matter that has received almost no attention in industry, or in government. That is the matter of mental disease. We already know enough about automation to know that it will throw workers into a lonely and eerie world inhabited by monster mechanical devices.

We also know that our mental hospitals are already crowded with people who have broken down under the stress of life in a complicated, impersonal and highly industrialized society. But we don't know how much more stress people can take, or what effect automation will have on a worker's nervous system. At what point does the human mind crack up from sheer loneliness, lack of contact with fellow workers, from uninterrupted repetition and brainwashing boredom?

I am not just tossing questions out at random here. All of the things I am talking about—from workmen's compensation and occupational disease to radiation and mental distress—have a valid relation to industrial health and safety—and are proper subjects of labor interest.

LOOK FOR DANGERS

For safety is a broad term. It is defined as: (1) the state or condition of being safe; (2) freedom from danger or risk; and (3) freedom from injury.

Safety means freedom from any kind of danger, risk or injury. When we apply that definition to industrial conditions we must think in terms of hidden dangers as well. We must change our attitude toward occupational diseases—go out looking for them instead of trying to pretend they don't exist, or implying if they do exist, that they have no relation to industrial causes.

I am not exaggerating when I say that industry has taken a "head-in-the-sand" attitude up to now. It has tried to cover up occupational diseases rather than to isolate, prevent and care for them.

There has been *little research*—either governmental or private—in the field. The Public Health Service spends less than one cent for each worker each year on the prevention of occupational diseases. The National Institute of Health, which has made hundreds of research grants during the past three or four years, has made less than half a dozen in the field of occupational health. There is an iron curtain of secrecy around this whole subject.

Not only does industry fail to support and subsidize research in occupational diseases, itself, but men who have tried to do independent research find that it is virtually impossible to get facts, information, or cooperation from the people in industry who are in a position to help. Worse still, if a

research project does tend to show a correlation between employment and disease, the authors find it is almost impossible to get their work published or distributed.

The result is a deplorable lack of information about occupational disease. We are years behind other countries in this respect. One expert in this field said that research in pneumoconiosis in this country is 25 years behind that of Great Britain.

SECRETS PREVAIL IN INDUSTRY

Industry actively opposes objective research and free interchange of information on occupational diseases because it is more afraid of the possibility of paying compensation benefits than it is that workers will die from lack of proper information and adequate precaution.

Here are specific examples that will illustrate this point. There is some medical evidence that the chemicals used in the dye industry and in the manufacture of synthetic rubber cause or contribute to cancer of the bladder. In fact, one of these—amine—is so dangerous that it has been outlawed for all industrial uses in Britain since 1951. But efforts to prove, publicize and restrict the dangers of this deadly acid have hit stubborn resistance in this country. The large chemical companies have refused to find out if amine does contribute to cancer of the bladder and have strongly resisted independent research into this problem.

Much the same situation holds true in the asbestos industry. There appears to be decided after-effects on workers who produce asbestos in that there is a marked correlation between asbestos employment and lung cancer. Here again, the industry has been traditionally reluctant to cooperate in a full scale scientific study of this curious correlation. This reluctance to do research in health hazards recurs in industry after industry.

DOCTORS OFTEN BIASED

But even worse when workers do succumb to cancer of the bladder or the lung, or to some other equally horrible diseases, we are treated to the spectacle of company doctors who testify that the disease couldn't possibly have been caused by their employment. Doctors are supposed to be above reproach in our society. But as a labor official I have known of too many cases in which company doctors have testified against workers and for management in occupational disease cases even though they knew their testimony was biased.

It should not surprise us that doctors can be unobjective in these cases where their testimony is bought and paid for. We have only to look at the wide-spread difference of opinion among doctors as to the effect of cigarette smoking to see that their testimony can sometimes be something less than truthful. Most doctors who are not in the pay of cigarette companies are convinced by all the scientific evidence on record that cigarettes undoubtedly contribute to lung cancer. But the doctors on the payrolls of the tobacco companies either deny that cigarettes contribute to lung cancer, or at best maintain that there is not yet enough proof.

As we contemplate these conflicting views among professional men—and as we thoughtfully study the reluctance of industry to be honest about this matter of occupational disease—we cannot help but wonder whether the lust for profits has made many men forget the real purpose of life. What is the real purpose of life? Is it production and profit—or the well-being of the individual? If there is conflict between the two, do we sacrifice production and profit or the well-being of the individual?

The ethical answer is obvious. But the practical methods of reaching the logical ethical conclusion are more difficult.

FEDERAL ACTS NEEDED

We could make a start by enacting comprehensive federal workmen's compensation and occupational disease legislation to take the place of the chaos that results from having 48 different state systems. But I have no hopes for such a constructive approach in the foreseeable future. I am afraid the insurance lobby, and the employer groups that profit from weak administration are too strong for us at this time. So we'll just have to make that one of our long range objectives.

But there are some things we can do right now. We can try to have programs set up in the National Institute of Health and in the Public Health Service which would recognize the importance of occupational disease—and which would put the research effort in this nation on a par with that of other civilized industrial nations.

If we cannot get decent factory inspection from the state goverment, then we in the labor movement must resort to self-help. Many unions are thinking in terms of collective bargaining clauses which would require the employer to adopt the safety standards set by the American Standards Association as the minimum acceptable in the shop.

LABOR FIGHTS FOR SELF

We are also prepared to bargain for more supplemental injury benefits when the compensation provided by state laws is not adequate to sustain a worker and his family. Although our efforts will directly benefit only the 17 million organized workers, perhaps they will release new pressures that will eventually result in improved legislation benefiting all workers.

The American labor movement has but one purpose—one reason for existence in American life—to serve and protect American workers. There are times when we make ourselves pretty unpopular because we keep looking for the things that are wrong with American industry and American society.

I may have offended industry men with this indictment of the ethics and morals of our business community. But I would be derelict in my duty and false to my trust as an elected officer of one of America's greatest unions if I did not say frankly and candidly that we in the labor movement are not satisfied with present legislation relating to industrial health and safety, workmen's compensation and occupational diseases.

In a sense this is a great challenge to the National Safety Council—a challenge that can be met only if all facts are squarely faced. If we in the labor movement could count on your assistance in the fight for better legislation and more research on both the state and federal levels we might, together, make this a far happier, healthier and safer nation in which to live and work. ▲

GOOD COMMUNICATIONS HELP SAFETY

by GEORGE SCRIVEN

public relations director, United Rubber, Cork, Linoleum & Plastic Workers of America, AFL-CIO, Akron, Ohio

Our organization has been safety minded for many years. The record on that score speaks for itself in a loud and clear manner. The results of our efforts, in cooperation with enlightened managements, tell the story of how we have seen the number of accidents reduced in the plants in which our members work. I shall not go into specific figures on frequency rates and such.

I don't suppose any of you would dispute the flat statement that good communications help safety. But I'd like to try and give you some of the techniques, the how and the why of that statement.

First, let's do a little word analyzing. I certainly don't want to sound like the pontifical professor lecturing his class on semantics. But when we say *good* in our topic, "Good Communications Help Safety," we immediately infer that there is another kind besides good. And there certainly is. I think there is a lot of bad and fuzzy communications going on in all fields.

Within the subject matter at hand, I would say the word *good* means that type which gets some concrete reaction and results. In the United Rubber Workers, we think our communications have been *good* because we have the results to show for it.

MUST HAVE RECEIVER

Now for the word *communications* in the phrase. You can't have communications—the *good* type that is—unless someone is sending the message and someone is receiving it. I was in the Air Force in World War II, and I served as a radio operator in the Pacific aboard a B-29 Superfortress. When I sent a message and no one received it, I didn't have communications. I was

just talking to myself, and that wasn't enlightening and certainly was of no practical value.

You've got to get through or you aren't communicating. Even with good communications—yes the best—you must remember that the transmission of ideas and advice is just a part of helping to promote safety.

You can't have good safety unless you have safe conditions—no matter how good your communication system is. So that's why we must keep in mind that good communications is an aid to safety and just doesn't bring about safety automatically if proper safeguards are not taken in the first place.

Good communications then basically gets the word out to encourage us all to do what we should do. Remember, the word has to be heard to have a chance of doing any good.

What are some of the ways of getting that word out—and in a manner that there is a good chance that it will be listened to? I'll try to outline some of the ways that the United Rubber Workers has found to be most effective.

Our union is considered as one of the labor unions which pioneered well-established safety programs, and I believe some of our communication techniques have been big help mates in our efforts. So, I'd like to talk a little bit about: mass communications, individual and/or selected group communications, the checklist technique, accident follow-up communications, union classes and institutes.

MASS COMMUNICATION

First, considering the broad subject of mass communications as it applies to safety, I think it might be proper to point out you can't expect anyone to do something or not do something unless you clearly and concisely tell him what to do or not to do.

By that I mean that clear and proper direction is the responsibility of the sender—you as the safety man—in this business of communication. You've all no doubt heard that one of the biggest complaints that employees have about bosses is that instructions are not clearly given.

I think it's that way in using communication tools in safety work. The message must be clear, complete and there must be a reason for it. Anything short of that isn't going to get through and is a waste of time.

The pamphlets, booklets, posters and newspaper stories that we use in our safety work in the United Rubber Workers must meet the test of completeness, clarity and, most important of all, carry the reason, either directly or implied, for doing or not doing something to promote safety. I'm afraid there are times when we all write or draft messages that are clear to us, but are vague in mass appeal.

In some recent issues of the *United Rubber Worker*, the official monthly publication of our union, featured in a prominent spot, and boxed so that it can be easily cut out, is a list of "dos" for workers when filing injury compensation claims. This is a mass communication effort in helping safety.

PRAISE HIGH RECORDS

Another recent issue of our paper carried a story concerning the setting of a new safety record by one of our local unions in the East. It pointed up the tremendous record, comments by company and union officials, and named the committee members and the work they did in helping bring about this record.

Our *United Rubber Worker* is probably our most effective mass communication sprung board for getting across our safety message. Your union or company paper can do the same.

I think posters are effective too. I particularly like the "right way" and the "wrong way" illustrations on safety posters and literature. Another effective technique is to mix in a few household hints with a safety message so that you'll appeal to a wider audience—the whole family, we hope. Often overlooked is the fact that posters can be placed in places besides the company bulletin board or in the union hall. I'm thinking particularly that posters in a coffee stand or restaurant near a plant can be effective.

Remember, basically we're selling safety and one of the tools of selling is a program of constant and consistent reminding. That brings us to our second point—that of individual and/or selected group communications.

Here, for the most part, I want to deal with the safety committee in a plant. In the rubber industry, we have a number of joint labor-management safety committees.

Many of our committees made up of union representatives hold regular meetings with management representatives for the purpose of discussing safety problems that arise within the plant. Our policy is that our safety committees should be authorized either on a joint basis with management or on their own to make safety inspection trips throughout the plant. A good exchange of information between union and management goes a long way towards helping promote safety. That's good communications.

INDIVIDUAL, LIMITED MESSAGES

We have also found it advantageous to have minutes kept of safety committee meetings. Copies of these minutes can be provided to members of the committee and the business of handling safety problems can be expedited. That's another example of good communications.

Perhaps one of the most important jobs of the safety committee should be to help promote an educational program on a joint basis with management to point up the importance of the safety program.

Everyone likes recognition for a job well done. That's why a good awards system of some type can be developed on a joint labor-management basis or a local union level to give recognition to the department or division of the plant with the fewest accidents.

I know this is a familiar technique to many of you, but I want to point out that it is an effective communications technique too because the word is passed through departments, thus stimulating others to reach this award goal.

In another phase of selected group communications, I believe it is important that the safety committee members become acquainted with the state division of safety regulations or codes and the division of the state labor department which has the authority of enforcement of safety regulations or codes to find out how these state agencies can help their local union further their safety program.

The checklist technique—the third point in this discussion—dovetails to a great extent with the work of the safety committee. A good safety inspection guide should be given to the local union safety committee to make sure that certain items are looked into at each inspection made by the safety committee.

I like to compare this with the checklist that an airplane pilot uses before take off. He doesn't take a chance on remembering everything that should be checked. He and his co-pilot take checklist in hand and go down a list of dozens of items to make sure that all is right before take off.

A safety committee should follow a complete checklist. This, too, is a form of good communications helping safety. Such a check list—which guards against memory lapses, oversights and provides a complete record—should include such points as housekeeping, material handling methods, adequacy of space, points of operation, guards, maintenance, hand tools, floors, platforms, stairs, railings, cranes, hoists, elevators and railways. Other points should include electrical equipment, eye protection, other personal protection equipment, dust, fumes, gases, vapors and mists, pressure vessels, other explosive hazards, oiling methods, chains, cables, exits, yards, roofs, roadways and any other items peculiar to a particular operation.

ACCIDENT FOLLOW-UP

I have listed accident follow-up communications as a fourth point because I believe that we can learn from mistakes. But I believe we can only learn from those mistakes if we discuss them and—in short communicate.

The purpose of accident investigation is to discover hazardous conditions and practices so that further accidents from similar causes can be prevented. We attempt to tell —communicate, if you will—our members in safety work how to investigate accidents thoroughly to find how and why the accident happened and how and why it could have been prevented and can be prevented in the future.

Often, in investigating an accident you will find an allied hazardous condition that will enable safeguards to be taken before it is too late. We flatly say, as a part of good communications in safety, that the safety committee should completely investigate every accident and follow up the investigation with action. Keeping the lines of

communication open between union and management makes this follow-up possible.

As a further part of getting the word out —or communicating with our safety committeemen, we conduct classes and clinics, which is the fifth and final point of this discussion. At our compensation and safety clinics some time is spent in off-the-job safety, such as on the highway, in traffic, and in the home.

The International Union has a library of safety films used by local union safety committees as well as at our clinics. We try to bring in outside speakers such as safety division department heads and state factory division inspectors to give our safety committeemen a better understanding of how best to do their jobs.

Our committeemen — and this is again showing the value of communications—attend city and state safety conferences as well as the President's Conference on Occupational Diseases and the National Safety Congress. Incidentally, a good number of our local unions are affiliated with the National Safety Council, Labor Conference, and we had more than 30 delegates from widely-scattered local unions attend the Congress.

ROLE OF THE U. S. DEPARTMENT OF LABOR IN OCCUPATIONAL SAFETY

by S. J. BUTCHER

supervisor, safety & union branch, Bureau of Labor Standards, U. S. Dept. of Labor, Washington, D. C.

The U. S. Department of Labor has the responsibility for fostering the welfare of the nation's workers. This has been done in the past and is being done now—both directly and indirectly:

Directly it is being done through assistance to labor unions at the national and international level in suggesting safety organization plans and programs; through safety training courses for union representatives and safety committee members; through research and the preparation of promotional and educational publications.

Indirectly it is being done through training state factory inspectors to do a more thorough and comprehensive job of inspection to provide safer work places; through special industry safety programs promoted through state agencies and operated through both labor and management to reduce work injuries in specific industries in certain states; through support of improved workmen's compensation laws; through assistance to states in the development of safety standards and codes; through participation on committees developing and revising American Safety standards; and through a large variety of technical and promotional activities dedicated to the elimination and control of hazardous working conditions and the development and use of safe work methods.

While many of these activities are carried on in terms of services to other groups and agencies which are on the firing line and are directly responsible for accomplishments, the Bureau of Labor Standards is proud of its supporting role in helping to supply many of the services which result in safer working conditions for the working men and women of America.

The Labor Conference offers another common meeting ground on which those agencies and groups having facilities and personnel available may make these services known and make arrangements for their use.

As always, the Bureau of Labor Standards is prepared to assist not only state agencies, employers and unions, but also groups such as the Labor Conference in the promotion of safety. Fundamentally, this conference is concerned with three steps of safety promotion: organization, planning, and implementation.

The organization is now well established; we are, at this moment, in the process of planning: The Bureau of Labor Standards has the field staff to assist in implementing the projects of this Conference.

FIELD STAFF

Our field staff consists of regional safety consultants who service state, federal, maritime, union and industry activities within their areas. While there will be certain limitations of time, personnel, and funds, through this staff the Bureau will be able to allot some of these men to the field work with key officials in these activities:

Training—Conducting safety training courses for key union personnel in selected locations. Such courses have been conducted for the steel workers, auto workers, rubber workers, machinists, and several others, two courses having been given in Arkansas and Iowa this month.

Organization—Assisting in the development of plans and action in the organization of safety committees and safety activities at the national, international, and state central level.

Promotion—Developing and assist in conducting promotional safety programs for selected industries as is now being done for the construction industry in Pennsylvania, Kentucky, and Minnesota.

Publications—Conduct research and develop material for helpful publications. As an example of the type of publications that may be developed, here (demonstrating) is a "Union Safety Guide" which explains the procedures for establishing safety committees, from the International to the Local level. It also gives examples of policy and types of safety clauses used in union contracts. While the Department of Labor cannot provide sufficient copies of such publications for total distribution, the materials can be compiled and prepared for re-printing by your unions, the Labor Conference, or any other group.

The Bureau of Labor Standards is a Federal agency established to be of service to State Labor Departments, employers, and unions in the promotion of worker safety. It is our policy and our desire to provide these services where they are requested and where they will do the most good.

The Bureau has a field staff to conduct safety training and to assist in organizing safety committees. The Bureau can aid in the development of promotional methods and materials, and can prepare material for publication.

However, it is necessary that you make your needs known. Tell us what you want, and we will make every attempt to provide you with the services and materials to make your programs active and successful.

NORTH DAKOTA TAKES SAFETY TO THE SMALL COMMUNITIES

by B. M. RYAN

commissioner, Workmen's Compensation Bureau, Bismarck, N. D.

We all have had our troubles at times trying to put over our safety program but I think we should say with the Poet,

"When things go wrong, as they sometimes will,
When the road you're trudging seems all up hill,
When the funds are low and the debts are high,
And you want to smile but you have to sigh,
When care is pressing you down a bit,
Rest, if you must—but don't you quit."

Industrial safety in North Dakota is dependent largely upon the plant inspection program of the Workmen's Compensation Bureau and the various safety education and training projects of community safety

groups, Volunteer Fire Department and contracting employers promoted and assisted by the safety department of the Bureau.

The North Dakota Workmen's Compensation Bureau is administered by three commissioners. It has been my privilege to represent Labor on the Commission since 1945 and for several years have been the commissioner in charge of the safety department. A boiler inspection program authorized by the 1953 legislature was added to our safety department.

Mandatory compensation coverage in North Dakota applies to every employer who employs one or more, except domestic help, clergy, and farm labor. For this reason, particular emphasis is placed on plant inspections to obtain as complete a coverage as possible. A prescribed form is used as a reminder and upon completion of a plant inspection, is signed by both employer and inspector. The original is left with the employer and the carbon copy filed in the office. Fire hazards are also checked and reported by letter to the local fire chief and state fire marshal.

Unless unusual hazards are found during plant inspection, a follow-up letter is mailed to the employer listing the recommendations and enclosing an addressed postal card for convenience in replying. If no reply is received within 30 days following inspection, a second follow-up letter is mailed. This procedure results in reply from approximately 90 per cent of the employers. A personal call on those who failed to reply discloses the fact that more than half have complied with recommendations but neglected to report when the work was completed.

RECOMMENDATIONS TO EMPLOYER

Authority for plant inspection was strengthened by the adoption of a Basic Safety Manual in 1952 and a supplement to the manual covering the construction, maintenance and operation of Electrical Supply Lines was adopted in 1953. A plant inspection is of little value unless both employers and employees are convinced that the safety recommendations are worthwhile. For this reason, leaflets are passed out at the time of inspection and need for elimination of specific hazards is explained. I am, and I am sure you are, a great believer in plant inspection.

A fatal accident which occurred some time ago in a grain elevator at Max, N. D. Mr. Haroshanko, manager of this elevator for about 10 years, no doubt knew every nook and corner of the grain elevator. In this elevator where Mr. Haroshanko walked every day, there was a drive shaft with a key sticking out beyond the end of the shaft about two and one-half inches. This key revolved with the shaft. One day he walked around the end of this revolving shaft, the jacket sleeve caught on this key, threw the man around the shaft and killed him.

If one of the safety engineers had come in there for an inspection prior to this accident, he no doubt would have detected this hazard. But with limited personnel, we cannot be all over. What I am getting at is this: an old timer like Mr. Haroshanko who had been walking around the plant for years did not see this hazard and, consequently did not remove this key.

But if someone had called his attention to it, he would have cut it off or put a shield over it and thereby saved his own life. When I checked on this accident, I found this key was rusted and obviously there for a long time.

USE TRAINING FILMS

Supplementing the distribution of leaflets in our safety education program, is a film library of training films, representing different films and covering practically every phase of accident and fire prevention. These films are loaned to employers, but are used mostly by volunteer fire departments, community safety committees and groups of foremen and supervisors. Both basic and supervisory courses are established and upon completion of the course, each participant is presented with a certificate of award, signed by the governor, the commissioner in charge of safety, and the safety director.

The operation of the industrial safety program is made difficult due to limited personnel and the lack of field men trained for separate industries. So our field men must be a jack of all trades.

North Dakota is primarily an agricultural state—not a large industrial state. We have a great number of small plants in comparatively small communities such as machine shops, garages, creameries, and small manufacturing plants. We have too, the Petroleum industries which started about five years ago and are growing at a rapid pace. We have also some large construction projects such as building of the Garrison Dam, which is one of the largest earth fill dams in the world, and are building two large air jet bases.

However, neither the large construction project nor the large industries give us much trouble insofar as accident prevention is concerned because the large employers as a rule carry on within their own groups a good safety program.

Among the smaller employers who employ comparatively few people in their plants we find the highest accident frequency rate and this type of establishment constitutes approximately 80 per cent of all coverage in our state.

As a rule, a small plant seldom has a safety program and often objects to suggestions that would lower the accident rate, cost of operation and increase production.

This situation presents a problem we feel can be solved only by personal contacts. By contact we mean contacts with the employer personally and with as many of his men as possible. Now, to make contacts with all the small plants throughout our state when we are operating with limited personnel and funds constitutes a real problem. No doubt you have heard, as I have, in safety meeting conferences, "How can we reach out to small communities with the safety program?" This was our problem and is still not solved entirely.

PERSONAL CONTACT BY TRAILER

However, we overcame some of it by going to work purchasing a 36 foot house trailer. We equipped this trailer with a movie screen and made a place for a 35 mm and a 16mm projector. We call this a mobile class room. This trailer will seat 15 people. We take this trailer into the small towns where we often find no meeting hall and we also take it to large construction camps and into the oil field. We have even used this trailer for first aid courses. Inside of this trailer we have exhibits of first aid equipment and also some old unsafe tools such as mushroomed chisels and broken hammer handles.

I might say we have had good results as we take this mobile classroom to the smaller communities and we go to employers who may employ only 10 to 15 people. We ask the employer to let his people off for 30 minutes to an hour so that we can show safety films and talk with them personally, and the cooperation has been wonderful. I'll have to admit, due to lack of funds and personnel, we have not used this mobile classroom as much as we would have liked to during the last year.

Let me tell you that in addition to what our state industrial safety department has done, the extension service of the State Agricultural College, under the direction of John Zelskie, has carried on a good farm safety program. Zelskie has done a wonderful job of bringing the accident prevention program to the farmers by literature, correspondence, and setting up classes in the various parts of our state. We appreciate the help and cooperation of this service.

FOREMAN TRAINING PROGRAM

A word about our foremen training program may be of interest to you. Mr. Drew, our safety director and Mr. Miller, our safety engineer, have included standard first aid courses with foremen training. The arrangement for the first aid courses was made possible through the help and courtesy of the U. S. Bureau of Mines. In the past couple of years, we have been able to complete several such courses and we know from records that these courses have been instrumental in saving at least two lives. Let me tell you about it. One such class was held in the gymnasium at Tioga and was sponsored jointly with Amerada Petroleum corp., and the Oil Field Services co.

This class was originally planned for foremen and supervisors but when so many others asked to be included, we arranged for several additional classes. On September 18th, 1956, Earl C. Emerson, production foreman for Amerada corporation, one of the participants in our first aid course, rescued a fellow workman who was overcome by hydrogen sulphide gas while making a drill stem test. After carrying the unconscious man to the open air, he immediately applied artificial respiration and when the ambulance arrived 20 minutes later, the man had regained consciousness.

Emerson later received a life-saving award from the U. S. Bureau of Mines in a television presentation. On July 19, 1957, we were notified that he had also been awarded a medal of honor by the Joseph A. Holmes Safety Association.

COURSE SAVES LIVES

A thorough investigation was made before such an award could be awarded, that Emerson actually saved this man's life. We also believe that Emerson, who had just nine days prior to this accident completed the first aid course, and who prior to completing this course knew nothing about first aid, could not have saved this man's life if it hadn't been for the knowledge acquired through the course.

I can tell you about another man who we believe was saved because of first aid teaching in the coal mines. A couple of years ago a coal miner fell from a moving ore car, both legs were severed. Fellow workmen applied tourniquets, preventing bleeding to death. Then 10 of the fellow workers followed the car to the hospital ready to give blood for transfusion and actually nine of those men contributed blood. Again I believe that if those men had not just prior to this accident completed a first aid training course, they wouldn't have known how to take such immediate action.

George Easton, state mine inspector, in conjunction with the U. S. Bureau of Mines and our safety department, has been carrying on an extensive accident prevention program among the miners in our state. He had just completed a first aid course prior to the accident I just mentioned and we feel that this course also paid off well by a life saved.

In North Dakota we are endeavoring to carry the safety program to our small communities by using what we may sum up under three letters, C.P.A., not Certified Public Accountant, but contact—promotion—action.

Contact—Contact is made before and after a plant inspection and recommendations for correction of hazards are also made personally to management when possible. If the plant is too small for a program alone, we arrange for a community group if possible. This program may be sponsored jointly with a civic or commercial group as sponsor but best results are obtained when spearheaded by a community safety council.

Much can be accomplished if our program is presented in a manner that will convince the owner or manager that safety will pay in lower insurance premiums, increased production, and better morale. We are therefore making contacts with as many as possible by using our mobile classroom, by personal contacts to set up foremen and supervisors' training courses.

Promotion—Promotion, our second step, we feel is vitally important too for we must have the support and cooperation of management if our program is to be successful. Promotion is necessary to sell our services, to interest others in a program dedicated to conservation of human life, and the prevention of suffering.

After making contacts and successfully promoting our safety program, we come to our third phase of the program which we call Action.

Action—Action involves actually doing the job—a follow-up on our contacts and promotional work. If we are to hold meetings, the smallest detail cannot be overlooked. I am sure each of you have at some time served as a chairman of a committee. It is my guess that if you hadn't personally checked on some of the minor details, the program would have been a flop.

Action also means a follow-up on existing hazards of a safety inspector, a safety engineer, and a safety consultant.

ACTION INCLUDES STUDY

Last but not least, action means study to learn more so that a person can discuss problems in an intelligent manner. This study must include a study of accidents checked and recommendations made to prevent reoccurrence. These recommendations must be practical for a plant with few employees which is not financially able to install all the improvements found in a similar plant employing a greater number of employees. Study is needed so an employer can be advised as to the approximate cost of changes recommended. Cost is important in these days of cut-throat competition, but removing the cause of frequent accidents may mean only a change in the manner of work and may not require additional equipment.

We know there is a cause for every accident and a remedy for every cause. If we are to make progress, we must have action in the form of preventive measures. If enforcement is necessary, it is usually the result of improper contact and promotional technique. Invoking the law is a step that should be taken after all other methods fail. In this connection, we can be sure of the cooperation and support of other government agencies and conditions warrant their support.

We must be better salesmen if we are to avoid resorting to legal measures to enforce safety rules, for we have something to sell. Safety is a product everyone can afford whether employed in private or public industry. Our job is to interest them in the service we have to offer. The conduct of workers and of all of us is influenced by personal habits. Safe habits are formed by doing the job in a safe way—by being safety conscious but must start with proper attitude.

Therefore, our first task is to make sure there is a genuine interest in our program of accident prevention. Action means more contacts, more inspections, more meetings, and more work.

It is extremely difficult to evaluate a safety program. Statistics are often misleading. But if we can point out even two examples where safety and first aid training courses have saved a life, we feel repaid for our efforts.

Let us not forget, however, that all of this means that we must continue to be optimistic. We must continue to prevent accidents, loss of life, and most of all, human suffering.

THE OREGON SAFETY STORY

by WILLIAM A. CALLAHAN

chairman, State Industrial Accident Commission, Salem, Oregon

Realizing the necessity for social legislation in the aid of injured workmen, in 1913 Oregon was one of the first states to enact a Workmen's Compensation Law. However, the State Industrial Accident commission, established by this law, did not become self-sufficient until 10 years later.

Up until 1941, the primary concern of the commission was compensation of injured workmen. Seeing the need for accident prevention, the state legislature appropriated separate funds for the safety of workmen in covered firms and designated the Accident Prevention division to direct it.

This fund was a percentage of all contributions paid in and, justified by the demand for more services in this field. It has been raised from time to time to meet the demand.

Actually the real safety program in Oregon did not begin until 1943. A year later, the state industrial death rate dropped 21 per cent and ranked Oregon in the top five states in the nation in this reduction.

Safety inspectors visit operations throughout the state making inspection tours of the premises, writing correction orders on unsafe conditions of the physical plant, equipment and unsafe practices. The employer has an agreed upon length of time to make these corrections and unless the hazard requires a cease work, an immediate compliance order is written. About 150 to 200 such orders are written each year.

RED TAG MARKS HAZARD

If an employer refuses to comply, we may hang a "Red Tag." In 1956, we used the "Red Tag" only five times. A "Red Tag" may be placed on a machine, scaffold, excavation, any part of an operation or on the entire operation, and regular operations must stop until the corrections are made. Until the last session of the legislature, violation of a "Red Tag" carried a $100 penalty. It has now been increased to $1,000.

At the last convention of the Oregon State Labor Council, A.F.L.-C.I.O., a resolution

was passed unanimously calling on all members to respect a "Red Tag" as they would a picket line. This "Red Tag" law is a big help in securing immediate compliance. We have no intention of relaxing our inspection and enforcement work, but we believe our educational work is more important and less enforcement will be necessary in the future.

Realizing that safety education is the backbone of the Oregon accident prevention program, the chief objective is to train industry to train itself in safety.

Oregon has many small business firms engaged in hazardous employment, such as logging and sawmill operations. About 95 per cent employ fewer than 50 men, many with less than 25.

Such a situation necessitates a tremendous effort on the part of the accident commission's Accident Prevention division in promoting safety programs because firms with few employees do not maintain full or even part time safety personnel.

In telling the Oregon safety story I will describe a 15 point safety education program that is getting results.

SAFETY COURSES

"Hack the attack on accidents" is fast becoming a motto in Oregon industry. One method of attack is the safety training courses begun in 1943. They are primarily request programs from management and labor—originating with either the field representative (safety inspectors), the area office, or the central office in Salem.

Once a request is made, the area special services representative arranges the presentation, procures statistical information and teaches the course. Often he is assisted by the local field representative.

The courses are of two types: the standard or basic course of six hours and the advanced course. The basic course is presented in three two-hour class periods for supervisory personnel; however, anyone can attend. The subject matter deals with understanding the problem; determining the accident causes—the conditions and acts of persons which cause injuries, and their control—and the development of an accident prevention program.

The advance course is primarily for key supervisory personnel. It is stressed to the supervisor that he is the key man in the safety program. Economic and sociological costs are also pointed out, as well as the psychological factors involved.

Often a request calls for a combined safety and first aid course. In this case, parts of each course may be presented. At the conclusion of a course, the Accident Prevention division issues a certificate to each participant. These classes are presented in a "down to earth" fashion and a question and answer period concludes the presentation.

ASSOCIATION TRAINING PROGRAMS

The State Industrial Accident commission and the Columbia Basin Loggers association co-sponsored a safety training program for their member firms. This organization consists of many small logging and sawmill operations. By working closely with labor organizations having jurisdiction, the association could draw key supervisory personnel of the individual firms for a safety education program.

This "safety school" was conducted at dinner meetings by select accident commission personnel in eight areas. Some of the points covered at these meetings were: employer problems and costs, state logging codes and regulations, acts of persons and conditions which cause accidents, accident investigations and self inspection and implementing the safety program.

SAFETY COMMITTEES

Safety committees have been established in Oregon for many years. Large companies know the value of such programs and have given safety information to smaller concerns. Yet many of these concerns do not find a committee compatible, and therefore other methods must be used to acquaint them with safety precautions.

In Oregon, industrial safety committees vary. One type is a management committee which takes in key supervisory personnel. Another is the labor or union committee, composed of key union represenatives. The third type—most widely used—is the joint management-labor committee. Some plants use a variety of the three. Often management will not organize a committee without labor's representation since both are concerned with the same problem, and both stand to gain.

The State Industrial Accident Commission through its Accident Prevention field representatives and the special services section helped organize many committees and activate old ones. Field representatives meet with as many of these committees as possible—giving technical advice and moral support. These men are dedicated—dedicated to keeping the workers of Oregon alive and unhurt and aiding the employer in reducing his accident costs.

FIRST AID

First aid is a deterrent to accidents. People trained in first aid have 50 per cent fewer accidents. For this reason we have a working agreement with the American Red Cross to teach its courses.

This program began 15 years ago by certifying each fieldman of the Accident Prevention division as a certified first aid instructor. All first aid requests originate in the field and are certified and assigned through the central office. Since the activated educational program began in 1943 approximately 20,000 people have received first aid training from the Accident Prevention division.

At the Governor's Industrial Safety Conference held last Spring the American Red Cross presented the Commission's Accident Prevention division the American Red Cross Award for "outstanding service in the field of first aid."

As an outgrowth from the Columbia Basin Loggers training program, eight Northwest communities organized district safety councils primarily concerned with industry's problems in that particular area.

These have been spontaneous—originating with management and labor groups in the area and sponsored by the Columbia Basin Loggers association. The organizational patterns of these councils are similar. Each has an elected chairman, a secretary and five representatives from both labor and management who rotate from three to six months.

Statistical data, films and other safety material supplied by the commission are available to the councils. Accident Prevention division personnel attend the monthly meetings in an advisory capacity.

For any educational program, certain statistical information is necessary to stress essential points. The actuarial division disseminates much information, such as the accident analysis of firms under state coverage, and the experience rating statements.

The accident analysis gives the name of the accident victim, nature of his injury and the claim costs. It also gives the employer contribution over a specified time, frequency and other data. This is valuable in stressing the costs to employers. It also permits the commission to evaluate the needs of a firm when setting up a safety program.

The experience rating statement of any covered firm is available within minutes. This statement can sell the employer on the need for a safety program by showing his previous cost of accidents. It also indicates the success of a safety program when measured in terms of dollars.

The nature, location and type are shown on agency charts. These charts show the nature of the injury, the parts of the body injured, the type of injury and what caused it. They mark the area where accidents occur and indicate where improvements in a safety program should begin.

In a basic safety course to a small Oregon sawmill employing 18 men and using this statistical information, the actual claim cost was cut in one year from $8,703.00 to $64.50.

SAFETY RALLIES

In 1953, backed by local publicity and public relations, the Accident Prevention division began a new course in accident prevention. This was the formal organized safety rallies. One type was the community rally whereby all industrial groups in an area are invited to help promote industrial safety in the community with labor groups cooperating.

Another type is the company rally promoted within one firm. A third type embraces as many local industries and labor groups as possible. All are organized with a local sponsoring group in cooperation with the State Industrial Accident commission which arranges the program details and schedule. This is one way for employers with a few workmen and no organized safety program to receive safety aid.

STATE REGIONAL CONFERENCES

The Commission conducts a number of regional safety conferences each year. These are the backbone of our educational work, the "grass roots" program of conferences and takes safety to the local people. Problems are discussed and acted upon and workmen are urged to attend.

The program is the people's program. A regional planning committee is established with the assistance and guidance of the state commission. The program is presented similar to the state-wide conferences. Some are organized on a general assembly type panel discussion basis while others have industry type panels.

In safety programming, entertainment is important in securing larger attendance. Year by year more women—wives of workmen—attend because they realize they too have a vital stake in their husbands' on-the-job safety.

Speech contests, employer paid luncheons, safety skits, door prizes and music are some of the entertainment features to secure a better attendance. One regional conference secured the help of the local Junior Chambers of Commerce in naming "safety queen candidates."

GOVERNOR'S SAFETY CONFERENCE

Oregon had its first state-wide safety conference in the capital city in 1944. Attendance doubled and tripled and after five conferences, the conference site was moved from Salem to Portland, where there was more room, and the name was changed to the "Governor's Industrial Safety Conference."

Television, radio, newspapers, magazines and public appearances are utilized by the central planning committee of state, labor and management people to promote attendance.

The attendance was so high at that conference, that the Accident Commission decided to use the conference as a springboard of ideas for the regional ones. When publicity started for the last meeting, the aim was primarily to attract the top safety men and committees that organized and conducted the regional conferences.

Also the program was changed from an industry panel discussion to a general assembly panel. Top safety men in the Northwest and from across the nation were secured for speakers.

FOOD PROCESSING CONFERENCES

The Commission co-sponsors a food processing conference dealing with safety problems in the industry. Aside from mechanical and human elements in accident prevention, industrial hygiene is stressed to combat occupational diseases which occur in the various processes.

The Accident Prevention division has two capable industrial hygiene engineers. Their efforts, along with those of the State Board of Health, are proving valuable in this field.

More than 200 key industry people from both labor and management attend these conferences yearly—thus cooperating to perfect a sound safety program within the large and expanding food processing industry in the state.

SCHOOL TRAINING PROGRAM

Another program is the school training program to acquaint high school boys and girls with laws governing employment during seasonal farm periods and the precautions for safety at work.

Receiving a safety program in the schools, the youth can carry this training and knowledge into adult employment.

This program was co-sponsored by labor groups having jurisdiction, the State Bureau of Labor and the State Industrial Accident commission. A program is being developed with state educational authorities for the Commission to give safety education to students as a prerequisite to job opportunities in other industrial fields.

PLEDGE CARDS AND SAFETY AWARDS

In the summer of 1956, the commission began a new program which operates on the assumption that if an employee signs a pledge to work safely, he will be a safer worker for his own benefit and the benefit of his fellow workers.

This program is patterned after the "red hat" hunting pledge. For our particular use, the pledge cards are given to employers, and they secure employees' signatures. These cards are perforated—the workmen keep one portion in their billfolds as a daily reminder of their pledge, and the employers file the other part. When the employers have a 100 per cent "sign-up" of workmen, the Commission presents them with a "Certificate of Commendation."

The mere signing of a pledge card will soon be forgotten. Actually, this is really a "gimmick" to get our foot in the door to sell them on a complete program. But we begin slowly—first aid classes, basic and advanced safety courses and safety committees.

Once a company has met the requirements of the pledge card program, it is in line for the Commission "Award of Merit" for "outstanding efforts and achievements in the field of safety." At present there are 245 firms in the state employing 25,000 men who are in the program.

Frequency and cost reductions are not the only criterion for earning this award. A firm must also avail itself of other educational services and programs of the Commission.

Visual aids are becoming more and more beneficial to our program of safety education. Our safety film library has 85 films, and new films will be available, free of charge.

Other visual aids and educational materials available are: safety codes, illustrated fatality reports, statistical information, posters and displays.

While the state safety codes are the basis for corrective orders, they are nevertheless primarily educational.

For each fatality occurring in covered employment, our artist illustrates or depicts by drawing what happened and this, along with a brief description, is sent to a mailing list of approximately 2,000 persons.

SPEAKERS BUREAU

The State Industrial Accident commission provides speakers for various functions in the state. A speakers bureau has been established whereby competent speakers on any phase of the Commission's work may be assigned.

For example, should an organization or company wish a speaker to discuss accident claims, a qualified person from that division is assigned. When a request for a speaker on safety is received, a qualified person from the Accident Prevention Division is assigned.

These speaker requests come from employers, unions, social, fraternal, school and womens' groups.

Safer Oregon is the official state safety publication, dedicated to the prevention of industrial accidents in the state. The monthly magazine imparts technical information and presents changes in the Workmen's Compensation Law and the safety codes. It reports new accident prevention programs and their progress. It tells of activities of the Commission—what is being done to prevent accidents and how employers may reduce or eliminate claim costs which are attributable to accidents.

Safer Oregon is a medium of exchange for safety ideas and sound accident prevention methods. It might be called a "springboard of knowledge" because it covers every phase of our accident prevention program. It is published with a humanitarian feeling to keep our people from becoming injured.

RESULTS OF OREGON'S PROGRAM

The results of our program are far reaching. Many foreign industrialists have been our guests while studying our program.

Despite the fact that the man days worked have increased more than 150 per cent in the last 10 years, we have held the lost-time injury rate to a 30 per cent increase over that same period.

One peculiarity of the Oregon Law is that there is no waiting period in the payment of claims, and time loss is paid even for the first day. This means if an injured person is unable to report to work for his next shift, it becomes a lost-time claim. This tends to keep our frequency higher than in states where there is a waiting period.

There are three yardsticks which used together will give a very accurate evaluation of the safety program of any state. I refer to the benefit schedule, the premium rates and the solvency of the fund. Measured by these yardsticks, Oregon shows up extremely well.

We know we have made great progress against the severe handicap of having most workers employed by small employers. We know that we dare not relax, and we know we have a tremendous job ahead of us.

We are encouraged by our successes and from these, we draw the strength for the long hard climb ahead of us. We know that while our work may become easier, it will never be done. We are happy to toil and serve in this great humanitarian work.▲

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GREEN CROSS FOR SAFETY®

MARITIME INDUSTRIES

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

MARINE SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Maritime Industries. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Marine Section carries on in behalf of its members, and for the benefit of accident prevention work in the maritime industry. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of the marine industry.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

"KNOWING'S NOT ENOUGH"

by DAVID L. BUCHANAN

assistant to vice president—operations, Pittsburgh Steamship Div., U. S. Steel Corp., Cleveland

In 1955 four men sat in stony silence in a conference room on the upper floors of an office in Chicago. This was an unusual business day for they were on the threshold of the first step to the solution of a problem that has plagued American management for more than half a century.

The problem they were wrestling was the strange phenomenon of a normal human being, who without apparent cause, ignores all his instinct, reason and training and walks into an accident.

Certainly there was nothing new about this problem. But two particular aspects concerned these men.

First, what quirk of the mind motivates that impulsive action which leads to an accident? What is it that blocks out the normal awareness to safety and self-preservation and hurls a man headlong into danger? And second, how can you communicate to all people the urgent need to recognize and stifle these impules before an accident occurs?

INJURED KNOW BETTER

The greatest number of injuries occur in that segment of the working force which "should know better." Our own experience at Pittsburgh Steamship division in 1956 dramatically points up this fact. Only 14 per cent of our injuries occurred in the age bracket of 20 and under. Thirty-eight per cent occurred in the age group of 21 to 30, and men 30 and over made up 47 per cent, or nearly half of our accident experience.

The mature, experienced and trained worker is the one getting hurt. This first premise became the central theme of the entire program—"Knowing's Not Enough!"

The second part of the problem was to carry this message to all the men and women in the mines, mills, offices, quarries and transporting units of United States Steel—for the men in that 1955 meeting were members of the Corporation's Safety Advisory committee.

Because they were dealing in human behavior, they realized such a program should also encompass employees of other companies and the citizens of United States Steel communities.

SNOW WHITE'S INFLUENCE

At this point Snow White appeared on the scene. Having agreed on the need to identify these impulses which suddenly block out all safety awareness, the committee members considered Snow White's seven dwarfs as possible characterizations of the impulses that cause human failure. But poor Snow White had too many dwarfs.

People generally retain only the first three or four central ideas in any program. Four imps, it was decided, would be maximum. However, Snow White left her mark on this program's development, for the notion of personifying these accident producing impulses stuck like glue. United States Steel's four imps, Impatience, Impulsive, Improvising and Impunity were born.

The final step in the basic plan was a proper story to put this safety message across. In a serious attempt to capture the imagination of a widely diversified audience the committee set their stage at a sports car race.

With competing cars streaking past the grandstand and skidding around corners, with film sequences taken in the cockpit, with the story of a driver in trouble trying to hold the lead position, United States Steel's 28 minute color motion picture, "Knowing's Not Enough" has little difficulty drawing its viewers quickly into the plot.

SHIP SAFETY PROGRAM

Because this film deals in the fundamentals of human attitudes and behavior, it automatically adapts itself to a safety program for steamship fleets. Pittsburgh Steamship division's safety program was designed to impart safety knowledge to our employees to develop good safety working habits, as well as a healthy respect for hazards inherent in marine operation. The program includes:

A. Pre-employment physical examinations.

B. Safety precaution booklet.

C. Personalized instruction and supervision by ship's officers and experienced crew members.

D. Monthly safety meetings.
   1. Safety subject of the month.
   2. Safe practice demonstration.
   3. Discussion of safety subject at fire and boat drill.
   4. Review of safety items in the United States Coast Guard publication, "Proceedings of the Merchant Marine Council."

E. National Safety Council posters.

F. Safety booklet included in the Good Reading Rack Service.

G. Lake Carriers' Association booklet "Recommendation for the Prevention of Accidents."

H. Monthly one page Division safety newsletter entitled "Safety Topics."

I. Articles and cartoons in our division employee magazine *Pittsburgh Sidelights*.

J. Recent publication of a booklet "Safety First in Verse" compiled from minutes of ship's safety committee meetings.

K. Fire fighting demonstrations before our ships sail in the spring.

L. Division safety contest.

M. Participation in Safety Contest of Marine Section of National Safety Council.

N. Shore Safety committee.

O. Presentation of "Knowing's Not Enough" to all shipboard personnel, implemented by special posters using the yellow flag.

IMPATIENCE IMPACTS

One of the chief assets of the "Knowing's Not Enough" program is the almost immediate identification of shipboard incidents with the four imps, Impatience, Impulsive, Improvising and Impunity. We find that in the minutes of the ship's safety meetings, crewmen connect the cause of an accident with the work of one of these imps. To show what we mean let me apply these imps to actual cases from our files.

Last season a fireman employed aboard our Steamer Myron C. Taylor decided that a lump of coal was too large for proper handling so he took the mallet and proceeded to break the lump. After striking the first blow, the lump parted and a number of particles embedded themselves in the man's right eye. He was rushed to the hospital and hospitalized for 10 days.

Investigation revealed that goggles were close at hand in the boiler room and the man with some 18 years experience at firing admitted he was in a hurry and did not wear the goggles on this particular job, although he had always worn them on previous occasions.

IMPUNITY IS SUBTLE

Impunity, the most subtle of the accident imps that block safety awareness, also had a hand in several lost time injuries. For example, one wheelsman had continuous sailing experience with our Division for 34 years. While his vessel was approaching the dock at Gary, Indiana, with a load of iron ore he apparently decided that he could jump to the dock before the ship was tied up, and allow himself a few minutes of additional shore leave.

The vessel was parallel to the dock and still moving as he jumped four to six feet from the deck to the dock fracturing his left foot. As a result he lost a total of 33 days from his job.

Impunity was on hand this season when a fireman with approximately four years sailing experience thought that the stokers were feeding coal into the furnace too fast. In his haste to rekindle the fire he threw some waste kerosene into the furnace. A flash back severely burned the man's left hand, forearm and face and resulting in 25 days lost time.

Both of these men with years of sailing experience attempted an act which they knew was unsafe and which could result in an injury. But even though they know better they could not deny Impunity's siren song, "Do It Any Way You Can Get Away With It."

BUSY IMPULSIVE IMP

If Impunity is the most subtle imp, certainly Impulsive is the busiest. Many injuries occur each season because seamen are somehow lured into acting without thinking of the painful consequences. Let's take the case of one, chief cook who was injured while off duty.

In leaving his quarters aboard ship he opened the screen door and stepped over the threshold with his right leg. At this point he inadvertently let go of the door and before he could get his left foot out, caught it between the steel threshold and door. His left foot was bruised severely causing a blood disorder which forced him to lose 22 days from his job.

Another example of impulsiveness on the part of an employee occurred while he was performing routine duties. A fireman with nine years experience while shaking grates was confronted with an oversized clinker which would not shake down. Instead of removing the clinker with the proper tool, he thought the clinker might go through by using extra effort on the bar used in shaking the grates.

The bar slipped out of its socket catching the man's ring finger between the bar and the front of the boiler. The proximal joint was fractured resulting in seven days lost time.

IMPROVING IMP IS BAD

Improvising is an impulse which has probably influenced all of us at one time or another. The best example of a shipboard injury caused by this imp is the use of the wrong tool on a job. There is another type of improvising, however, which does not involve tools as much as working procedures. Such was the case of a fireman injured while assisting the first assistant engineer to install an angle iron above the main engine.

While installing the angle iron from ladders, the angle slipped off a securing bolt, knocking the fireman from the ladder to the top of the main engine, and pinning the first assistant's arm between angle iron and an upright bracing angle. As a result the fireman with four years previous experience, suffered a fractured wrist and other contusions keeping him from his job a total of 46 days.

The first assistant with 10 years of experience suffered a severe bruise of the upper arm but was able to remain aboard ship. Had either of these men only thought to tie off the angle iron and hoist it into position, this accident would have been avoided.

The men who man the 57 ships of our silver-stacked fleet have felt the impact of this program. The device of the yellow warning flag has become a symbol of avoiding an accident. In the film, the yellow flag is flashed to drivers to announce an accident somewhere on the course. They must maintain their positions so an ambulance or a wrecker can get to the man in trouble and clear the track. The theme of the Knowing's Not Enough Program is simply—get the yellow flag out before the accident occurs.

HEED YELLOW FLAGS

Without any instructions from management, ship safety committees have painted yellow warning flags on ladders, hatch cranes and other high accident areas. They are identifying that yellow flag with the conscious act of pausing long enough to remember that any job done unsafely isn't done right. And that pause to let reason, knowledge and training take hold, is a pause that prevents accidents and saves lives.

United States Steel announced the program to its management people last year in a closed-circuit television broadcast. Management members and their wives gathered in theatres at various cities for the kick-off address by Corporation President Clifford Hood. After remarks by Hood and Executive Vice President—Operations, Harvey B. Jordan, "Knowing's Not Enough" was screened for the people who would help sell the program to all United States Steel employees.

This spring when Pittsburgh Steamship was fitting out its fleet at Great Lakes port cities, traveling teams from our Cleveland office showed the film to crewmen and explained the details of the program.

IMPS GAINED FAME

Shortly afterward, the benefits began to appear. The program had captured the imagination of our people. As I mentioned before, we began to see the yellow flag and its attendent philosophy blossom forth from ship safety committee activity. The four imps were quickly established as the cause behind that behavior of human beings that produces accidents.

To give you some idea of the popularity this film has already had, the film entitled "Miracle in Paradise Valley" which had the greatest sales of any safety movie ever produced, sold 400 copy prints in eight years. In the first eight months of the "Knowing's Not Enough" program, more than 200 prints have been purchased by outside companies. More than five million pieces of descriptive literature on the movie have been printed to date; 150 prints are in a circulating library; 125 prints are being shown in United States Steel plants over the country.

Many companies have adapted the entire program and have purchased quantity prints for screenings for all their employees.

Through the American Iron and Steel Institute a copy will be shown at the International Labor Organization meeting in Mexico. The script for the film has been re-written in three other languages. Prints of the film are available to the public. The magazine "Business Screen" made this announcement in a special story which included booklets as special inserts in this issue.

The story of the four imps has been honored with a number of awards, including a First Prize from the National Committee of Films for Safety.

There will be new accident prevention programs in United States Steel and throughtout industry in the future which will come even closer toward stopping the needless waste and pain that accidents incur. But certainly we feel we have seen an important forward step taken in establishing one important premise—that Knowing's Not Enough.

SAFETY PRECAUTIONS TAKEN ON INLAND WATER VESSELS TO AVOID ACCIDENTS . . . AND STILL THEY HAPPEN!

by S. B. PARSELL

operating manager, Inland division, Socony Mobil Oil co., Inc., New York city

Although newspapers, periodicals, and safety house magizines publish stories and pictures of gruesome accidents, men still take chances with their lives. These accidents are very costly both to the men and their companies. They are costly to the men because loss of wages, loss of limbs, loss of eyes and even loss of life results.

By the same token, they are costly to companies because they lose employees—many whose long service and special training make them difficult to replace. Companies also lose money when unsafe operations result in bad collisions and groundings. And lastly, law suits frequently follow accidents often resulting in high monetary settlements.

Our company operates a fleet of self-propelled tankers, barges and tow boats on the coast and inland waters of the United States, including the Great Lakes and the Mississippi River System. The personnel on these inland vessels are more likely to have accidents than men on ocean vessels, because they are in ports more often, work in more confined areas and perform these duties practically every day. The possibility of accidents to inland waterway personnel is even greater in the north with ice and snow during winter months.

Well aware of these conditions, we continuously preach safety to alleviate accident-charged situations. We publish a safety magazine, "The Life Preserver," to get our safety message across. We affix safety decals to the bulkheads of our vessels. We stencil safety messages on each cargo hatch and pump room entrances such as, "Is this

tank gas free?" "Is there anyone in this tank?", or "Do not enter without an attendant." Several years ago, we made a motion picture on marine safety.

We also established a new medical program *requiring marine employees to have* physical examinations on the following schedule:

Between the ages of 18 and 35 years, every three years.

Between 35 and 45 years, every two years.

Over 45 years of age, every year.

This was done because some men develop quirks and ailments which cause lapses in good, safe judgment.

BUT ACCIDENTS STILL OCCUR

In spite of these efforts, we still have avoidable accidents, caused by lack of training and lapses in safe thinking. Here are several instances where education would have helped. A deck hand working on a barge was missed. An inspection of the barge revealed the pump room hatch was open. Since this was contrary to company practice, the mate investigated and found the missing deck hand lying across a cargo pump unconscious. Why did such an accident happen; an accident caused by working in strict disobeyance of company orders?

The man in question formerly worked on a barge carrying No. 6 fuel oil. There it was customary for men to go into the pump room at any time to work on the pumps. Seeing this, the man in question, who was new, followed suit. When he was transferred to the barge carrying refined products he thought he could do the same thing. He saw the stencil on the pump room hatch, but ignored it. Education is the answer in this case but should we start with the new men or the older men?

Last winter aboard a tanker in Lake Michigan, a very peculiar accident occurred. The vessel had a very rough passage across the lake, and arrived at East Chicago, Indiana covered with ice. Due to a change in cargo, it became necessary to clean several compartments. The tank hatches were raised by turning long threaded rods through threaded blocks for the men to wash from the deck. They did not put the safety device, a forked rod, in place.

Two men handling the hose were leaning over the edge of the expansion dome, when the hatch started to close by itself. This was probably due to the weight of the ice on the hatch and ice on the rod threads. Before the men realized what happened, the hatch lowered and pinned them between it and the opening. Two men rushed to their aid, and pushed up on the hatch cover. However, one man had been squeezed enough to require hospital treatment thereby causing a lost time accident. This vessel had been without a lost time accident for more than over two years.

Why wasn't the forked safety rod put in place? Had it been, the hatch could not possibly have closed. Probably the old excuse—we've done it that way before, and nothing happened. This is a lapse in safe thinking as well as education.

CARELESSNESS CAUSES MOST ACCIDENTS

Continuous studies are made to eliminate every hazardous condition on vessels. Actually the percentage of accidents from hazardous conditions is much lower than accidents which happen from human beings' being careless.

Here are a few examples of avoidable accidents:

- A new employee while tying up a vessel, climbed aboard, not over the gangway, and hit his leg on a mooring bit.
- An old employee received lacerations on the forehead and the left eye because a wrench he used was not the size suited for the job and it slipped while he was tightening on the nut.
- A crew member cleaning the pilot house windows didn't watch where he was going, slipped on the deck and fell backwards, sustaining a painful back injury.
- A man cleaning an overhead grating received an irritated eardrum from cleaning fluid when he carelessly dripped the fluid in his ear.
- A man not watching his step, slipped on deck injuring his left ankle.
- One working in the pilot house let a small iron plate fall on his foot.

These are samples of careless accidents people become involved in. What can we do to make our employees think and act more safely in their daily tasks? The marine industry has a safety training job to do, particularly among unlicensed men. It lags

far behind the shore industries in such a program. Generally speaking, many marine companies give licensed men a hit and miss training program and then expect the officers to train the unlicensed people.

A more active training program should be laid out for unlicensed personnel. Practically all companies are adverse to negotiating or even talking of safety with the unions. However, much can be done along this line and perhaps the unions might be more than willing to cooperate with a constructive program. The health, welfare and workability of their people are as important to them as to employers. We should devise palatable ways and means of appealing to our unlicensed people to make them think, act, and work safely.

SAFETY MEASURES FOR INLAND VESSELS

So much for crew safety. Now here are cases considered safe vessel operations on inland vessels.

At the spring meeting of the marine section, National Safety Council, Capt. Hewlett R. Bishop, Atlantic Coast Director, U. S. Maritime Administration suggested that a visible signal such as an amber light be synchronized with the whistle for night operations. He called attention to two collisions in N. Y. harbor during the winter months that were preceded by unheard signals. This is already a requirement on Western rivers towboats and is favored by the U. S. Coast Guard on the Great Lakes.

We have an amber signal light on each inland vessel which flashes when the whistle is blown. One cold night, we had a collision in N. Y. harbor that developed into who blew first and what whistles were blown. The pilot said if the tugs had a visible signal synchronized with the whistle it would be very helpful in the daytime as well as at night.

I immediately recommended an amber light be installed on our harbor tugs, (which are diesel propelled) for night safety, and in less than a week, word came down from the "top" to install whistle lights on all inland vessels.

Several years ago, we had a crank case explosion on a tug which resulted in considerable damage to the vessel. Our investigation showed that prior to the explosion, white smoke was seen coming from the engine and then a small pop followed by the explosion.

I discussed this problem and learned that some foreign ships used CO2 gas as a prevention. In other words, if a shot of CO2 gas is injected when the white smoke is seen coming from the engine it will create a non-explosive mixture in the crank case and prevent an explosion.

RADIO-TELEPHONE PREVENTS ACCIDENTS

In addition, inland vessels are using the radio-telephone as a safety factor more than ocean vessels.

On Lake Erie and Michigan vessel lanes are laid out on all charts. On Erie there is an east bound lane and a west bound lane. On Lake Michigan there are lanes for north and south bound vessels. Once a Captain saw a south bound vessel close to the north bound lane and immediately called the vessel via radio-telephone. Both vessels established themselves, their destination, and prevented a possible collision. Radios can also be used in fog when a whistle is heard forward of the beam.

Once a Mississippi towboat, up-bound with 12 loaded oil barges approached a narrow point in the river near a bad bend. Some miles up river, the Captain saw the searchlight of another towboat, but didn't know which way it was bound. He called the other pilot on the radio-telephone and asked for identification, size of tow and the direction bound. In this manner, they arrived at a safe passing point since they were steaming in opposite directions.

However, the radio-telephone, like radar, is only an aid to navigation and does not excuse failure to follow all rules for safe navigation.

ANNUAL COMMITTEE REPORTS

REPORT OF THE GENERAL CHAIRMAN

CAPT. JONES F. DEVLIN, JR.
general manager, United States Lines, North River, N. Y.

Our membership has increased since the first of the year. As there are industry representatives present from all sections of the country I would like to take this opportunity to announce our new members:

United Fruit Company,
New York, N. Y.

American Foreign Steamship Company,
New York N. Y.

Luckenbach Steamship Corp.,
Brooklyn, N. Y.

M. & J. Tracy, Inc.,
New York, N. Y.

Coyle Lines, Inc.,
New Orleans, La.

McAllister Brothers, Inc.,
New York, N. Y.

Central Gulf Steamship Corp.,
New Orleans, La.

Charleston Stevedoring Co.,
Charleston, S. C.

International Cargo Gear Bureau, Inc.
New York, N. Y.

I am pleased to note that a discussion group has been formed for the Great Lakes Operators which extends the fine work now being done by the Cargo Vessel discussion group and the Tanker discussion group.

I would like to voice my personal thanks to Mr. Harold Wick for his outstanding work on behalf of the Marine Section; to Admiral Ed Holden who is always ready to assist with his vast knowledge of safety business, and to Mr. Les Dutton who graciously receives our complaints and problems; always managing to straighten them out.

It is regrettable to note that we are losing two of our members through retirement this year—Mr. "Nippy" Parsell, who has so excellently edited our Newsletter, and Mr. Carl Holmes, Past General Chairman and Chairman of our Awards Committee. I think we should give them a vote of thanks for the splendid work they've done over a period of many years.

I entreat you to keep an unflagging interest in this Marine Section of the National Safety Council as once you Executives become diffident or deputize your Safety Program I promise you it will shortly become decadent. Safety is an intangible which constantly needs prodding and alert executive attention. I repeat my gratitude to you all for your cooperation during my term as General Chairman and know that this same support will be given my successor. Thank you.

REPORT OF THE VICE GENERAL CHAIRMAN (STEVEDORING)

G. H. E. BUXTON
director, Safety Bureau, New York Shipping Assn., New York, N. Y.

At the Spring meeting, which was held in conjunction with the Annual Convention of the Greater New York Safety Council, three papers on stevedoring were given. The meeting was well attended, and we were most encouraged to find many people present from other ports.

The Management Advisory Cargo Handling Safety Committee, which represents steamship operators and stevedoring companies on the Atlantic, Gulf and West Coasts, the Great Lakes and Hawaii, has appointed a Sub-Committee to work in liaison with the Marine Section of the National Safety Council. In this way, every port in the country can be kept advised of matters concerning safety in stevedoring operations, while at the same time there is now a means of interchange of information.

REPORT OF THE ASSISTANT GENERAL CHAIRMAN (PROGRAMS AND CONVENTIONS)

HAROLD M. WICK
assistant vice president, American Bureau of Shipping, New York, N. Y.

During the past year this committee has arranged four sessions for the Marine Section. Two were general meetings of the Executive Committee of the Marine Section held in New York at the Maritime Exchange on January 15 and June 11. These meetings were very well attended and a good many reports were received from various committee heads.

The annual Spring meeting was arranged, this being a two-day session in New York and held as usual in conjunction with The Greater New York Safety Council Annual Convention and Exposition. This was held at the Statler Hotel, March 20 and 21. The committee secured nine speakers and the services of three session arrangers and eight presiding chairmen. There were three sessions, these being the annual Shipbuilding and Repair Yard Session, a Ship Operators Session and a Stevedoring Session. A joint luncheon was arranged with the Propeller Club, Port of New York, at the Waldorf-Astoria Hotel at which Rear Admiral Henry T. Jewell, Chief, Office of Merchant Marine Safety, U. S. Coast Guard, Washington, D. C., was the principal speaker.

The current annual meeting was also arranged, this being a three-day session, devoted primarily to ship operation, stevedoring and Coast Guard activities. Ten speakers were secured together with the services of seven presiding chairmen. A joint luncheon with the Propeller Club, Port of Chicago, was arranged as a concluding feature of the meetings. The principal speaker at this luncheon will be Vice Admiral John M. Will, Commander, Military Sea Transportation Service, Department of the Navy, Washington, D. C. The committee also arranged for the annual business meeting on the morning of October 23, and the showing of two movies during the course of the meetings.

The committee wishes to express appreciation to the staff of the National Safety Council at Chicago, in particular to Mr. L. W. Dutton for the considerable assistance rendered in arranging with the Morrison Hotel for the details of our luncheon with the Propeller Club.

The committee also wishes to express appreciation to various maritime organizations for assistance rendered in distributing copies of the Spring meeting program and the annual meeting program. These were the American Merchant Marine Institute, the Lake Carriers Association, the American Waterways Operators, The Shipbuilders Council of America, the New York Shipping Association, the New York Board of Marine Underwriters, the Propeller Clubs, Port of Chicago, Port of New York, and Port of Joliet, Ill.

MEMBERSHIP COMMITTEE REPORT

T. T. WILKINSON
superintendent engineer, Marine Dept., Sinclair Refining co., New York, N. Y.

The General Chairman announced at the Marine Section meetings last year that a campaign would be waged to enlist new members. A large number of companies in the Marine field were contacted and acquainted with the advantages of membership in the Marine Section. As a result 10 new members joined during the year October 1, 1956 to September 30, 1957.

There were seven cancellations during this period—some due to member companies going out of business, or for inactivity. In two cases no reason was given and efforts are being made to persuade these companies to reconsider their decision and re-join.

The present total of our membership is now 115 of which 85 are operating companies and 30 are associations, insurance companies, etc.

The Membership Committee requests that all members continue to cooperate and advise of any likely prospects for our Marine Section.

PUBLIC RELATIONS COMMITTEE REPORT

FRANK O. BRAYNARD

director, Bureau of Information, American Merchant Marine Institute, New York, N. Y.

The Public Relations Committee carried on its regular function of seeking to provide publicity both in the marine press and in the general press for the Marine Section. Our purpose was twofold:

1) to tell the story that American ships are the safest in the world;

2) to encourage safety thinking among personnel.

It was a privilege to cooperate with the Ship Safety Achievement Award Committee in publicizing the various award presentations. May I add here that a subcommittee of the American Merchant Marine Institute Public Relations Committee was appointed during the year to handle arrangements for these award presentations. This subcommittee was headed by S. R. Bross of the Alcoa Steamship Company. Dick Bross did a remarkable job in my opinion.

The recent *Reader's Digest* safety article holds a public relations problem of considerable dimension. We regret to say that aside from a strong address by Ralph E. Casey, President of the Institute, we were unable to take any action to correct the bad name that this widely read article may have given safety on American passenger ships. To properly combat this type of article would require a constructive public relations effort of no mean proportions both as to cost and time.▲

SHIP SAFETY ACHIEVEMENT AWARD COMMITTEE REPORT

MAITLAND S. PENNINGTON

assistant vice president, Moore-McCormack Lines, New York, N. Y.

The Ship Safety Achievement Award Committee now in its fourth year of activity, made three awards and created a new citation during the past year. Two of these awards and the new citation have been presented; the fourth will be presented before the calendar year is out.

The awards were made to the liner AMERICA, with presentation ceremonies aboard the ship; the freighter CAPE ANN, also with ceremonies aboard the ship; and the tanker GULF OIL—for which no presentation has been made yet.

The special award was created to honor the Military Sea Transportation Service. It is entitled "Distinguished Sea Rescue Award" and the first presentation was made to the transport FREEMAN in Seattle last May.

We are endeavoring to extend the Ship Safety Achievement Award to include special awards to individual seamen and officers. As you know, the present award includes a pennant for the ship and individually-named scrolls for every man aboard the ship except in certain instances where only segments of the crew participated.

I hope that a new series of awards will be set up next year for various types of individual safety achievements.

It is a pleasure to thank Ralph E. Casey of the American Merchant Marine Institute for his cooperation in making the Ship Safety Achievement Award program possible. As you know, these awards are a joint project of the AMMI and the Marine Section.▲

SAFETY POSTER COMMITTEE REPORT

M. BREECE

Esso Shipping co., New York, N. Y.

The objective of the Safety Poster Committee is to assimulate and select specific material pertaining to safety in the Marine Industry, presenting this material to the National Safety Council staff who will construct safety posters suitable for use by the Marine Industry.

The first meeting of the Safety Poster Committee of the Marine section was held on March 12, 1957. At this meeting various samples of posters previously utilized in the Marine Industry were reviewed, including the two previous Marine series issued by the National Safety Council.

After our first meeting, Mr. Les Dutton of the National Safety Council was contacted in reference to what material the National Safety Council Staff desired from us and what procedure they expected to employ in issuing further Marine safety posters. Mr. Dutton informed the Poster committee that the National Safety Council staff is primarily interested in obtaining specific poster subjects with necessary supporting material to enable them to construct one two colored 8½ x 11½ inch posters at each two month interval or a total of six posters a year. These posters would be made available to the Marine Industry, and also produced in miniature in the National Safety News and Marine Section News Letter.

With the assurance that the National Safety Council can issue Marine safety posters at two month intervals, it will be possible for the shipping companies to lay out their 12 month schedule interspersing suitable posters selected from the General Poster Directory.

The second meeting of the poster committee was held on April 30, 1957. At this meeting five suggestions for posters were submitted by the members.

The 3rd meeting was held on August 14, 1957 in which the following data for safety posters was submitted:

1. Don't be a railbird.
2. Careful use of culinary knives.
3. The hazardous use of bathroom clogs aboard ship.
4. Improper rigging of bos'ns chair shackles.
5. Know your equipment and how to use it. Safety equipment (Inhalator).
6. Test tanks and compartments before entering.
7. Don't leave open floor plates unguarded.

These slogans accompanied by photographs, were submitted for approval by the committee. I suggested that the slogan "Safety is Seamanship" appear on the Life Ring Preserver on each poster. Capt. Jones F. Devlin, General Chairman of the Marine Section, gave carte blanche authority and approval from his office for the recommendation.

The posters were then sent to Mr. L. W. Dutton of the Marine Section National Safety Council. I suggested that sketches of all these designs submitted be prepared for display at the Marine Section Meetings during the coming National Safety Congress. Mr. Dutton replied that every effort will be made to have at least some of them ready for display. He also agreed that others will appear at intervals through the coming year.

Mr. Dutton felt that the miniatures of these posters can be produced in the Newsletter and in the *National Safety News* as the posters are issued. He suggested that at the time the first poster appears that we feature in the Newsletter the fact that this is the first of a series and ask the members to watch for future issues.

The first poster is tentatively scheduled for announcement in Jan. issue *National Safety News.*▲

TANKER SAFETY DISCUSSION GROUP REPORT

C. A. CULVER

safety engineer, Atlantic Refining co., Philadelphia, Pa.

Meetings are held on the second Wednesday of each month at either the Board Room or the Library of the Maritime Exchange, 80 Broad Street, New York, N. Y., July and August excepted.

The following is a brief résumé of the meetings held since my last report dated June 11, 1957:

June 12, 1957—Joint meeting with Dry Cargo Group—Mr. Francis T. Brannigan, Safety Engineer, Safety and Fire Protection Branch of the Atomic Energy Commission, Washington, D. C. led the discussion on hazards incidental to the handling of atomic materials, particularly with regard to situations where there might be fire, collision, etc. *Approximately* 30 attended.

September 25, 1957—Planning program for 1957-1958. Tank cleaning and gas freeing operations were also discussed. 17 attended.

October 9, 1957—Mr. D. S. Wechsler, Safety Engineer for the Maritime Administration, Washington, D. C. led the discussion on dry scale removal from ship's tanks using a Lamb Air Mover. This system may be adaptable to tank cleaning operations on tank vessels. 18 attended.

We believe that we are growing each year and the good attendance is evidence that our programs are interesting. There are no recommendations to make at this time.

INLAND WATERWAYS COMMITTEE REPORT

F. A. MECHLING

vice president, A. L. Mechling Barge Lines, Joliet, Ill.

The inland waterways industry is now in its fourth year of concentrated marine safety activity. The program is satisfactorily progressing through the joint efforts of The American Waterways Operators, Inc., and the Marine Section of the National Safety Council.

Safety activities currently underway in the inland waterways industry:

1. AWO makes continuous distribution of Chart of Comparative Analysis of Western River and Inland Pilot Rules Applicable Jurisdiction to Inland Rivers and Waterways of the U. S. A.
2. The Inland Waterways Safety Contest jointly sponsored by the Marine Section of the National Safety Council and The American Waterways Operators, Inc., is now in its third year. Seven new companies are participating in the contest this year for a total participation of 42 companies.
3. AWO makes continuous distribution of printed booklet entitled "Accident Prevention Guide for Inland Waterway Industry."
4. AWO develops and distributes approximately 1700 copies of the monthly Safety News to Member companies and interested groups.
5. AWO renders continuous assistance to companies with their Accident Prevention Programs.
6. AWO in cooperation with the Marine Section of the National Safety Council, has designed a special insignia to be displayed on inland vessels receiving safety recognition commencing with 1958 awards.

GREAT LAKES AREA REPORT

D. L. BUCHANAN

director, Claims Division, Pittsburgh Steamship Div., United States Steel Corp., Cleveland, Ohio

During the past year, members of the Marine Section—Great Lakes Area—have been active in promoting and stimulating interest in Marine Safety. Some of the major activities have been as follows:

1. The addition of eight new members which will mean a substantial increase in participation in the Marine Safety Contest.
2. The promotion of an organization to be known as the "Great Lakes Discussion Group of the National Safety Council." This group is composed for the most part of members of the Marine Section—National Safety Council. Permanent officers have already been elected and the group plans to meet monthly to discuss problems with regard to safety on Great Lakes Vessels. Current injuries aboard ship of general interest will also be discussed fully.
3. Assisting the Lake Carriers' Association in the preparation of another Great Lakes Safety Calendar.

We plan to continue our efforts in 1958 to interest other vessel companies operating on the Great Lakes to actively participate in the Marine Safety Contest.

GULF AREA REPORT

ROBERT F. RADER

vice president, Lykes Bros. Steamship co., Inc., New Orleans, La.

I submit the following report of committee activities for the year 1957.

CHANGES

None.

ADDITIONS

None.

ACTIVITIES

The Delta Safety Society and its Marine Section and the Metropolitan New Orleans Safety Council and its Marine Section continue their activities in promoting the furtherance of accident prevention and safety into all phases of Marine Operations with the assistance and co-operation of local Steamship Companies, Stevedore Companies, the various Ship Repair Companies, the Coast Guard, the New Orleans Levee Board, the Board of Commissioners, Port of New Orleans, and other various companies related to the Marine Industry.

The Marine Section, Delta Safety Society sponsored a very successful Marine Section Program of the Louisiana Safety Association Conference, held December 10th and 11th of 1956. The Marine Section is again in process of sponsoring a similar program on the occasion of the Louisiana Safety Association Conference, December 9th and 10th this year. A very excellent group of speakers have been selected for this Marine program and with the many efforts being put forth by the Marine Section, we are looking forward to a greater attendance and a most successful program.

On January 14, 1957, in Chicago, a large group of Marine Industry Representatives from the East Coast, Gulf Coast, West Coast, and the Hawaiian Islands met for the purpose of forming a "Management Advisory Cargo Handling Safety Committee" in an effort to promote safety in cargo handling operations further throughout the United States. The Gulf Area has been well represented and very active in assisting to organize this committee, which was requested by the Bureau of Labor Standards.

The Metropolitan New Orleans Safety Council and the New Orleans Chapter of American Safety Engineers, Sponsors of the Seventh Industrial Safety Contest, which ended June 30, 1957, awarded certificates of achievement on September 18, 1957, to the following Marine Companies for their outstanding safety records:

Jahncke Service Incorporated ...	Marine #2	Frec. 2.27
Higgins, Incorporated		Frec. 5.15
Dixie Machine Welding & Metal Works		Frec. 5.96
Jahncke Service Incorporated ...	Marine #1	Frec. 8.54
Avondale Machine Ways, Incorporated		Frec. 8.75

The Marine Section, Delta Safety Society assists the Gulf Coast Offshore Oil Drilling Companies with safety problems when called upon and stimulates safety interest among other Industrial Marine Operations. There has been reported a 25 to 30 per cent increase in membership in the Marine Section, Delta Safety Society, this year.

PENDING MATTERS:

Mr. Elliot V. Parker, Chief, Division of Safety Standards, U. S. Department of Labor, attended various joint conferences of Steamship Associations and Stevedoring Associations, in Texas, Louisiana and Alabama, in 1955 for the purpose of outlining to these two groups Safety Standards proposed by the department for voluntary adoption by the Marine Industry. This matter yet remains under advisement.

RECOMMENDATIONS:

On account of time required to do the right kind of job, which is most important, a new Vice Chairman for the Gulf Area should be appointed forthwith.

As a result of the many supplemented efforts put forth this year by all members of the Marine Industry through their various safety organizations and individual company programs, the entire Gulf Area, should produce a very good record, safety-wise for 1957.▲

PACIFIC AREA REPORT

A. E. KIHN

president, California Shipping co., San Francisco, Calif.

The form of the report will take that of a few observations on safety as related to the Pacific Coast.

The record of marine casualties on the Pacific Coast was much better last year than it was the year before. In the year October '55-October '56 there were some five major collisions, a stranding and a vessel broken in half. This year, October '56 to October '57 there have been two serious marine casualties. One was an explosion in the fuel tank of a tank vessel in a shipyard which killed 10 men with more than one million dollars damage to the ship. The other was a collision in which a freighter sank a government dredge with the loss of three men.

These tragic accidents serve to remind us that constant vigilance is the price of safety.

Last year I reported on a safety problem on the Pacific Coast that is common to other areas. This had to do with the operations of small pleasure craft in waterways also used by commercial vessels, including seagoing vessels which, because of their size, cannot maneuver as readily as the small craft. Dangerous situations sometimes evolve when the larger vessels attempt to keep clear of the smaller vessels and at the same time avoid natural hazards.

Our good friends, the Coast Guard, have been cognizant of this problem and have taken action. I speak of the Mobile Boarding Units that have been organized and assigned to the various Coast Guard Districts. These units consist of a Chief Petty Officer with three men and a trailer boat and truck. They visit recreational boating centers where they check safety equipment in boats, distribute safety literature and otherwise strive to educate the boating public.

They take action where reckless or negligent operation of vessels is observed. This is a step in the right direction and it is our hope that the activities of the Coast Guard in this regard will be expanded to keep pace with the expansion of recreational boating.

During this last year we have had a trainee assigned to our firm from the Coast Guard Merchant Marine Inspection Service. The purpose of the program is to acquaint young Coast Guard officers, who will later be in the Inspection Service, with the overall picture of the marine industry to the end that they will be better equipped to discharge their duties. Lt. Bertrand Ronneberg is the individual assigned to our company.

He is a very personable young man and we are happy to have him with us. The association will be, I am sure, of mutual advantage to industry and government.

I close with my respects to you gentlemen and to the motives that brought you to the Safety Conference—the prevention of accidents with the avoidance of human suffering and the preservation of our ships and commerce.▲

PROTECTING OIL TANKER CREWS FROM ACCIDENTS

by CARL F. VANDER CLUTE

general manager, Marine Dept., Gulf Oil Corp., New York city

To cover the scope of the subject matter would fill a large-sized volume. On the other hand, I could give you a brief solution to the proposition. Safety means "NO ACCIDENTS."

Just as we are all against sin, so we all favor safety . . . that is axiomatic. It is also true that we are against those things that are unsafe. However, though we are against them and preach and try to educate crew members, we must realize that, like death and taxes, accidents will always be with us due to the vagaries of the human element.

It is our job to keep accidents to a minimum, especially since the courts have extended the range of liability to the point that the ship owner is the sailor's guardian angel. A seaman in the days of yore was considered the ward of the Admiralty.

In those days there may have been reason for such a doctrine. Today, that doctrine has been so expanded that the time has come when the courts should courageously repudiate antiquated doctrines of the horse and buggy era.

It behooves the ship owner to indulge in safety education as a protective measure. Educate the men to avoid the accidents to circumvent the need for the court to exercise its parental guardianship for the modern sailor. As a matter of fact, the men who go down to the sea in ships are well educated, intelligent men for the most part. They are, in the main, a credit to the high standards of the American Merchant Marine and need not be considered "Wards" of the Admiralty.

COURTS GUARD SAILORS

Nevertheless, today, the courts go far astray in treating seamen as Wards of the Admiralty. Seamen, as well as other men, have their frailties. A classic case is cited as follows:

The plaintiff, a seaman, rated as a fireman and watertender on the SS. _____, was injured while on shore leave in the port of Split, Yugoslavia. He had collected his pay and medical expense and now sued for 36 days maintenance. Going ashore about noon he resorted to a tavern where he drank one glass of wine.

He visited another liquid dispensary where he quaffed two glasses of similar vintage. There he met a woman who lured him to her room for purposes not particularly platonic; while there "consideration like an angel came and whipped the offending Adam out of him." The woman scorned was unappeased by his contribution and vociferously remonstrated unless her unregarded charms were requited by an accretion of "dinner" (phonetically put). The court erroneously interpreted the word as showing that the woman had a carniverous frenzy, which could only be soothed by the succulent sirloin provided at the plaintiff's expense.

MAN LOCKED IN

But, it was explained to denote a pecuniary, not a gastronomic dun; she then essayed to relieve his pockets of their monetary content. Completely thwarted, the woman locked plaintiff in her room. He kicked the door while he clamored for exit; not thus persuasive, he went to the window about six to eight feet above the ground and while there contemplating departure, he was quickened to resolution by the sudden appearance of a man.

So the plaintiff thus confronted leaped from the window and sustained injuries which hospitalized him in Yugoslavia and the United States. During the extensive period of his incapacitation his wages and hospital bills were paid by defendant; the only question confronting the court is his claim for maintenance over a period of 36 days.

ENTITLED TO SUE?

Consider the peculiar circumstances under which plaintiff met with his injuries: do they militate against the recovery of maintenance from the defendant? No authority with an analogous state of facts was cited by either side; the defendant contends the plaintiff accompanied the woman to her room and his leap from the window was tainted with his original immoral intent. Therefore, he is not entitled to sue for maintenance.

It cannot be consistently argued that plaintiff, having abandoned that original purpose and having sought to conserve his safety as well as the life of a good sailor, was acting on continuance of the initial immoral intent. In the court's opinion the proximate cause of plaintiff's leap from the window was not his original intent but was the concurrence of the locked door and the subsequent looming threat of the man.

FEAR CAUSED ERROR

The plaintiff's violent fear caused him to exercise an erroneous judgment to jump rather than drop to the ground. Under the circumstances, the window was the only solution presented to plaintiff in his emergency; at least he cannot be condemned for so conjecturing despite his starting on the wrong moral foot.

The court mentioned another case where a seaman on shore leave was not found to be definitely intoxicated from the consumption of three bottles of beer and his diving into a dry swimming pool was not construed as wilful or gross misconduct. The court did not find in the present case that drinking three glasses of wine rendered plaintiff intoxicated; nor did his jump from from the window denote inebriation. To hold otherwise would argue strongly against his ability to choose the means of escape and would indict him for an error of judgment which is not the law against one who chooses in an emergency one means of safety when another might have been more conducive to that end.

Peculiarly, the plaintiff chose the only means of escape even though it resulted in his injuries; had he elected to go out the door with the threatening man there barring the way, his injuries reasonably might have been more serious. Judgment was for the plaintiff for 36 days maintenance.

In another case a learned judge used the following language:

"Substantially all maritime risks are insured, and if we must suppose that the addition of this risk will show in the premiums, in the end it will be likely also to show in freight rates; and so far as it does, the recovery will be spread among those who use the ships."

COURTS FAVOR SAILORS

In other words, the court went all out to find against the ship because it was covered by insurance. It actually means that a ship owner must subsidize accidents to seamen caused by their own vices.

To take advantage of the beneficent attitude of the courts are some less desirable elements to whom education is of no value.

In this connection I again think that a U.S.P.H. certificate N.F.F.D. (Not Fit For Duty) is too broad. It makes no distinction between ratings. All are classed as seamen but the Public Health doctor doesn't know and cannot be expected to know unless industry tells him that there are different categories. A condition that would justify an N.F.F.D. for an A.B. or Oiler does not necessarily incapacitate a messman or wiper from performing his limited duties.

ELIMINATE HAZARDS

We must therefore conclude that while safety education is valuable and not to be discounted in any way, it has its limitations. It, therefore, is well for us to give considerable thought to the elimination of hazards wherever possible, or provide protective measures. In other words, reduce the exposure.

Assume that our sailor has navigated the voyage safely back from shore and to the ship's gangway. Here is a place where caution can be exercised in a preventive manner. Don't forget the ship is primarily responsible for the gangway even though it be furnished by the dock or shipyard. The gangway should have a proper approach and be properly rigged with man ropes or rails and well lighted after sundown.

A life ring with life line should be available at the gangway at all times. Above all, a life ring should be close by when a Jacob's ladder is being used for boarding. Every precaution should be taken to make sure the gangway is safe so that our sailor can get aboard without slipping, or if he slips, so he can't fall overboard. Proper treads and abrasive non-skid material between treads as well as well-rigged ramps when required, are essentials. Cleanliness is of importance.

ENSURE GANGWAY SAFETY

Recently, there was a case where a shipyard furnished the gangway and there was sand on it. The sailor slipped, but that's not all, one of the safety lines allegedly was missing and the sailor went over the side. The sailor was badly injured and it cost a large sum of money to dispose of the case.

The point is that the ship should make sure that the gangway is safe in all respects, regardless of whose gangway it is, because it forms the means of ingress and egress, and it is the ship's primary responsibility to see to it that such ingress and egress are proper and safe. This, then, is a matter of education of your ship's officers to realize that, even though someone else furnishes the gangway, it is their duty to see that it is safe and proper. As preventive medicine we supply the ships with the safest gangway we can buy.

Now our sailor is aboard. We must prevent his slipping for slipping cases outnumber all others. Here again, while all efforts are made to educate our sailor to watch where he steps and to maintain an even keel, it again behooves us to use preventive medicine.

We know ships are endeavoring to go all out and make all deck spaces non-skid. We have experimented with various items but find that the use of Fuller's Earth sprayed on the paint while wet establishes a very effective surface. However, nothing is perfect. A man without proper equilibrium must be regarded as unstable. He therefore becomes a hazard.

Our crews have developed several types of sprayers and thus created a competitive spirit, each trying to outdo the other. This competition, as well as the actual spraying leaves a lasting safety impression. The actual doing of the job is better than many lectures.

SHIP HOUSEKEEPING IMPORTANT

Good housekeeping aboard ship is always essential. Usually a ship that exhibits good housekeeping is an efficient ship which is conducive to a happy ship, and this all goes toward a safe ship.

Among others, the forecastle and the poop deck are places where good housekeeping is essential because of the gear and equipment—mooring lines, chains and stoppers, anchor windlass forward, winches aft. Pausing for a moment at the anchor windlass we, in Gulf, have experimented with anchor locking bars and brake bars. We are replacing the old heavy steel anchor bars with light-weight aluminum bars. We

also have provided a working platform to afford safe footing and a good position for a man when he has to lock a windlass in or out.

The forecastle deck is a location where non-skid decks are most important. Often wet, the possibility of oil from the windlass, mud from the anchor chains and wet mooring lines all contribute to the necessity for providing non-skid footing. However, failure of men to wear proper foot gear contributes materially to slipping and falling accidents.

PREVENT PUMP LEAKS

As we move along, let us stop at the pump room. The leakage of cargo into the bilge through the cargo pumps was a matter of concern to us. We have installed mechanical seals which eliminated this potential source of trouble. Incidentally, we have also utilized the mechanical seals on the fire pumps to eliminate wetting down the electric motor and putting it out of business.

We also advocate the installation of fog nozzles in the pump room. In the event of fire, if men are in the pump room the use of CO_2 would be disastrous. The fog nozzles permit fighting the fire and also give the men a chance to get out.

We feel that the use of good, light-reflecting paint—white, in our case—is helpful in preventing slips, bumps and other accidents.

After the pump room, it is natural to think of the tanks. We are experimenting with a deck eductor which is light and easy to handle. The type we are trying weighs only about 20 pounds and is easy to handle. It is kept on deck and only 1¼-inch hose is lowered into the tank. Whenever a piece of equipment can be made light enough to handle easily the hazards are reduced. The possibilities of dropping on toes, hernias, sprained backs and the usual run of injuries that can result from handling heavy equipment are reduced. This is the type of thinking I refer to as preventive medicine.

As do many others, we use the Coppus blowers, eliminating the old bulky and accident-prone windsails.

Mucking tanks still has its share of accidents. We furnish hard hats, rounded bottom-edged buckets and a special hook which is as near fool-proof as we can find. We have also reduced the size of the buckets to facilitate handling and reduce the weight. The latest plastic bucket we are looking at has no metal rim on the bottom, having only a top rim and a handle.

While we furnish hard hats, we know they are not always worn and by the use of the plastic buckets with no metal rim on the bottom, we hope that if a man is struck by one the results will not be as catastrophic as would be the case with the old metal buckets. With the deck eductor we are trying out, we hope to decrease the amount of mucking necessary and thereby reduce the exposure.

Apropos of our constant study to reduce weight to facilitate handling, thereby reducing the slipping, falling and straining cases, we have reduced the size of our laundry bags. This may sound like a simple proposition but we have found that one of these old laundry bags coming back with clean, folded sheets weighed up to 100 pounds. We have now cut the size of the laundry bag in half so that the maximum weight now is about 50 pounds, making it much easier for a man to handle. Since the institution of these smaller bags we have not had a claim resulting from carrying linen aboard or stowing it.

Throughout the ship ladders are constantly being checked to assure a good footing. Nevertheless, we still have men going up and down ladders "No hands" and, at times, winding up with an accident report.

CHECK LIST INSPECTIONS

We have a regular form which our safety inspectors use going aboard a vessel covering conditions in general, including safety items. We also have what we call a concentrated check list. Each month we select a group of items, usually eight and, in addition to the general inspection, have a specific examination and report on these selected items.

Our regular review of all accident reports sometimes suggests items for this list. For instance, one month might cover gangways, anchor windlass bars, screens on portholes, guards on fans, goggles, ullage opening screens, floor plates in the engine room, guards on gauge glasses, etc. The following month the list will contain different items. This check list not only is a preventive but

is also corrective if defects are found and aids in the instilling in the mind of all that safety is a mighty important commodity.

Through the courtesy and safety cooperation of the Navy Department we are sending as many of our officers as is possible to the fire-fighting school at the Philadelphia Naval Shipyard. As a result of this education, we feel our officers are more fire conscious and, hence, more aware of fire hazards and their elimination. After taking the course, one of our officers was asked what he thought of it. I believe he summed it up in good style when he said: "Before I went to the school I thought I could fight a fire, now I know I can."

PREVENTION EMPHASIZED

Again, the Navy has extended safety assistance (M.S.T.S.) and we are taking advantage of the opportunity afforded by sending our men to the Bayonne school, which covers damage control. The Radar school is another educational facility that we are utilizing as much as possible. This is all education, it is true, but is preventive medicine. It emphasizes safety through the interest we take in helping our men to prevent accidents.

Far be it from me to forget the Engine room spaces but our accident record in the Engine room has been good. This is a tribute to the men below and we hope we can continue to make this statement. Nevertheless, our inspectors have their items to check in the Engine room—the floor plates, leaky glands and guards.

Believing that repetition is one means of emphasis, we periodically replace the safety posters on the ships. We try to abstain from using signs that say WARNING because we are a peculiar people. Witness the WET PAINT sign which, for some reason, seems to have a hypnotic effect on many who must test the paint to see if it is wet. To many, a warning seems to have the same effect—a signal to take a chance and see if it is really true. Yes, people are funny but the pain and suffering of the man and the insurance costs that follow some of the consequences of the chance-taking establishes truths that create no hilarity.

Safety is serious business. It pays to play it safe and while the great importance of safety education is acknowledged it still behooves us to exercise all possible precautions to protect man against himself.

I publicly salute my staff, our ships' officers and men for we are proud of their response to our safety endeavors and grateful for their aid and cooperation for the common cause of safety.

PREVENTION OF ACCIDENTS TO CREW ABOARD FREIGHTERS

by ROBERT J. TARR

operating manger, Luckenbach Steamship co., Brooklyn, N. Y.

Our present "Shipboard Safety Program" was started in March, 1952, and is similar to the National Shipping Authority Safety Program and to the safety programs followed by other owners and operators of U. S. Flag Cargo Ships. It provides for the establishment aboard each vessel of a Ship Safety committee, with the Captain acting as chairman who, in the course of their safety duties, meet at least once a month to discuss all accidents since last safety meeting.

Also discussed are: New safety bulletins, safe practice pamphlets, safety directives and literature received since last meeting; report of, and action taken, by Ship's Safety Inspection committee; and report of action taken by "Home Office" to previous suggestions by Ship's Safety committee. Minutes of all meetings and recommendations of Ship's Safety committees, are promptly forwarded to our shoreside safety director in Brooklyn.

Now comes the most important part of the entire Shipboard Safety Program—the attitude and action taken by the "Home Office"—in our case our operating department—to these minutes and recommendations. Our safety director studies the minutes and recommendations as soon as received and forwards them to the operating manager with his comments.

The operating manager then reviews, together with the safety director's comments, and further discusses minutes and recommendations with his general marine superintendent, superintendent engineer, purchasing agent, port steward, supervisor-crew personnel claims, terminals superintendent and/or others in his shore staff that may be directly concerned with a particular safety recommendation.

HOME OFFICE FOLLOWS UP

Action is then decided upon and our general marine superintendent arranges for the necessary work to be accomplished—advising both our safety director and the master of the vessel originally submitting the recommendations. In the event a recommendation is turned down, both our safety director and master of the vessel submitting the recommedation are so advised—together with reasons for turn down.

It is this prompt follow up by the "Home Office" that is so necessary to the continuance of a high degree of interest by masters, officers and crew members in a Shipboard Safety Program.

Our "Safety Director"—the shoreside coordinator of our safety program—is also our port captain and Atlantic Coast pilot. This combination of duties works to the advantage of our safety program since it affords our safety director an opportunity, in addition to his overall shoreside supervision, to observe our safety program in actual shipboard operation at sea each time his piloting duties places him aboard one of our ships.

He thus often has the opportunity of "sitting in" on the Ship Safety committee meetings and presenting the company's shoreside views on many of the items brought up. On those vessels whose Ship Safety committee meeting minutes indicate a lack of enthusiasm, he utilizes this opportunity actually to take part in and rejuvenate, the interest so necessary to the success of any "Shipboard Safety Program."

I reviewed the minutes of all our safety meetings from March, 1952, and will relate some of the more unusual and interesting safety problems encountered by us in the past five and one half years, together with our solutions to these problems, plus a quick briefing on some of our present safety action and our safety training for the future.

OPERATE 16 VESSELS

We own and operate a fleet of 16 cargo vessels of C-2, C-3, and C-4 type, principally in the Intercoastal Trade but also in Off-Shore Service. Additionally, as general agents for the Maritime Administration, we have operated Mavi, Liberty, Victory and Mariner types of cargo vessels. Under Bareboat Charter from the Maritime Administration we have operated Liberty ships in the bulk grain, coal, and ore trades. Our review of our Shipboard Safety Program for the past five and one half years is based on this type of operation.

We have made nine subdivisions of our comments simply for ease of discussion rather than on the basis of safety importance since, with safety, every hazard is important.

GANGWAYS—LADDERS

Shipboard safety starts at the gangway. Gangways have been the subject of many of our safety meetings since a safely rigged gangway is important to everyone (crew, longshoremen, passengers, repairmen and officials) that boards or leaves a vessel in port. Our gangway problems have involved minor to major solutions.

Proper guarding of the gangway roller, after much experimentation, was accomplished in a simple and practical manner by extending the gangway floor boards about six inches beyond the end of the gangway—thus forming a guard over the roller.

The C-2 vessels of our fleet presented a major gangway problem since the gangways are rigged at cabin deck, rather than weather deck-level and with vessels in light condition the regular 38 foot gangway originally provided was too steep for safety.

After considerable study, we designed, and had constructed, aluminum 50 foot gangways for three of our C-2 vessels. The fourth C-2 could not properly house a 50 foot aluminum gangway and still clear the lifeboats—being slightly different in design. Therefore a 38 foot gangway with a 12 foot portable extension was designed and constructed of aluminum and our problems were solved.

GANGWAYS WERE HAZARDS

Originally our C-4 vessels had gangways fitted either between #3 and #4 hatches or at #6 hatch—both dangerous locations due to concentration of cargo handling activity at these large double-geared hatches. We relocated the gangways of our C-4's to the poop deck of the after house, just forward of the small single-geared #7 hatch, greatly minimizing the hazards from cargo operations.

Safety meeting minutes indicate a strong preference for "string-of-light" gangway illumination during darkness rather than a single makeshift light or a quickly rigged cargo light brightly illuminating only a small portion of the gangway and casting dangerous shadows over the remainder.

Safety nets are provided for all our vessels and our safety instructions require their rigging beneath ship's gangways not only at Pacific Coast Ports where longshore rules require their use, but at all Ports of Call. These nets have already caught, and saved from possible injury several late returning crew members who had lost their stability after faulty shoreside loading of liquid cargo.

A gangway hazard often complained of in our ship's safety meetings and one most difficult of completely satisfactory solution despite our best efforts, concerned a situation at our Pier 84, South Wharves, Philadelphia. Depressed railroad tracks run down both aprons of the pier. A large portion of our cargo, particularly steel, is loaded direct to ship from railroad car and some cargo is discharged direct from ship to railroad cars. This operation requires frequent "drills" of cars over the aprons.

CATWALK ACROSS DEPRESSED TRACK

The use of ship's gangway required persons to make their own way over the depressed tracks to, and from, the pier. As a partial correction of this hazard, a plank catwalk was provided across the depressed track from pier to edge of ship's gangway. This required "breaking" (uncoupling) each drill of cars just abreast of ship's gangway to position the plank catwalk. You can visualize the disadvantage of this plan.

Many crew members would not wait for the catwalk to be placed and, even when it was in position, some continued to make their way through empty freight cars or over the couplings between loaded cars—a most dangerous procedure. After considerable trial and error attempts to correct this hazard, we decided the complete solution required the design and construction of a shoreside, portable, platform type, lightweight gangway to span, not only the tracks, but loaded railroad cars as well and provide a safe, direct route from pier to ship, independent of ship's gangway.

We designed an aluminum gangway, swivel-fitted to a raised stairway platform on rollers at the pier end, but fitted with a special-alloy grooved slot for clamping to the sheer strake at the ship end. This design was a complete success. It spanned loaded railroad cars and eliminated necessity to "break" drills abreast of ship's gangway.

To insure only this one safe avenue is available, ship's gangway remains housed. This solution was costly. The gangway cost more than $2,000.00 and we have since purchased a second one for use when working a vessel on each side of the pier.

CUT PIPE RAILINGS

At certain periods we encountered gangway safety problems at Portland and, occasionally, at Terminal Island when the weather decks of our vessels, in loaded condition, dropped below the level of the dock. Our short, shoreside brows at these two locations when the above conditions prevailed did not form a smooth, even passage from dock to weather deck. Cutting the pipe railings on the cabin decks of our vessels to accommodate our shoreside brows (and fitting the openings with removable pipe railing inserts) corrected the hazard.

A hazard is usually created when a cargo hold ladder rung is damaged or knocked off during cargo operations which prevent prompt and permanent repair or replacement. We placed aboard each of our vessels several spare ladder rungs of a special type that can be quickly and easily clamped

in place of a damaged or missing ladder rung and perform safely until permanent repairs or replacement can be accomplished.

Safety meetings have endorsed aluminum step ladders aboard ship for gradual replacement of wood—based on the sturdier, lighter and more dependable properties of the aluminum from the safety standpoint. We gave them a trial and, although more expensive than wood, we find them a definite safety asset and feel their longer wearing qualities will minimize the cost differences.

PASSAGEWAYS—WALKWAYS

One of the frequent causes of falls appearing in safety meeting minutes is oil on decks. Oil in the vicinity of winches is a problem of good housekeeping requiring the cooperative clean-up efforts of both deck and engine departments. Poor footing conditions, however, resulting from fish oil compounds used in the maintenance and preservation of weather decks is a problem that has existed ever since the operation of ships with steel decks, and the solution to this problem seems to have been pondered just as long.

Despite the numerous weather deck coatings developed in the past years, fish oil formulas seem to remain as the best preservative, from the standpoint of economy, ease of application and results for maintaining weather decks on cargo vessels. Its use, however, presents slipping hazards even when intelligent precautions are diligently taken. We have tried, over the years, as have many operators, numerous recommended products to preserve our weather decks yet eliminate the slipping hazard associated with fish oil mixtures.

COAL-TAR DECK COATING

We had little success until a few years ago when we discovered a certain coal-tar base product and decided to try it as a weather deck coating—after properly preparing the test surface by shot blasting to bare metal. An experimental patch was applied alongside #5 hatch on a C-4—a most active location subject to extreme conditions of weather and cargo handling. This product dries quickly, forms a rather thick, protective, abrasion-resistant coating and produces a non-skid surface.

Our experiment worked so well that after six months of trial, we applied this product to the entire weather well deck of one of our C-4's. The product is relatively inexpensive. Initial application is costly since it requires bare metal preparation of surfaces and two or three coat original applications. Maintaining the coating and touching up abrasion spots is quick and simple.

Although our studies continue, I feel we will find, despite the original application expense of this product, we have eliminated the hazard of slipping, the sleep destroying noise of frequent deck scaling, the obnoxious odor of fish oil, also reducing the high deck crew costs of maintenance of the weather decks of this vessel. If this proves true, we plan to apply this coating to the weather decks of the remaining vessels of our fleet.

Our C-4 type vessels, when first acquired, presented a dangerous condition at sea for crew members to make their way over the weather decks, alongside hatches 3, 4, 5, and 6. This condition was more serious during bad weather and especially when vessels had deck cargoes stored in these locations. These engine-aft ships feed in the after house while the bridge and quarters for the deck officers and radio operator are forward, therefore it is essential a safe passageway be provided between the bridge and the after house.

NEED SAFE CARGO STORAGE

This hazard was discussed at many C-4 safety meetings. We finally devised a plan of installing portable deck stanchions, bolted to welded deck pads, in two rows on the weather deck, on both sides of hatches 3, 4, 5, and 6, to confine and provide a safe method of securing deck cargo and furnish a safe walkway on both sides of the hatch coamings. The outboard row of stanchions were installed as close to the sheer strake as possible, consistent with necessary allowance for bitts and shrouds and proper securing of deck cargo.

The inboard row were installed just far enough from the hatch coamings to provide a safe passageway alongside the coamings, on both port and starboard sides, for the crew. Pad eyes for lashing and securing deck cargo were also suitably arranged in rows close to the stanchions. This system completely corrected the hazard and provided a far safer and more economical method of securing deck cargo.

It required less shoring and lashing materials, lessened the time required by carpenters to secure (usually the last operation and almost always on overtime) and eliminated the expense of building last minute catwalks over the tops of deck cargo with the continual worry they might carry away with possible injury to, or loss of, a seaman.

This plan worked so well on our C-4's that we made similar stanchion installations on the weather decks of our entire fleet of C-2's and C-3's, abreast of hatches 1, 2, 3, 4, and 5. Several years ago the Maritime Administration indicated considerable interest in our deck stanchion arrangement for their "Clipper Class of Proposed Cargo Ships," since these vessels were also designed as engines-aft vessels and presented passageway safety problems similar to our C-4's.

STEEL CARGO CONTAINERS

Safe on-deck stowage and proper securing of the many small parcels of certain types of "label" cargo moving in the intercoastal trade was greatly improved safety-wise by our purchase and semi-permanent installation of large (20L x 8W x 7H) surplus, steel cargo containers for the stowage of this type of on-deck cargo. Again we found savings, as well as safety, resulted from our efforts. Expensive securing bins and elaborate covering arrangements were no longer necessary. The danger of "label" cargo coming adrift in bad weather was greatly minimized and our out-turns were greatly improved.

Providing additional lighting in emergency escape trunks of our C-4's has lessened possibility of injuries, as has installation of glass ports in all doors opening out into passageways.

Galvanized metal wind scoops, projecting at face heights into outside passageways, have been condemned in safety meetings. We have corrected this hazard by replacement with rubber wind scoops and, although about a third more expensive, they certainly are longer lasting.

To insure safe passage from engine room to steering engine room on our C-2's in rough weather, a door was cut in shaft alley escape to the stores flat, above the steering engine room, providing a completely inside route for the engine crew.

Longshoremen create hazards for themselves and the crew by their failure to leave walkways clear of pontoons, dunnage and assorted gear. Failure of longshoremen to replace rails when not working cargo is dangerous for the crew. Continual watchfulness on the part of ship's mates and relief mates is required to combat these hazards.

HANDLING GEAR SAFELY

Tip-top maintenance of all cargo handling and related gear aboard a cargo ship is essential to safety of crew and longshoremen. We maintain the cargo gear aboard our vessels in accordance with the very stringent rules of the International Cargo Gear Bureau, requiring annual inspection and Quadrenial Tests.

In addition, and most important, our mates are required to keep their "Register of Cargo Gear" up-to-date, properly logging every replacement or runner, shackle, block, chain, etc. Our general marine superintendent personally inspects the registers of every ship on call at New York during his general inspection of the ship and her gear.

All our C-2, C-3 and C-4 type vessels are equipped with ½ inch, improved plow steel cargo runners to provide a safe working load in excess of the rated single fall winch pull of the winches aboard these vessels.

HATCH COAMING SAFETY

Hatch coamings become scored from cargo runner abrasion and it is important from a safety standpoint that these scorings be built up with welding from time to time. If the grooves are allowed to cut deeply, a cargo runner will "hang up" temporarily in a deep groove and not follow the load, finally snapping out of the groove with a jerk, sometimes severe enough to upset the draft at the risk of those working below. Strict maintenance of hatch beam locking devices is essential to safety.

To modernize and improve the safety of our cargo gear and eliminate the use of rope for guys, we have equipped all our vessels with Guy Winches and Vang Stands and substituted more dependable wire for manila which has abolished entirely the need for preventers.

The positioning of cargo booms is often mentioned in safety meetings, and elsewhere in safety literature and discussions, as haz-

ardous and certainly the many booms dropped, with resultant injuries and near misses, give plenty of cause for concern. The favorite cause of boom accidents, from our experience, is the improper use of chain stoppers. The U.S.P.&I., in their Cargo Series Safety Letter #082057 entitled "Chain Stoppers," excellently covers this subject.

We have distributed copies to all our vessels for their safety program, as we do with all their fine safety literature. Many modern cargo vessels are equipped with topping lift winches as are our C-4's, which practically eliminate cargo boom topping hazards. Several years ago we purchased all the topping lift winches available from the conversion of C-4 type vessels and installed them after adaptation at the 10-ton boom locations on our C-2 and C-3 type vessels, for the prime purpose of safety as well as modernization of our cargo gear.

Hatch tent gantlines have carried away due to chafing by cargo runners. A safe gantline has received the study of safety people both afloat and ashore. After considerable experiment, we found ¾" chain pendants, rigged to allow hatch tent blocks to hang clear of gin blocks and cargo runners, to be the safest. We are just completing our program of chain pendant installations on all ships.

FIRE HAZARD ON BOARD

The worst hazard of all, and the most difficult to completely defeat, despite receiving the most attention, study and regulation, is fire. Smoking remains as one of the main causes of fire aboard ship. Careless smoking habits of the crew and illegal smoking by longshoremen during cargo operations, as well as by shipyard workers and contractors working aboard, have all contributed to shipboard fires.

It is amazing that we continue to run across cases of crew members smoking in bed and burning up bed clothing and mattresses, yet miraculously escaping serious burns themselves. Other companies may have experienced serious burns to their crew members from this absolutely foolhardy practice. In addition to constant hammering at this hazard via our safety meetings, we have found charging the guilty crew member for the bed clothing and mattress burned as a result of smoking in bed, has had some effect towards halting this practice.

Providing numerous inexpensive ash trays for crew use is helpful. At least with ash trays around crew members are not inclined to flick their cigar, cigarette, or pipe ashes into waste baskets where scrap paper provides the missing ingredient for a delayed action fire.

FIRE REGULATIONS DIFFICULT

Constant supervision is required to combat the smoking hazard. This is perhaps, our most difficult safety policing job aboard our ships. We have provided designated smoking areas for longshoremen aboard all type vessels of our fleet. These areas are permanently marked by signs and our chief officers are responsible for enforcing the smoking regulation program aboard ship.

Repairs aboard ship, involving welding and burning operations, present a potential fire hazard, utmost supervision on the part of vessel's Officers, Port Engineers and Job Foremen is essential to insure proper fire watch is maintained, adequate hose strung out, and other fire fighting equipment kept in readiness. Not only must the vicinity of the welding and burning operation be free of cargo, dunnage, paper and other combustibles but, even more important, a check must be made of the areas under the deck, or on the other side of the bulkhead from the area to be burned or welded.

A place where danger of explosion and resultant fire might not be expected but exists, is in motor lifeboats where gasoline fumes may accumulate under the boat covers and an attempt to unlash, uncover, and start the motor quickly could be disastrous. Motor lifeboats should be given an opportunity to air out after covers are removed and before attempting to start motors.

DECK PRECAUTIONS

Our experience indicates many more minor or "little things," aboard ship contribute to injuries than do major, or "big things." It is most important, particularly when working on deck handling mooring lines or working cargo gear, that only English be spoken. A misunderstood foreign word, exclamation or order could, and has caused accidents.

A clean chain locker minimizes the amount of rust and dirt flying around and endangering the eyes of the deck crew during anchoring. Wearing goggles during anchoring operations further guards against rust and dirt particles entering their eyes. The use of chain pipe covers at sea is also a safeguard to the eyes of the deck crew during anchoring since the use of cement is eliminated and, therefore, the hazard of flying cement particles.

The installation of lights under poop verandas has proven a safety aid during berthing and mooring operations in darkness.

INSTALLED RUNGS ON BOOMS

Whenever men are working over the side painting, a good precaution is to have a life ring on a suitable line floating under their staging. A sign, informing longshoremen that men are working over the side, is an added precaution guarding against the possibility of their throwing dunnage or other objects over the side, endangering the men on the staging. Securing the ship's whistle, while men are working around the stack, is good safety procedure.

As a result of recommendations in the minutes of safety meetings held aboard our C-2's we installed ladder rungs on the boom cradles of these vessels—making the task of securing booms safer, easier, and quicker.

Securing the bow and stern sections of lifeboat covers was made safer on our vessels by the installation of lifeboat ladders at the boat ends, fitted with safety rings to allow seamen safe use of both arms in securing boat covers. I have learned of a new design of boat cover with inboard, athwartship slots, instead of conventional fore and aft end slots, permitting the securing of the entire boat cover, in safety, from the sheltered inboard side of the boats, instead of from the exposed ends. We have arranged to give one a trial.

Another safety problem encountered by us, the solution of which resulted in some savings, in addition to increased safety, was the hazard to seamen painting over the side around the bows of our ships. Working from stagings in this bow flare area is precarious and the necessity of frequently shifting stagings results in a slow and costly job of painting.

We purchased a large, stable paint float, reconditioned it, equipped it with permanent, sturdy staking and a small outboard motor. This paint float is based at our Terminal Island berth and is used during loading and discharging operations by the intercoastal vessels of our fleet calling there.

Since weather is usually good at Terminal Island, we can easily complete the painting of both bow and counter areas plus the offshore side during the northbound call—completing the remaining side, by berthing opposite side to, during the southbound call. The small outboard motor is used to shift the float. When not in use, the paint float is chained to our terminal and the outboard motor kept in a locker ashore. Our experience has shown this paint float has not only greatly diminished a hazard, but has provided a quicker, better and less expensive method of maintaining the hulls of our fleet.

ENGINE ROOM HOUSEKEEPING

Constant engine room vigilance in keeping ladders, floor plates and catwalks, free of oil spots is necessary to insure good footing and avoid slips and falls. Flat bar coamings, installed around turbo-generators and steering engines to contain any oil leakage, prevent slipping injuries.

Often a simple modification to a projecting valve will eliminate a hazard to the engine room crew. Guards fitted over the exposed flexible couplings are a safety aid. Sometimes a few minutes spent in padding a particular overhead pipe or fitting that might catch that occasional extra tall member of the engine gang, could avoid a painful head injury.

We have eliminated the use of toxic carbon tetrachloride and substituted one of the safe chemical solvents now on the market for use in our engine rooms and electrical shops. (With the exception of carbon tet fire extinguishers in our motor lifeboats, we have practically eliminated the use of carbon tet on our ships).

Winch repairs seem to involve injuries too frequently to the engine force. It is essential that master switches to winches to be repaired, particularly in port, are turned off prior to start of repair work. Repairs should never begin on a winch next to an open hatch until a pontoon cover, or a section of hatch covers alongside the winch, have been replaced . To avoid lifting injuries to personnel, we have installed handles on the heavy brake housings of our winches for easier handling by two persons.

Insisting engine personnel use the inside route via shaft to steering engine room, in rough weather, has made for greater safety.

Expanded metal screen sections have been provided on operating level gratings over watch stander's stations to prevent injury from loose material above. We now obtain fire-brick for stores in packaged lots to reduce hazards from loose materials being handled in the engine room.

OTHER SAFETY MEASURES

Permanent welded pad eyes have now been installed in the overhead of upper engine casing on our C-3 vessels for safely securing paint staging and eliminating hazardous, makeshift rigging to inadequate beam lamps. We have provided new, lightweight, alloy chain falls, with extra length hoist chains, to enable safer removal of material from engine room to 'tween deck passageway, without transfer of load enroute.

Engine room ladders, at operating level, have been relocated on one of our vessels to provide safer pitch and existing hand rails extended for greater safety. We extended gratings and hand rails to certain machinery not originally fitted, to eliminate use of hazardous makeshift wood planking. We use portable steel ladders, with telescoping sections, during maintenance and cleaning inside the furnace of boilers. These ladder sections are also useful as supports for staging inside the furnaces—all contributing to safer working conditions.

On three of our C-3's, we have replaced burner registers with a different type to prevent dangerous flare backs and explosions from improper combustion. Signs are posted in all our engine rooms warning firemen to use torch when lighting-off rather than furnace brickwork or another burner. Combustion control system on these vessels was also modified to a later type to reduce possibility of flare-back from improper operation.

ALTERED, INSTALLED SAFETY

To insure proper ventilation for crew working in enclosed areas like tanks or boiler drums we have provided portable vent blowers with two ten foot sections of flexible hose.

Making minor alterations and providing simple installations and equipment has made our ships safer.

Providing a chute for dry stores on our C-2's and C-3's has eliminated the need of carrying stores down a steep ladder in a narrow passageway—thus avoiding lifting injuries to steward's department personnel previously experienced in this storing operation. Non-skid decks have been installed in the galleys of several of our vessels and the use of non-skid floor wax on regular galley tile floors has contributed to safety.

Prohibiting the use of tin cans as ash trays in crew mess areas and crew forecastles has avoided painful cuts. Many painful cuts results from careless dropping of glassware in the dishwashing sink. Providing plastic-covered glass trays has helped avoid broken glass and resultant cuts. Providing knife racks of micarta (U.S.P.H.S. Approved) and insisting chief stewards insure they are used prevent cuts from knives otherwise carelessly left lying around.

A can opener on one ship was condemned as a hazard! It was reported that the can opener was faulty and deposited metal shavings in the food during the opening operation— resulting in mouth cuts to several crew members. Even a seemingly harmless common household item like this may be a potential source of injury. We replaced all chipped enamel parts from galley slicing machines with stainless steel to prevent chips getting into food.

AVOID WATER IN GALLEY

Steward personnel must be continually cautioned against using a water hose for washing down the galley due to the hazard of water contacting the electric galley range. A rope safety line, rigged as a hand grab across galley ranges on our C-2's, has helped avoid accidents in bad weather.

Heavy refrigerator doors are bad medicine in rough weather, unless handled with extreme care. We have recently learned of a new type plastic door, weighing 90 pounds as against present doors weighing 500 pounds. This sounds to us like safety progress and we will certainly give one a trial.

Several of our C-3's were orginally designed and fitted with a lattice cross girder joining the king posts at the after end of #5 hatch. This girder presented a difficult and dangerous maintenance problem, due to continuous exposure to corrosive stack gases and resultant rapid deterioration. After study and consultation with regulatory bodies, we obtained approval to remove this lattice girder, during shipyard availability, and replace it with a one and one-quarter inch wire cross stay connecting the king posts. In this case economy rewarded our safety efforts.

Some years ago, we shifted our cargo operations from Manhattan to Port Newark, where aircraft activity at neighboring Newark Airport caused us some safety concern, since certain glidepath patterns ran fairly close overhead of our berths. A plane in trouble, attempting a landing during darkness, could be hazardous to our ships. We installed aircraft warning lights to the topmasts of all our privately owned ships to lessen this danger. There are several other ports where airports are close to berthed vessels.

PORT NEWARK TROUBLES

Heavy porthole glasses, in the passenger quarters of our cargo ships, worried us as a potential hazard to elderly passengers—ignorant as to their safe use. Winged at the top, a carelessly released chain could allow them to drop on a passenger's hand or fingers with serious results. We finally have devised a method to minimize this danger. A special alloy steel tension installed at the porthole hinge cases the port glass down—preventing it from slamming closed.

Heavy doors aboard ship have been the cause of many minor but painful injuries to crew's hands and fingers. By replacing those door knobs, that are too close to door frames to afford safe finger clearance, with handles, this type of injury has been minimized.

Minor head injuries to crew have resulted from badly placed bunk lights when a simple shift in location by the ship's electrician could end the hazard. We have installed chlorination and filter equipment to the drinking water systems of our fleet as a safeguard to the health of our seagoing personnel.

A Safety Educational Program aboard our ships has been undertaken with little lost time, simply by taking advantage of opportunities when crew are gathered together for regular ship duty purposes. On our ships we encourage instruction and demonstration immediately following fire and boat drills and while the crew is still assembled, in oxygen breathing apparatus, safety lamp, artificial respiration, portable lifeboat radio transmitter and fire extinguishers—giving one subject only at each drill, and each time by a different officer. Not only is this instructive for the crew, but each officer does some advance "boning up"—thus refreshing his knowledge of the subject he will instruct.

CREW'S INDIVIDUAL SAFETY

The individual crew member greatly controls his own "safety strings." His well being and safety aboard ship depend for the most part on himself. If he is careless in his working and living habits, no amount of thought and effort on the part of others can completely safeguard him from accidents.

Much has been written and discussed on the physical and mental fitness of crew members. I think the recent innovation of indexing both physical and mental histories of crew members will aid in sorting out those that are potentially dangerous to themselves and to their shipmates.

One would think all crew members would be conscientious about their own safety, wearing proper and safe foot gear aboard ship at all times, attending fire and boat drills properly clothed for the "real thing" (who knows when it might be?), keeping life jackets in racks provided under bunks, insuring electrical tools are properly grounded during use, taking those extra safety precautions against additional and unfamilar hazards while in shipyard or drydock, being careful about boarding, traveling in and leaving liberty launches—particularly in certain foreign ports where there is a tendency to overload and attempt longer trips in rough weather, practicing good housekeeping in accordance with U.S.P.H.S. regulations—these few things and so many more, should be only a part of the regular "safety thinking" of the individual crew member. Shipboard safety meetings are an excellent place to remind all to think and act safety.

From this you might construe we have solved all our safety problems. Unfortunately we, like others in ship operation, can never mark "finished" to the job of safety. It is a continuing effort and taxes the ability and ingenuity of us all. Cooperative effort and free exchange of information on safety problems and solutions among all of us will certainly speed our work in the safety field.▲

ACCIDENT PREVENTION IN PASSENGER VESSELS

by CAPT. L. A. RENEHAN
marine superintendent, Farrell Lines, Inc., New York city

The safety program of Farrell Lines has been in operation for eight years. The program was well planned, organized, conducted and well supervised. Initially it was accepted with great interest and enthusiasm. The ships' safety committees submitted interesting and well prepared minutes of safety meetings and made numerous intelligent suggestions for the improvement of conditions for prevention of shipboard accidents.

Manifold new practices were inaugurated, practices with which all of you are familiar, for you have tried them and they have been advocated in many safety publications. These were such things as paint schemes to emphasize danger areas, signs and posters cautioning and warning of hazards, various types of guards, non-skid treads, hand rails, safety locks, safety screens and new lighting plans. Ships were supplied with pounds of safety literature and posters. A safety magazine was published and it was an immediate success. It was widely circulated and read with interest.

But—let us not deceive ourselves, none of these procedures is the answer to a successful safety program. The key to reducing accidents is held in the hand of the seamen themselves by their adoption and exercise of safe work practices. To achieve this condition you must start to work at the top.

Throughout the promotion of this program, the importance of proper supervision by ship's officers was stressed continuously, and emphasis was made on safety and safety consciousness to such a degree that not only the members of the shipboard safety committee, but all of the licensed officers of every vessel were saturated with safety consciousness.

If the men in your ships have not yet reached this plateau of interest in safety talk and safety reminders, if they are still actively interested in a safety program and participate in this program with enthusiasm, then you are fortunate, but I must say that I feel that this condition is not permanent. The important question now is, how to ensure a continuation of this success that we have had and presently enjoy?

One of our shipmasters revealed to me the other day that the most odious task he performs in the course of a foreign voyage is the preparation of the minutes of the meetings of his safety committee. His explanation was that he was merely repeating dull, uninteresting material and repeating a worn out theme to his officers. As he described it, it was like requiring everyone in the ship to stay after school and stand at the blackboard and write, "I will be safe," several hundred times.

PERSISTENCE IN SAFETY

I am not for one minute going to deny the importance of persistence in safety education. The unrelenting emphasis on safety consciousness is what will develop safe work practices and eventually prevent accidents. This is the system that most of us employ today, let me call it the Punitive Approach. There may be raised eyebrows at this choice of words, but it is expressive of the current feeling of our responsible seagoing personnel.

The campaign starts with the safety director, in his talks with the captains, chief engineers, chief mates and chief stewards. By reminders, discussion and questions, he shapes the beginning of safety thought in their mind. He is exercising the primary responsibility of shore-based safety personnel. His interest, enthusiasm and tenacity sets the keynote of a safety program. By shipboard inspections and instructions to ships' officers, the groundwork is laid.

This must be the beginning, but it is only possible when the ship is in port. At sea, the Master must take up the cudgels and in turn convey this attitude to his officers. It is a matter of continuous education, by reminders and repetition. This method is a recognized necessity. By repetition and continuous remunders, the fundamentals of shipboard safety are established. We must persist in this! However, unless an effort is made to create new interests, a shipboard safety program will become a strongly resented bridge.

Let us look at some ways that spice may be added to this recipe. One way is through the use of financial statistics. All seafaring men are at heart conservative, money-conscious people. Most of them spend hours calculating their payoff. Also the more devoted they are to their job, the harder they work to save money for the company.

USE COST STATISTICS

This man responds quickly to cost and expense figures. He would be interested to know how much a lost time accident costs the company. I would recommend to you that this aspect of shipboard expense be illustrated to your responsible officers, not in general overall statistics, but in specific cases where an injury costs several dollars in time lost and claim settlements. The publication of specific cases from your claims experience would be of vital interest to your shipmasters.

The circulation of this information should be limited to the master and responsible officers, for if too widely publicized, it might serve to encourage an already claim conscious crew. There is a great value in this information when properly used, for once a shipmaster becomes aware of the actual dollars and cents costs of an accident, his interest in their prevention is a natural consequence. You are indicating to him your recognition of his position of responsibility.

It would be a good idea to explain to your masters the meaning of maintenance and cure, to show them the great facility with which a seaman becomes a beneficiary of this benevolent program. Properly inspired ships' officers could often take action that would prevent this much exploited financial drain. It would be well to explain how insurance is written.

NEED UNIFORM RATINGS

To continue with the statistical approach, I find that a certain amount of value of competitive statistics is lost in a lack of uniformity of accident ratings. You cannot expect a team to be interested in a contest in which each side keeps score in a different manner. There is a difference of opinion in the industry over what should be considered an accident.

The National Safety Council has developed an excellent formula for rating all industries by classifying lost time accidents. We find that in the marine field this system is not altogether feasible, inasmuch as so many claims are filed by seamen who have not suffered a lost time accident. Many a slight finger cut, or leg bruise will return to plague you as the spectre of a large claim in the form of an unreported accident.

Far better, we feel, to have the information and details of an accident than an impressive accident-free record. There is a happy mean to be established here, a system whereby a competitive spirit is maintained with the understanding that all accidents are to be reported. Perhaps the answer lies in an understanding between the ship and the office personnel. It is practically impossible to establish a clearly defined set of rules, but we have been working along these lines with notable success.

USE MAGAZINE, MOVIES

The prime mover in the campaign to encourage interest in safety in the fleet has been our Safety News. The value of a company publication, devoted to this subject, must be emphasized. Without using specific names of persons or ships, the embarrassing experiences, the boners and the accidents may be published and they invariably make good reading.

It is important to try to strike a humorous vein in this medium, for sailors dwell on views of other ships and a piece of such information presented in an amusing fashion is widely distributed. The message does get across and often without realizing it, your ships' officers are talking and thinking safety.

Shipboard movies are another excellent medium for transmission of the safety message. Most ships that carry passengers today, show films for entertainment. At various times during the voyage they are shown to the crew. If such feature films were preceded by a short reel on safety, you would have achieved an ad man's coup with a captive audience.

Unfortunately the number of such films is altogether too few. The U. S. Navy has

some good ones which, although not altogether applicable to merchant vessels, illustrate good shipboard practices. Perhaps some thought should be given to the possible production of additional films for shipboard use.

There is another matter which should be of vital importance to every operator of American flag passenger vessels. A strong movement is underway in the legislative circles of this country to enact laws and regulations intended to make safer, the ships that are already acknowledged as the safest in the world.

LAWS CAN'T BRING SAFETY

Much of this is a direct consequence of the tragic Andrea Doria/Stockholm disaster; much is part of a crusade of well intentioned but inadequately informed legislators. However, laws, rules and regulations do not make a safe ship. We have learned that the initiative must be ours, that this responsibility should remain with the shipowner.

At this moment there are over a dozen bills pending that would add additional controls and restrictions to the shipping industry. There are several committees that are now meeting with the intention of recommending regulations or legislation for ship equipment and cargo gear, ship construction, ballasting, stowage of bulk cargoes and the use of electronic and radio equipment. Some of this legislation is necessary and worthwhile.

It is not my intention to persuade or discourage the passage of any of it, but I will exhort you to take an interest in this development, to give it your close attention, to direct it to the attention of your associates, for without an active participation by everyone in this industry, we could be accused of falling into the same state of apathy that we try so hard to avoid among the men in our ships.

SAFETY IN SHIP REPAIR

by JAMES R. O'DONNELL

safety engineer, Avondale Marine Ways, New Orleans, La.

This paper will present the "human elements" of safety—those factors of safety which are inherent with each and every member of the production team. These elements are not exclusive; they may occur just as readily with a machinist as with a foreman or, for that matter, with management itself.

When an accident occurs we are prone to place the blame on machinery, equipment or conditions. It is a simple thing to attribute an injury to a faulty chisel or a piece of metal that was left in the middle of a passageway—but, what about the "human element"? Someone neglected to grind the "mushroom" off the faulty chisel. Someone neglected to remove the metal from the passageway. Although equipment was the instrument of injury, people were the cause.

There are numerous problems relating to Marine Safety which are common and readily identified as having accident potential: scaffolding, cranes and ladders. These are physical things that can be alleviated but, what about the other sources of accidents —the ones that present a hazard due to the behavior of people?

For the most part we assume that with proper instructions and adequate safety equipment the chances of an accident are almost eliminated. Actually, the chances are reduced but not eliminated.

INTANGIBLE HAZARDS

How about the "human elements" that we can not see? How about the inner reactions of a man when he must perform a job at great heights? How about the pattern habits that make a man reach for a cigarette before he considers the existing hazards around him? How about the physical condition of the man himself or the inability of the human body to resist the effects of a reduced oxygen area? These are the intangibles of safety—the "human element" that can knock the props from under any well planned safety campaign.

These factors can be held to a minimum only by the cooperation of every member in the plant. Fear of height is common with many men yet some will try to dispell the fear rather than let their foreman know that it exists. It is not a pretty thing to see a man freeze to a beam until he can be pried free and carried down by his fellow workers. It is still worse to see a man overcome with fear plunge to an unresisting steel deck, yet it has happened.

How can such a thing be prevented? How could I know what would happen? Such things can be prevented and it is part of your job to know that they will happen! If it is impossible to know each of the men in your plant at least know those who delegate work. Gain their confidence. Talk to them.

Learn all you can about the behavior pattern of the workers. Take time out to check the physical pattern of the workers. Take time out to check the physical examination records of the men who are called upon for unusual activity. Make periodic check ups a must and sell management on the idea.

CHART ACCIDENTS, CAUSES

Keep a chart on the number and kind of accidents that occur on each job. It may be a surprise to discover that the foreman with a fairly decent cost record is actually costing the company money through repeated accidents. These accidents are job costs, too, and have no more right to be charged to overhead than the steel plate that makes up a ship's hull.

The bull-of-the-woods supervisor is a thing of the past. A recent survey showed that autocratic supervision—again one of the "human elements"—was a definite cause of accidents. By considering injuries as "job costs" the burden is placed where it belongs. Although the books might reflect a good profit for a certain job, if the total insurance and settlement costs are placed against the job, what might at first appear as a highly profitable showing, may in reality turn into an astounding loss.

This procedure accomplishes two things, first, it definitely shows management the actual earnings of the job and, secondly, it makes the supervisory personnel liable for the safety of those who work for him. This responsibility, in turn, can be delegated to the foreman and leaderman who can effectively impress its concept on the men.

How rigid are your requirements about gas-freeing ships and barges? It is almost impossible to detect a lack of oxygen with the senses with which man is endowed—a casualty is usually his first indication.

HAZARD OF OXYGEN

Couple the knowledge that the workman can not identify a gas-laden atmosphere with the fact that a gas-free certificate is only good for the immediate period during which the enclosure is tested—even if the area is gas-free today, and you have a certificate from a reputable chemist to prove it, it may not be gas-free tomorrow. Nothing can be taken for granted! You must constantly check and re-check—you must be sure!

Men must be constantly reminded that they can not safely enter tanks and other closed compartments until they have been assured of the conditions. When this rule has been broken, and as long as we must fight the "human elements" of safety we know that there will be those who will violate it, the others must know not to attempt a rescue without proper equipment and a sound knowledge of its use. Otherwise, the would-be rescuer becomes another casualty.

The proper rescue equipment for this type of work must be on hand at all times as well as sufficient trained personnel to put it into use immediately—breathing apparatus, stretcher baskets for hoisting men out of holds and compartments, rope and other equipment for affecting an immediate rescue.

The men must be placed on deck, in a clear free air space, and resuscitation begun immediately. Where oxygen deficiencies are encountered it is the first few minutes of rescue that mean the difference between life or death.

Ventilation of all areas must be maintained at all times. Man feels that if he can breathe there is no danger. Assuredly, good ventilation is a definite requirement but it is not always a criterion of safety. Toxic vapors, inflammable gases and stifling smoke can be carried into compartments by inadequate ventilating equipment.

The practice of maintaining a watch at all potential danger points will pay real dividends. No man should be permitted to descend into any danger area without either a watcher or assistant standing by. In most instances it is advisable that the men entering the tank or compartment be attached to the watcher by means of a safety line tied securely around the waist.

A system of signals can then be arranged and constant communication maintained by jerking the line at periodic intervals. Watchers should maintain a tally of the number of men that enter a compartment and must never leave that area until properly relieved —even for a drink of water.

FIRE—ALWAYS POTENTIAL HAZARD

Fire is another hazard in all ship repair or construction where burning, cutting and welding are accomplished almost everywhere on board. Keep a constant watch and, when a fire starts, arrest it immediately. To assure its being kept under control, maintain sufficient extinguishers at strategic points on the vessel. Make certain that the extinguishers are fully charged and that the men know what kind to use for a given situation.

Lighting is extremely important. Well lighted work areas not only increase the efficiency of the workers but reduce the hazards. Keep the area well lighted and the lighting equipment in a condition conducive to prevent fires through sparking.

Air, oxygen and acetylene lines must be properly strung and maintained. A leaking line and a careless cigarette are a sure fire combination for trouble. Also, grease and leaking oxygen are another pair that can set the best laid plans of the safety department to naught. Loose lines scattered over the decks and across gangways are a constant tripping hazard.

There are many ways to overcome this housekeeping problem, depending upon the nature of your yard, and the equipment in use, but it can be done. Of course, it will take a little effort on the part of the men and their supervisors but it will pay off in safety.

One of the soundest pieces of advice in regard to safety and the "human element" that I ever heard was from an old chief engineer who had spent most of his life at sea. "You've got to use each of your six senses," he said, "to know danger before it strikes:

USE SIX SENSES

"Sight—to see fire, a frayed line or an obstacle in your path.

"Touch—to feel grease on a handrail, a bulkhead before it blisters from a fire on the other side or the warning heat from being too close to a hot pipe line.

"Hearing—to hear the hiss of escaping gas, the whine of a faulty machine or the warning cry of a fellow worker.

"Smell—the smell of smouldering rags, the pungent odor of gas or the hot smell of an overheated bearing.

"Taste—to taste the fumes of an overcharged bank of batteries, the acrid taste of an electrical fire or a spilled flask of acid."

"But," I said, "you said six senses. That's only five."

He chewed on his pipe stem a moment and then looked me full in the eyes. "Mister, I meant six and the last one is important. 'Don't trust any of them completely and learn to watch the other guy, too.'"

The "human element" in safety is something different than working with tangibles but people, too, conform to a pattern. The safety director must constantly observe and remind—actually he must never relax his guard or let those around him become lax in their attitude toward their own safety. Injuries cause so much suffering and unhappiness that to eliminate them is one of the most gratifying jobs a man could ask for.

NAUTICAL CHARTS FOR SAFE NAVIGATION

by H. ARNOLD KARO, Rear Admiral USC&GS
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The Coast and Geodetic Survey of the United States Department of Commerce has made an impressive record in promoting safety in marine navigation through significant achievements in charting the coastal waters of the United States and its possessions. The great progress achieved in improving the means and methods of conducting surveys at sea and improving charting techniques, has given the nautical chart its present high standard in precision and scientific status.

This basic product of the Bureau, together with related publications such as coast pilots, tide and current tables, and magnetic data for charting compass courses, provides an essential aid to safe navigation.

Since 1844 we have issued about 34 million copies of nautical charts. The total production for 1844, the first year, was only 169 copies. This rate increased steadily until by the Civil War period total annual output reached more than 50,000 copies.

By the turn of the century the volume of charts produced was raised to about 100,000 copies annually. Maximum production of over four million copies was achieved in 1945, in support of the war effort. The annual output of nautical charts now averages more than one million copies.

This impressive record was achieved in addition to the tremendous volume of aeronautical charts now being produced—a maximum of about 44 million copies for the present year.

Charting the vast coastline of the United States and Alaska, representing thousands of miles of tidal shoreline, is a challenging task. The U. S. Atlantic coast is over 28,000 statute miles. The Gulf coast is 17,000 miles, and the Pacific coast measures almost 8,000 miles. This seemingly endless zone of demarcation between land and sea takes on even here a greater significance when the 34,000 statute miles of Alaskan shoreline are added.

To survey this enormous stretch and portray it on charts so that land and offshore features including subsurface configurations are properly indicated, is no small undertaking.

A chart used by navigators is of maximum value only when it reflects completely reliable information. The great effort expended in producing a chart is not apparent in the finished product. The published chart represents thousands of man hours of careful work.

This work can be accomplished only after a vast amount of technical data are obtained by surveying ships supported by field parties engaged in geodetic, astronomic, gravity, tidal and magnetic observations. Both field and office activities represent never-ending labor that must be accomplished with a high degree of accuracy, often under adverse and trying conditions.

The nautical chart is a graphic representation on which the mariner may see, almost at a glance, many details of terrain, harbors and navigational features essential to safe navigation of his craft. The nautical chart gives warning of hidden dangers and enables the mariner to navigate in safe channels. The sea is never at rest and there are no landmarks to which the mariner can readily refer his position.

The fate of a ship and the lives of the crew, therefore, depend entirely on nautical charts published by the Coast and Geodetic Survey.

A small error in reporting a sounding could mean a costly accident—perhaps the loss of life. Yet every mariner has come to rely upon these charts implicitly and without question. Thus, the nautical chart is indispensable to the safety of maritime commerce. It is just as essential to the ship's equipment as are the engines or rudders.

The format and substance of nautical charts have come a long way since the days of the schooners and windjammers. In the early days charts consisted of an occasional sounding obtained with a hand lead and vague coastal features supplemented with

sketches of headlands and other landmarks. With the advent of modern shipping, new and more precise methods of recording the ocean bottom and adjacent coastal features became necessary.

The present nautical chart has been developed pursuant to that need. It is the ultimate in professional cartographic accomplishment demonstrated by the accurate delineation of survey data together with the skill and accuracy with which such data are portrayed on the chart manuscript.

The sea chart differs from a land map. Features on land are always seen and recognized, whereas at sea the greater part of features that are of vital importance to the navigator are hidden beneath the surface of the water. The navigator must have complete confidence in his chart for, unlike the user of the land map, he has no visible means of checking the information it provides and upon which the safety of his ship depends.

The nautical chart is a scientific instrument that should be treated just like any other instrument that has been carefully made and precisely calibrated. Rigid and minute accuracy is thus the first essential of every chart. The mariner must be furnished through his chart all information necessary for navigation, but essential details must not be confused by including information not useful to the navigator and which would result in needless congestion.

All charted details must be expressed with the utmost clarity and in the simplest possible form. Nautical charts, therefore, embody carefully selected data expertly portrayed by an elaborate system of symbols and precisely located by a rigid system of control. Every chart is prepared with one paramount consideration — to render the maximum possible service to the navigator in the clearest possible manner.

Until the advent of echo-sounding the mariner was afforded a minimum of soundings and had only limited means of visualizing the configuration of the ocean floor while navigating over deep water. This oldest of electronic surveying equipment is now used almost exclusively by the Coast and Geodetic Survey in determining water depths.

Thousands of soundings are now obtained in areas where formerly only a few scattered ones were economically feasible. Recorders connected with the sounding device provide a continuous profile of the ocean floor showing the ridges and depressions on a permanent visual graph. Many submerged features presenting great danger to navigation have been found by using echo-sounding methods.

The development of echo-sounding apparatus for general maritime use introduced a new factor in marine navigation. The navigator can now utilize the charted depths for fixing his position without stopping the ship and measuring the depth with a wire. This means that deep water submarine relief has become important to the mariner in a very practical manner. Significant changes in the appearance and usefulness of the nautical chart were necessary to make use of this new wealth of survey data.

Despite all of this progress in surveying and charting, undiscovered submerged rocks, reefs and unnatural obstructions still caused groundings and shipwrecks. Although we were able with the echo-sounder to effect intensive developments of underwater areas, obstructions were still missed with conventional hydrographic surveying techniques. It was therefore necessary that a safety technique be developed to detect the presence of small but dangerous submerged obstructions missed by regular depth sounding methods.

WIRE DRAG METHOD

To provide for this contingency the Coast and Geodetic Survey developed prior to World War I a unique method to supplement the ordinary methods of sounding in areas where pinnacle rocks, boulders or coral reefs were likely to exist. This apparatus consists of an extended length of wire, sometimes a mile or more long, supported at an adjustable depth by floats and buoys. The wire will snag on any obstruction which extends above the depth to which it is set. Many dangers to navigation have been found by this method along the rocky coasts of California, Alaska, the Gulf of Maine, and elsewhere.

The function of a hydrographic survey is to reveal hidden dangers. The function of the chart is to show them accurately. Once the obstructions are charted the navigator is aware of their existence and can shape his course accordingly. In recent years the wire drag method has been used effectively in locating and charting many wrecks along our Atlantic seaboard resulting from enemy submarine warfare.

The great advancements in navigation have steadily increased the demands for more complete and exacting charts. Improved techniques in cartographic presentation, the great strides made in hydorgraphic surveying methods and equipment, and modern advancements made in lithographic processes are reflected in the modern nautical chart of today.

About two decades ago the Coast and Geodetic Survey introduced a new type of nautical chart on which depth curves were given special prominence. Experience indicated that the most useful method of making full use of the wealth of survey data now available was by means of contours. Bottom irregularities that could not be charted by soundings alone were revealed by the system of depth curves which made use of all the soundings obtained on a modern hydrographic survey.

This entirely new technique of nautical charting marked the first radical change in the cartographic treatment of the nautical chart since the introduction of lithography with the use of multicolors in chart production. Prior to this time nautical charts were distinguished by many soundings and few depth curves. In contrast, the new charts are characterized by many depth curves and a minimum of soundings.

The choice of depth curve intervals to insure the most value to the navigator is a factor always given careful consideration. The thoroughness of available surveys, the nature of the submarine relief, and the scale of the chart enter into this decision.

Each depth curve appearing on a chart is equivalent to charting a continuous line of soundings of any given depth. The more irregular the bottom, the more applicable it is within limits to depth curve navigation. Submarine topography is now disclosed in many areas comparable in magnitude and extent to some of the major topographic formations found on land.

Depth curve navigation is especially effective in clearing dangerous headlands or foul areas during bad weather when visibility is poor. By selecting a curve which would represent the minimum depth that a navigator would wish to cross, the echo-sounding machine could be used in following a selected curve, thereby keeping clear of the danger area.

The increasing number of complex navigational instruments and aids which are now considered necessary for safe navigation sometimes cause considerable apprehension on the part of navigators. It should be made clear, however, that most of these new devices are worthwhile developments which make navigation easier and also safer, but certainly not simpler.

Navigators should never become so involved in the intricacies of supernavigational devices as to lose sight of the basic fundamentals of navigation. The qualified navigator need not be reminded of the importance of accurate nautical charts, complete in every detail, yet so simple in presentation as to be easily understood.

Modern nautical charts, when compiled from present-day basic surveys, have no parallel in the history of marine navigation. Regardless of how complex, automatic and seemingly infallible our modern navigational aids, systems and instruments are, the fact remains that they are tied to the chart upon which they depend for their ultimate accuracy in use.

Constant vigilance by navigators, using all the tools at their command, is essential in this modern age of high speed navigation. Any slackening of vigilance, including too great a dependence on any single instrument or method, may place a vessel in jeopardy.

The modern nautical chart is a superior product, a safety tool which, when used in its proper relationship with other aids, provides safe passage in marked as well as unmarked waters. But charting is not static —changes are inevitable and must be taken care of in any progressive charting program. Over the years experience by the Bureau has provided an unerring barometer to the lack of stability in our coastal areas.

Forces of nature resulting in unnatural changes create problems of instability of shorelines, inlets and bottom areas apart from uncharted rocks and other submerged obstructions. Moreover, sea-going ships are made larger and speedier. Navigational aids are continually being revised. New coastal structures and developments constantly create new hazards. Safety of navigation de-

pends upon accurate delineation of all these changes on the published chart.

The objection of our charting program is to furnish the mariner with charts which will show existing conditions at the time he is navigating the area covered by the chart. Therefore, new editions are printed at frequent intervals. Changes reported between revisions are hand-corrected on the charts so that copies are correct when issued.

Thus our nautical charts have been designed and maintained by an intensive system of revision so as to insure maximum usefulness of our coastal waters with the fullest measure of safety in marine navigation.

The Coast and Geodetic Survey is not alone in furthering the safety of marine navigation. Many other agencies play an important part in the overall safety program covering our navigable waters.

Special tribute is paid to the United States Coast Guard in this connection. This great organization has a long and most commendable record in safeguarding the waterways of the Nation. The establishment of navigational aids, the constant patrol and radio communications, search and rescue operations, and a notice to mariners provide an immense measure of security to maritime commerce.

The expanse of activities carried on by the Corps of Engineers in the dredging, improvement, maintenance and regulation of waterways is evident to all. Mention should also be made of the fine surveying and charting accomplished by the United States Lake Survey and the Mississippi River Commission. Both of these great organizations have specific responsibilities in promoting safety and facilitating navigation on large segments of our national waterways.

The United States Navy also has broad responsibility for the collection and prompt dissemination of critical information affecting sea navigation. Daily broadcasts from Naval radio stations, and weekly notices published by the Navy Hydrographic Office provide services of inestimable value to navigators.

In addition to providing this essential information on new dangers and shipping conditions, the Hydrographic Office has the major task of providing nautical charts and other information of extensive foreign coastal and oceanic areas.

The Weather Bureau issues storm warnings and other Federal and State agencies, as well as port users, furnish information of importance to the marine navigator and charting agencies.

The responsibility of safeguarding the lives and property of both passengers and mariners navigating the waters under the jurisdiction of the United States is a great one indeed. This great and important mission is accepted with a deep sense of dedication to the public welfare by the engineers and cartographers of the Coast and Geodetic Survey.

CURRENT DEVELOPMENTS IN INFLATABLE LIFERAFTS

by COMMANDER JOSEPH W. NAAB JR.
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Anything said about inflatable liferafts is a report on a recent development because they are so new. The lifeboat is only a little more than 100 years old. The United States first required certain vessels to carry "longboats" in 1838, and Great Britain, in 1854. Since that time we have seen considerable improvement in ships, but little change in lifeboat design except to add buoyancy tanks or blocks and in launching details such as gravity davits, power winches and quick releasing gear.

Conservatism of mariners and [illegible]ation of the seafarer and the passengers are the reasons for the changes.

Once a law requiring certain types of equipment is in effect, ship owners spend large sums to meet its requirements. Obviously, changing the type of equipment demanded by the law would be an uneconomic and highly unpopular move.

World War II focused attention on lifesaving equipment because of the tremendous loss of life at sea. Figures from the British Admiralty show that more than 100,000 men of the Royal Navy died at sea. Two thirds were lost *after* abandoning ship safely, and about 35,000 men died after they reached a lifeboat or liferaft.

Our Navy did not lose as many men in the water as the British because the larger part of our effort was in the Pacific where conditions for survival were better. But even then, when the Cruiser *Indianapolis* was sunk by a Japanese submarine, more than 900 men who safely abandoned ship in good condition died in the three days before rescue came, even though weather and water conditions were almost ideal. These figures showed the need for a re-evaluation of lifesaving gear, particularly on combatant ships.

During the War we used lifeboats, balsa rafts and so-called life nets on combatant ships. The same equipment was used in the Merchant Marine.

AIRMEN USE RUBBER RAFTS

While we were suffering frightful losses at sea, 26,000 Allied airmen were saved by inflatable liferafts. The success of inflatable craft directed the attention of the U. S. and British Navies to using similar rafts in place of traditional wood and metal boats and floats.

Over a period of years, lifeboat requirements have been set down by necessity, custom or law: reliability, seaworthiness, capability of being launched under all conditions, ease of boarding, resistance to damage, provision for shelter for survivors, capability of locomotion, provision for distress signals, and capability of being found.

Reliability of inflatable liferafts can be improved. The Civil Aeronautics Authority recently conducted tests with commercial airplane rafts and 10 per cent of the rafts failed completely while 90 per cent had some deficiency. This is partly because the specifications for these rafts do not require performance tests for acceptance. In Great Britain, to be accepted, a newly designed raft must be moored two weeks to a buoy in the North Sea with a full load of sand bags, as well as other tests.

One difficult problem was developing a satisfactory inflation system. All rafts now use carbon dioxide gas. In most cases this is satisfactory, but in cold weather inflation may be extremely slow. Raft manufacturers and other companies are developing a better system. One new system uses the jet or injector principle in which a small quantity of high pressure air is expanded through a nozzle at high velocity, entrapping large amounts of atmospheric air with it, and inflating the raft to its designed pressure of 2 psi in seconds. The obvious disadvantage is if the injector is underwater when actuated.

Reliability is improving by greater attention to details of manufacturing, including better cementing or vulcanizing of seams, lighter and stronger materials, and more rigid inspection and testing at the factory.

Part of the answer to insuring reliability after manufacture is periodic inspection. The CAA requires airlines to inspect rafts under a prescribed procedure every six months. If liferafts are used in large numbers, a similar inspection by highly trained technicians is necessary.

The seaworthiness of the inflated rafts is astounding. The record voyage was made by three airmen in the Caribbean who survived in a rubber raft 139 days before rescue.

RAFT EASY TO LAUNCH

In ability to launch, the liferaft has no equal because it can be rolled, carried, or thrown over the side and inflated in the water. A 20-man liferaft with all equipment weighs 300 pounds in stowage case, or about 15 pounds per man. In favorable conditions one man roll this raft over the side. Even under unfavorable conditions, three or four men can launch such a raft without difficulty. Smaller rafts of six and 12 man capacity weigh about 120 pounds and 200 pounds. In the case of the steam trawler *St. Celestin*, which collided May 1956, the

ship sank so fast the men didn't have time to put on their life jackets, but they safely launched their liferafts.

Liferafts are easy to jump into, and even to get into from the water. However, if survivors must swim in very cold water, or are impeded by life jackets or clothing, or are feeble or injured, it may be difficult to get in, even with the boarding ladders provided. The recent development of a boarding ramp has eased this problem somewhat. Getting passengers aboard rafts from large ships with 60 feet of freeboard or more is a particularly knotty problem. The solution appears to be ladders, or some sort of power lift such as the one recently patented by a Coast Guard officer.

The liferaft has good resistance to damage, as in the case of the *Gudrun*. Because of its resilience and tough fabric it can lie alongside a ship and withstand battering that would sink a rigid lifeboat. On the other hand, it is vulnerable to sharp projections and stowage deteriorating from creases in folding, heat, oil and sunlight.

However, a new fibreglass re-enforced plastic case improves stowage conditions. Rafts have a number of separate buoyancy chambers, so that a puncture in one will not sink it. In addition, the low pressure makes small leaks easy to control with the hand pump, mechanical leak stoppers and temporary repair kits that are part of the raft's equipment.

RAFT SHELTER FOR SURVIVORS

The provision of shelter for survivors is one of the most important considerations. Surprisingly enough, the inflatable raft does this better than open, rigid boats. All newer rafts have canopies, automatically erected when the raft inflates. Another feature may be a manually inflated rubber mattress-type floor to insulate the bottom. The latest model U. S. Navy raft has an entrance, which can be closed with a draw-string. There is an identical opening on the other end, and boarding ladders. A similar raft was tested in Newfoundland by having ten volunteers, wearing life jackets and outfits from dungarees to heavy parkas, jump over the side of a vessel into 34°F water and swim 25 feet to the raft. Then, without any heat except from their bodies, they stayed there five days. The average air temperature outside the raft was about 40°F but inside the raft it dropped below 70°F only briefly on two occasions.

For locomotion, the inflatable liferaft may have paddles, but even then it is difficult to move in any direction except down wind. However, with modern communication and airplane searches, it may be an actual advantage to remain in the vicinity of the disaster. If a good position is given with the distress call, and a number of rafts are in the vicinity, rescue is almost certain because their drift can be estimated. If the liferafts are propelled they are likely to be separated within a few days, and since their courses would be unpredictable, the search problem is intensified.

To send out distress signals, some lifeboats are equipped with radio. Some inflatable rafts are also, although the increased weight, expense and difficulty of maintenance have discouraged their use in commercial models. With transistors and new batteries, however, a two-pound two-way radio is available. In addition, the Armed Forces are developing a crash locator beacon, which is ejected automatically and sounds a radio call continuously for many hours. As with boats, liferafts are equipped with pyrotechnic signals.

Any other features that will help find survivors are desirable. It is difficult to see a small boat or raft from a ship in any seaway, and even more difficult from an airplane. Radar has eased this difficulty, but not eliminated it. Because they are larger and of solid material, boats give better radar response than do inflatable liferafts. However, this disadvantage can be overcome by using highly efficient metallized cloth, some of which is now incorporated in the canopies of the latest U. S. Navy rafts. Fluorescent dyes make rafts easier to find. A raft with a canopy of the best of these colors can be seen three or four times as far as the conventional one.

In addition to the standard rafts there are a number of special designs. One is the Arctic Shelter type. By using special materials, air spaces for insulation and special provisions for ventilation, this shelter can keep 20 people warm even under Arctic conditions. It is not yet in production.

The Navy has a special one-man liferaft to rescue men who fall overboard. It is ejected from its container and inflates automatically while flying through the air. The arch above the man's head has the metallized cloth radar reflector material, and a light activated on contact with the water.

The Air Force has one-man rafts for pilots, and it is working toward a parachute, liferaft and survival kit, all in one compact package which is ejected with the pilot.

The Coast Guard is working on a large raft to take people off sinking ships or ditched aircraft, and rugged enough to be a fender and landing platform for boats coming alongside the ship with survivors in rough weather. This raft is a self-bailer, because it is completely reversible, with the deck between the two supporting tubes. Even with a full load of passengers, breaking seas will drain out of the raft. In calm weather, the drains, which are reversible sleeves of the same rubberized cloth as the raft, may be closed to keep water out.

What are the prospects for increased use of inflatable liferafts? Obviously, because of weight and spare requirements, the airlines will continue to use them. For these same reasons, and others, the U. S. Navy and the U. S. Coast Guard have adopted inflatable liferafts to replace all other types of floats and rafts. In Great Britain, since October 1956 all fishing vessels 50 to 145 feet long are required to carry one or two inflatable rafts. Inflatable liferafts are also required on cross-channel passenger ships, cargo ships on coastal and short international voyages, ocean-going tugs and other small craft.

In general, every category except large vessels on international voyages is required to replace the present buoyant apparatus with liferafts. Vessels on international voyages are excluded because they have regulations for life saving equipment set up by the International Convention for the Safety of Life at Sea. The Convention forbids using devices dependent on inflation by either air or gas as mandatory equipment on the various types of vessels. Liferafts may be carried in addition to the required equipment, however.

Recent reports say the British Government has agreed with the Scandanavian countries, and other European countries to change the Convention to use inflatable liferafts in lieu of the present buoyant apparatus and possibly to replace some lifeboats, even on passenger vessels on international voyages.

RAFTS MAY REPLACE LIFEBOATS

The United States, as one of the signatory nations to the Convention, is precluded from approving inflatable liferafts on vessels in international trade. In addition, the United States Revised Statutes 4488, which lists the required "Lifesaving Appliances on Ocean, Lake, Bays and Sound Steamers and Foreign Vessels" specifically states "No boat may be approved, the buoyancy of which depends upon the previous adjustment of one of the principle parts of the hull."

Therefore, unless the law is changed, inflatable liferafts may not be substituted for lifeboats on United States vessels required to have them.

The Coast Guard is studying this problem with the other agencies affected. It may be some time before a decision is reached as to whether or not a recommendation by the United States for a change in the Convention should be made; or a recommendation to Congress for a change in R.S. 4488.

The use of the inflatable liferaft is becoming more widespread, and will increase as its reliability is increased and its cost reduced. It is already replacing the older type balsa and Carley rafts in many countries. One might be tempted to say that the inflatable liferaft will never replace the lifeboat entirely—but in this changing world "never" is a risky word.

RADAR PLOTTING ON MERCHANT SHIPS

by LOUIS M. THAYER, JR.
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The collision between the Swedish motor vessel Stockholm and the Italian steamer Andrea Doria, in July 1956, awakened people both in and out of the marine industry to the fact that radar in operation aboard ship is not necessarily a means for preventing disaster. The public is now aware that unless proper use is made of the information radar provides, the equipment is of little use for averting collision. The Andrea Doria-Stockholm collision would have been prevented if the information provided by radar had been properly used.

It is the purpose of this paper to discuss the information radar provides, and to illustrate how to use it properly. In this discussion radar is a navigational aid—perhaps the most useful aid to safety of navigation ever devised—from which the direction and distance of an object are obtained.

A pip is a bright spot which appears on the radar screen when an object is within range of the instrument; and a radar Reading is the bearing and range of the object at a given time. The Object is called a target, regardless of its true identity. Bearings may be either relative or true and ranges are in nautical miles and tenths. You are in charge of the bridge in a ship which is underway with way on.

RADAR READINGS

The information which radar provides is the instantaneous value of the bearing and range of a target. Since you are underway and moving, it is immediately apparent that each new reading on a target must be different from the last one (unless the target happens to be on exactly your course at precisely your speed—a most unlikely possibility). What does this mean?

Suppose that you should make a point with a grease pencil, directly on the screen, indicating the position of the pip each time it appears. If you then draw a line through this series of points, you will be making a trace of the Relative Movement Line (RML) of the target, and not its true course.

A series of readings on a buoy of known position, and then plotted in this manner, will result in a RML. Any target plotted in this manner will show relative movement, regardless of whether it is stopped or moving.

The relative movement line of a target is the course the target seems to be on; that is, if you are headed directly toward a buoy, and make a plot of readings taken on the buoy, a RML will develop: the buoy will seem to be on a course opposite to yours.

PLOTTING CHART

Likewise if you make such a plot on a moving target, the resultant RML will be the course the target seems to be on; and if there is danger of collision with this target, requiring you to maneuver to avoid her, it will do you little good to know the course she seems to be on: you must know her actual course, and her true speed. True course and speed of a target are obtained from a plot. If you plot and interpret radar information accurately, you are making proper use of it.

For the purpose of illustration, assume you are underway on course 000 true at speed 15 knots. You make radar contact, and take the readings which are recorded in the upper lefthand corner of the diagram. Proceed to plot as follows:

(Editor's note: Readings are plotted on a standard maneuvering board. Referring to the description which follows, point e is the center of the diagram; point g is seven and one half spaces along the 0 meridian; point 1100 is at 012 on the circle marked 10; points 03 and 06 are marked at actual bearing points of the pips; point a is the end of the line faired through the three points above extended to any point in the lower part of the circle. Line ex is drawn perpendicular to RML from point e to a point, x, on RML.)

1. The first line you draw is one to represent your own true course and speed. It is the line *eg*. The direction is 000. If you assume that one space between circles is equal to a speed of 2 knots (two nautical mph), then 7½ spaces equal 15 knots.

2. You then plot the readings: the first one, taken at 1100, was at bearing 012, range 10 miles. If you assume that one space is equal to a distance of one nautical mile, this reading will plot on the circle marked 10, at bearing 012. Label it 1100. The other two points, taken three and six minutes later, are labelled 03 and 06, respectively. A line faired carefully through the three points, and extended is the line 1100—a. As before, this is the Relative Movement Line.

3. Measure the distance between the first and third points: it is 1.2 miles. The target has moved 1.2 miles in six minutes; or, her speed along this RML—her Relative Speed—is 12 knots.

4. From *g*, lay down a line parallel to RML, and in the same direction. Make it long enough to represent the target's relative speed: six spaces equal 12 knots. Label the extremity of the line *m*.

5. Connect *e* and *m* with a straight line. This line, *em*, represents two things: by its direction, it is target's true course, 311; and by its length, 2.8 spaces, it is target's true speed, 5.6 knots.

6. Note the line *ex*. It is drawn perpendicular to RML. The point *x* is 1.4 spaces from you, and it is the closest point of approach of the target (CPA). In other words, when the target bears 290 degrees, she will be at her closest approach—1.4 miles.

HOW TO CHART

This is the plot. From first contact to its completion you should have used no more than 10 minutes, at which time the range would still be eight miles. You know now that the target is on your starboard bow; that she is on a northwesterly heading, at about 5.6 knots; that when she is dead ahead of you she will be four miles distant; and that when she bears 290 she will be 1.4 miles distant.

You check her progress, at convenient time intervals, and plot the readings. If they fall along RML, you know that there has been no change in target course or speed. If they do not fall along RML, you will know immediately of such a change, a glance at the plot will show you how the new RML is developing, and new course and speed can be calculated.

Suppose your master has left standing orders that you should never permit your vessel to come closer than three miles to another when you are underway at sea. If you decide to change course to comply with these orders when the range drops to seven miles, your new course, at 15 knots, is found quickly, provided you have already solved for target course and speed. It is 013; and CPA is three miles on bearing 304 true.

RECHARTING IN 10 MIN.

The entire time elapsed during recording the first few radar readings, and then constructing any plot should never be more than 10 minutes. Only three or four minutes of this time are used consecutively during the actual drawing of the RML and triangle. Of the other six or seven minutes, perhaps two minutes are used in taking readings and recording them; and the rest of the time the officer on the bridge can be away from his radar and plot, if other duties require his attention.

Is this too long? Does the process require that you spend too much time away from the ordinary duties expected of you? I think not. If there is another vessel in your immediate vicinity, it may be that your most important duty is to see that you clear her. What of additional readings, as a check of the progress of the target?

They should be taken, and plotted; but to take a reading and then plot a point along a RML require only a few seconds. If you should then find it necessary to make a change, you may do so, with full information.

Almost all ships in the merchant service today, and a great many other types of vessels, are equipped with radar. There is ample evidence to support the claim that if radar is properly used, it can do much to reduce the risk of collision to a minimum. A logical question is then, has there been a reduction in the number of collisions since the general installation of radar beginning about 10 years ago? This is a difficult question to answer. However, MSTS Magazine, in the January 1957 issue, carried the following revealing data:

> An average of nearly three ships a day collide. Lloyds of London lists 6,110 ships involved in collisions in the last

6 years—more than 1,000 a year. This listing does not include collisions involving ships of less than 500 gross tons. Nor does the figure include collisions in inland waters.

Last year in U. S. coastal waters and harbors alone more than 500 collisions occurred! This shocking statistic from the records of the Merchant Vessel Inspection Division at U. S. Coast Guard Headquarters excludes ferry boats, towing vessels, fishing craft, foreign registry ships and small craft.

Some of these collisions occurred in fog; others, in clear weather. Some took place in confined water; others, in open sea.

It is my personal opinion, based upon experience over the last ten years, that the vast majority of officers do not make proper use of radar to avert collision. There is widespread conviction among our officers that plotting such as this is not practical, that it consumes too much of the officers' time, and that, if the target changes course, the plot becomes useless.

I do not concur in these objections. I have talked to a great many officers about this subject, and have taught some. They agree that plotting is desirable, and that it is not too difficult. But I repeat, my experience is that the vast majority of them do not plot. Why? I think the reason is that they do not fully understand how easy it is, in spite of the fact that an instruction diagram looks complicated. They shy away from it because they are not proficient in its use. Some carry the plot only so far as to draw in the RML.

If this line indicates that the vessels will clear satisfactorily, no further information is derived. This is better than nothing, but my objection is that unless the plot is developed further, the officer cannot determine whether the target is approaching, crossing, or being overtaken, under certain conditions.

DIRECT PLOT USED

Some officers make what is known as a direct plot: that is, they make the plot directly over the screen, using grease pencil and some built-in features of certain types of equipment. There is no objection to this method. The same principle is used, and the same results can be obtained. I prefer the maneuvering board for at least two reasons: greater accuracy is gained, and it is a lasting record of your plot, to be used, to demonstrate before a hearing how and why you altered course and speed.

Some officers claim they use a method not involving relative movement. If this procedure is used, you lay down your true course on an ordinary plotting sheet, and step off your positions along this track line to indicate where you were when you took your readings. You then plot points to indicate where, with respect to each of your advanced positions, the target was when you took the readings.

A line faired through the points so plotted will be the target's true course. You can then calculate her true speed by using distance sailed along true course during recorded time intervals. You can also discover changes in course and speed. But this method is not recommended. It is too long and involved, requiring great care and accuracy.

An officer who makes such a plot is indeed spending too much of his time away from other duties, because if he develops this plot far enough to be of real value, he has little time for anything else while there is a target in range. It is somewhat like using addition rather than multiplication to arrive at the answer to the problem 10 times 12.

U. S. REQUIRES PLOTTING

If I am correct in my opinion that most officers do not plot, we are permitting a dangerous practice to survive. Are we doing anything about it? The United States is doing something; we are requiring that any applicant for an original license in the merchant marine must demonstrate his ability to plot; and we are also requiring the same sort of demonstration of any officer who desires to raise the grade of his license.

Great Britain is requiring something more: after the Andrea Doria accident, the United Kingdom took action to increase the requirement for a deck officer's license to include the submission of a certificate of proficiency as a radar observer.

The courts of Great Britain, Canada, and the United States have added stimulus to the need for plotting: they have found that any vessel involved in a collision is at fault if she is equipped with radar and is not making proper use of it; that is, unless the officer on watch is making proper interpretation of the information his radar provides, the vessel is at fault!

New types of equipment are now in use, and others are being developed and/or evaluated. The Decca company, a British concern, has a type on the market known as True Motion Radar. American companies are in the process of evaluating models of equipment of the same general type. These equipments will show the mariner his own true motion and also the true motion of targets within range.

Stopped targets are recognized at once as being motionless, and thus the mariner has a sort of bird's eye view of his immediate surroundings. No plotting is necessary with this gear. The equipment is not in general use at this time. It may become the answer to our current problem when more ships install it.

In the meantime, deck officers must learn to plot. More important, they must make complete plots if they are to rely on radar for the purpose of averting collision. If they do not, they are permitting themselves to be trapped into a frightening sense of false security. Properly used, radar should build a reassuring sense of true security; but improperly used, it can do more harm than good.

No deck officer would think of failing to work out a sight after he has taken an observation with a sextant. His observation is of no value; but his line of position is. Why then should the same man fail to make a plot of radar information? A series of unplotted readings is of little value; but a proper plot is invaluable. Such a plot on the bridge of both Stockholm and Andrea Doria would have saved lives, anguish—and vast amounts of money and property.

Remember, many accidents have happened because the officer was too busy to plot, but none, of which I have any knowledge, has occurred because the officer was too busy plotting.

THE NEW NUCLEAR—EQUIPPED, GUIDED MISSILE NAVY

by VICE ADMIRAL J. M. WILL, USN

commander, Military Sea Transportation Service, Dept. of the Navy, Washington, D. C.

There was a time when sailors who wanted to retire would say that they would begin to walk with an oar over their shoulder and, if someone asked, "What is that?" then they would settle down in that particular place. It is no longer even possible to joke that way because the Navy has become an integral part of your defense, a sizeable customer of your products, and a patron of your research.

I know safety is a theme that needs to be sounded in these remarks. First, I want to talk briefly about safety on an operational level, and then about safety in terms of national defense.

We are proud of the fact that when an SOS goes out, MSTS ships are in a position to answer quickly. They are often the first ships there. We are proud of the "Distinguished Sea Rescue Award" that the USNS FREEMAN received from the American Merchant Marine Institute and the Marine Section of the National Safety Council.

MOST DANGEROUS INDUSTRY

The National Safety Council now rates the maritime industry as the most hazardous industry in America today. Avoidance of hazards becomes a matter of economics as well as one of humanity, for every good administrator knows that he saves money when he succeeds in having a good safety record. MSTS feels that it is responsible to its customers, the military services, for

economical operations. We pass on our overall savings to the military services and eventually to the taxpayer.

Therefore, we feel that it is important to us that our operation be as safe as we can make it. In 1956, you recall, 12 commercial companies competed for the National Safety Council's Marine Section Safety Award. First place was awarded to a commercial line with an accident frequency of 5.58 for each million crew man-days worked. Although MSTS could not be included in the contest category, we were proud of our over-all accident frequency rate for 1956 of 3.86.

While the national accident rate average is declining, accident costs are increasing. For instance, in naval aviation, even though the accident rate has decreased, the cost of major accidents in aircraft damage alone has increased from $150,000 per accident in 1956 to $222,0000 in 1957. Only persistent attention to two factors, personnel and material, can reduce accidents.

As equipment becomes more complex, the selection and training of personnel becomes a critical consideration. The advent of nuclear power on merchant ships will present operators with the same problems of training and retaining qualified men that the Navy now faces. Management must continue to promote safety consciousness with new developments. Of course, the improvement of equipment is a primary consideration. We need to devise systems to reduce accidents, and then to find the money to install those systems.

Let us talk now about safety at the level of national safety.

SEA STRENGTH THREATS

I am not simply stretching a point: I believe safety is a matter of avoiding risks and being prepared to cope with emergencies and I think that "The Nuclear-Equipped, Guided Missile Navy" does just that. I was asked to present to you a closer look at the new nuclear-powered, guided missile Navy which will give our nation a margin of safety. We know the necessity of building up our defense capabilities because we know the threat to our sea control has become more and more evident. Let me emphasize this with some examples.

Consider for a moment the relative sizes of the submarine fleet of Hitler's 57 submarines at the start of World War II compared to that of Russia's present 475 submarines. We remember the disastrous result of our early inability to cope with the submarine menace to shipping in World War II.

During the year 1942, the United States and her allies lost 1,144 ships, and a total of more than eight million gross tons were sunk. During this time only 106 German and Italian submarines were destroyed. It is the Navy's primary responsibility to give merchant ships safe passage. We must be prepared to meet this real sea threat.

Another example of this growing sea threat occurred not too long ago. Television carried the newsreel picture of the Soviet cruisers steaming through the Suez Canal. The Russians are aware of what they have termed "gunboat diplomacy." This was an inconsequential ship movement, but it is symbolic of a total picture in which we find ourselves pitted against the rapidly growing sea power of Russia.

INSURE CRUCIAL TRADE

Our strength and the strength of the free world allies ultimately rests in our use of the sea lanes. Every day more than 2,000 merchant ships steam the North Atlantic sea lanes. The Navy must be ready to protect this shipping, for our real power lies in this maritime capability.

One of the strengths of our peacetime economy—a cold war strength—rests in our selling four billion dollars more than we purchase. During peacetime, our standard of living is maintained by this trade, and during a war this trade becomes critical to our industries. Of our leading imports, 66 are considered of strategic importance. It is significant that there are only a handful of these imports in which we can be self-sufficient. In a very real sense we are a "have not" nation—dependent upon vital imports.

Of course, our allies are definitely dependent upon us. It is a necessity then for our economy and for our national defense that we control the sea lanes: Sea power insures that sea control. Sea power, the naval capability, and the merchant ship delivery ability, will deter and may prevent war.

In understanding naval sea power, however, it is important that we do not think in terms of matching Russia ship for ship. It is estimated that she now has 2,700 ships, of which a good many are ships of the line. This exceeds our Navy in number, but not in striking potential. Our new Navy is built on a concept of mobility: Mobility on the sea, under the sea, and in the air—a mobility which extends vastly the range of our effectiveness by the use of high speed nuclear propulsion, guided missiles and supersonic aircraft.

Recently, for instance, aircraft of a carrier on the west coast flew non-stop to a carrier on the east coast. And, not long ago, this same type Navy plane crossed the United States in three hours and 23 minutes to break the speed record.

The mobility of the new Navy is a part of our strategic concept that we need to be capable of applying appropriate force, controlled in degree, to precise targets rather than be capable of delivering mass annihilation. Too often we structure our thinking to the concept of all-out nuclear war. The feeling that limited wars are a thing of the past is not justified for instance by the experience of the limited wars in Korea and Suez. Nor is it justified theoretically: Mr. Murray of the Joint Committee on Atomic Energy summed it all up very well when he said:

> "The alternative to limited war is moral indignation, but whatever its value, moral indignation is not an adequate instrument to insure the success of the American mandate over the Communist mandate."

NEED ALL ARMED BRANCHES

Our defense must not be limited to one strategy, one weapon, or one service. Our national safety necessitates that we guard against the "all eggs in one basket" idea. We need all "four services"—the Army, Navy, Air Force, and the Merchant Marine. No one of them has the ultimate weapon, nor the ultimate answer. To discharge the Navy's responsibility in defense, we must have a versatile fleet—one that is mobile and packs a real punch.

Let's look now at the Navy's plans for a mobile fleet. These plans are centered around the fast carrier task forces. At the center of this task force is the attack carrier. The Navy plans to begin building one of these nuclear-propelled carriers in 1958, and it is contemplated that five more will eventually be built.

By 1965, then, with the conversions of existing conventionally-powered aircraft carriers, and the addition of new ones already authorized, we will have 15 aircraft carriers, of which six are programmed to be nuclear-powered carriers, and the others will be the big FORRESTAL type, capable of handling the present heavy aircraft. The costs of a conventional aircraft carrier and a nuclear-propelled one are comparatively equal at about 350 million dollars—equal if you consider that the conventional carrier necessitates the cost of operation and maintenance of an oiler.

What do we gain with this nuclear-propulsion? Speed, endurance, and safety. The flight deck has been redesigned without the stacks; without these vulnerable uptakes, the air-tightness against fallout is improved and we are independent of a critical oil supply. These are among some of the advantages in addition to the tremendous mobility gained in being able to steam at full power for an extended period of time.

PLANNED FOR '61

Now, out in our disposition around the carrier center are our guided missile cruisers. By 1961, we will have 12 of them, one of which will be new construction and the others will be conversions. The armament on these ships reflects the fact that World War II guns simply cannot combat the aircraft of today. The Navy's research and development in rockets and missiles goes far back in time, but it has been only within the last two years that production and installation have been made possible. Even now, some of the types of missiles are not in a production status.

These cruisers are big enough for the TALOS missile. Some of these cruisers will have TALOS twin launchers fore and aft. The TALOS is one of the five different missiles which are now operational. It can use either high explosive or nuclear warheads against ships or shore bases as well as against high-speed aircraft and other missiles. It is considered a surface-to-air missile and can deliver to any altitude that airplanes fly. Powered by a ramjet engine of 30 inches in diameter, it has a velocity several times the speed of sound.

Beyond the cruisers in our task force ring—dispersed at long distances because of the nuclear bomb threat—are the new frigates. The frigate is larger and faster than a destroyer and it has a longer operating range. It is about two-thirds the size of a World War II cruiser. There will be 10 of them completed by 1959; eight more are planned for 1962 at which time we will have a force of 18 frigates equipped with the TERRIER guided missile.

The TERRIER is smaller than the TALOS—it was a preliminary development to the TALOS and was so good, it was kept. It is 15 feet long and weighs about 1,100 pounds. Now you all have heard of the missile cruisers, the BOSTON and the CANBERRA, and the destroyer GYATT. They are now operationally carrying the TERRIER. The frigates will be equipped with twin TERRIER launchers fore and aft. With long-range radar and long-range sonar, these ships become part of the anti-submarine defense, as well as the anti-aircraft defense.

TARTAR—NEWEST

The destroyers in the carrier screen will be carrying a smaller missile called the TARTAR. The TARTAR, which is still highly classified, is the newest and smallest of the surface-to-air missiles and is being installed in guided missile destroyers under the 1957-1958 conversion program.

The REGULUS I is a 30-foot swept-wing pilotless aircraft capable of delivering everything from an atomic punch to photographic reconnaissance. It is operational in the fleet. The REGULUS II, its successor, is longer ranged and is supersonic. It has undergone extensive tests and will soon be operational in the fleet.

Time does not permit a complete rundown on the shipbuilding plans of the Navy, but I know you are all interested in the submarine planning. So much has been said of the NAUTILUS that it need not be repeated here. The SEAWOLF, of course, with a different nuclear coolant, had difficulties with leaks. I understand that it is limited to 80 per cent of its capacity and that the sodium coolant system will not be used in future plants.

The Navy plans to build three guided missile nuclear-powered submarines which will carry the REGULUS II weapon. By December 1961, it is expected that we will have four nuclear-propelled and four conventionally-propelled guided missile submarines. These submarines will have four torpedo tubes in addition to the REGULUS II.

By 1961, too, we plan on having 15 nuclear-powered submarines which are designed for destruction of ships and other submarines. They will follow the plan of the NAUTILUS, incorporating what has been learned to increase speed and save on weight.

In addition to the major missiles in the fleet arsenal, we have the SIDEWINDER, the SPARROW, and the PETREL carried by our aircraft. They are all air to air missiles.

FLEET BALLISTIC MISSILE

Of special importance in the future will be the fleet ballistic missile, the POLARIS. Essentially, a ballistic missile is a space missile. It gets only an initial guidance, and thereafter it follows a predetermined trajectory path above the atmosphere in free space. The guided missile, on the other hand, has a mechanism which homes onto the target. The ballistic missile must be fired at a fixed target whose geographical location is known.

For this reason, the ballistic missile cannot very well be fired at a ship or task force underway. It can be fired, however, from a ship against a fixed land target, and we have already commissioned a ship to secure the data from tests and evaluations necessary for effective firing. The fleet ballistic missile expands our range of firepower: we can lob nuclear warheads 1,500 miles, effectively demolishing the source of the enemy's seapower strength. With the Navy's carriers and submarines we do not need an intercontinental ballistic missile.

The Navy consistently emphasizes that its role is the control of the seas, not the strategic destruction of inland targets. But you can readily see that such a weapon whose base does not depend on the use of land in foreign countries, and whose location cannot be determined, actually extends our total capability for sea control.

Let me draw together here some salient points. First, Russia has been a political, economic, and moral threat to the United States for a very long time; recently, she has become a mighty military threat and even more recently, she has become a threat to our sea power: We must be able to move merchant ships when and where we please, both for our peacetime economy and in a wartime situation.

USE NAVY FOR DEFENSE

We must be ready to utilize our Navy not only as a sea lane protector, but as a siege weapon during wartime to prevent the enemy from utilizing his harbors, his shipbuilding facilities, and his exits to the sea.

We must have a force which can move rapidly, which is sufficiently mobile to cover strategic areas to deter wars, not with the threat of nuclear annihilation, but with the threat of limited and controlled force.

In order to play it safe, we have planned for 1958 the building of 19 new ships and are converting five existing naval ships as well as converting seven merchant ships. Our building program includes carriers, cruisers, frigates, destroyers, submarines, amphibious assault ships for helicopter platforms, ocean radar station ships, and a survey ship to get precise data for ballistic missile launching.

We must face the fact that defense does cost. Defense has always been a major item in any nation's budget. Not only are we faced with rising labor costs and rising material costs, but we are faced with the tremendous expense of this new equipment. Personally, I feel that security is worth paying for, but I know that we must face these growing costs with a determination to find ways to reduce all nonessential expenditures. We must work diligently to improve the quality of our weapons. We must continue to do our utmost to attract and retain men of high quality. I am confident that the nuclear powered Navy armed with guided missiles, even though costly, is economical for it helps to insure our security.

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CURRENT SAFETY TOPICS Volume 17

GREEN CROSS FOR SAFETY®

METALS INDUSTRY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE METALS SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Metals Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Metals Section carries on in behalf of its members, and for the benefit of accident prevention work in the metals industry generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of metals plants.

The activities of the Section are under the direction of its executive committee, the members of which are listed at the close of this volume.

In addition to selecting and developing men to supervise in good safety work, we promote an active program by providing our supervision and workers with the proper tools, environment, and incentives to work safely. These include the following:

GOOD HOUSEKEEPING

Good housekeeping, proper sanitary facilities, and adequate locker rooms are important in developing the worker's safety attitude. If a plant is well kept, the safety record will be good and the efficiency of operation will be high because plant morale is high. Men work better and enjoy their work more in clean and attractive surroundings.

In promoting cleanliness and good housekeeping, we do not favor the periodic clean-up campaign. We keep a plant clean by *never letting it get dirty.*

We believe in organizing and supervising so that the plant is always clean and neat. Each department head has an area and HE —no one else—is responsible for the housekeeping. Each department head has supervisors assigned to definite areas for which they are responsible.

In 1956, we spent nearly one million dollars for personal protective equipment such as hard hats, flame retardent clothing, goggles, face shields, prescription safety glasses, hand cremes, respirators, gas masks, and special purpose equipment. It is the supervisor's job to see that these devices are used by developing among his men an understanding of the value and need for this equipment plus a willingness to use it.

INDUSTRIAL HYGIENE AND MEDICINE

The Industrial Hygiene division checks the atmosphere in working areas for toxic gases, vapors, fumes, and proper lighting. Drinking water and in-plant feeding facilities are also checked regularly.

Our safety and training departments assist department heads in safety training and education programs.

The worker's safety education consists of an indoctrination session, followed by on-the-job instructions from his foreman. He receives a rule book which is reviewed with him by his foreman. He is either contacted on the job about safety or attends group safety meetings showing safety movies and slides. Employees are encouraged to report unsafe conditions promptly to their foremen. Safety bulletin boards of various sizes and shapes are located throughout the plant.

Each year more than 10 per cent of our employees are trainer or retrainer in a three-hour modified course in first aid. As a climax, an annual first aid contest is held. Competition is active and the winners are honored at an award luncheon. During 1956, 2,194 employees received *first aid training.*

In addition to the first aid program we have two other group programs training men to deal with hazards present in a steel mill—gas and fire. About 1,448 employees were trained in Gas Protection Procedures and 2,194 employees in our Fire Squad Commander Program.

The first few seconds are the most important to control a fire. And the person closest to the fire is the most important in the plant at that moment. But he is no value if he can't operate the available equipment. Three years ago we developed a training program to teach employees to use fire extinguishers. The departmental instructor is trained by the Inland fire department.

STRESS LOCK-OUT PRECAUTIONS

The departments set up fire fighting squads according to jobs. For instance the hooker calls the fire department, the shearman blows the fire whistle, the mechanic and helper lay the hose line, the roller and feeder bring an extinguisher to the fire location.

About 2,000 employees are trained each year to put out fires *by actually using* portable extinguishers. This training has paid off, and has made our employees more fire conscious. They respect the fire fighting equipment, and seldom block access to the equipment.

As in most plants, our general safety rule "machinery shall be stopped, locked out and tagged while adjustments or repairs are being made," was *too* general. Some adjustments have to be made while a mill is running, and in many cases supervisors saved time by pulling a switch—not locking it out. As a control measure, every six months department heads are required to submit a status report on the Lock-Out Procedure.

Our safety department recommended that written procedures covering every conceivable type of work done on that equipment be developed for all movable equipment in the plant.

In 1956, after the lock out program was in effect two years, we analyzed our accident records, and noted that in 1953 and 1954, we had 15 disabling injuries, four of them were fatal. Two years under this program we had two disabling injuries and no fatalities. In two years, an investment of 3,000 supervisory man hours in preparing these procedures, saved four lives and 13 disabling injuries. Here is proof that good supervisory performance results in better safety performance.

Visual aids are used in our safety education programs, especially model cranes and electrical demonstration boards.

Because injuries occur more frequently off the job than on the job, we have an off-the-job safety program emphasizing traffic, home and public safety. In six months this year 46 employees were injured on the job, none fatal. However 124 employees were injured off the job, and nine were fatalities.

RECOGNITION ACTS AS INCENTIVE

Recognition is a primary motivation for most people, and for this reason we have recognition program of awards, dinners, publicity, and letters of commendation.

Employees in departments with 365 days or a million man hours without a disabling injury are presented with individual merit awards. Employees who prevent or minimize an injury to a co-worker receive individual awards. Employees who develop a useful safety device are given individual merit awards.

Supervisors know their safety performance is a major criteria in considering promotion and merit reviews. We will not approve promotion or raises for supervisors *whose safety performance is not* good.

Safety in a plant is the company's responsibility. Under our system of privately operated enterprise this responsibility can not legally, morally, or logically be shifted to either the employee or the community. The law, courts, and society hold the company responsible for on-the-job safety. Unsafe workers and unsafe conditions are an indication of poor management. A good safety record, therefore, is a characteristic of *good management.*

Our management functions to insure that the health and well being of our employees are not jeopardized by their jobs. Any supervisor who does not continually promote safety is not representing management, and is failing in an important aspect of his job.

Better working conditions, safety equipment, safety procedures, safety engineering, safety training, safety motivation, good housekeeping, and a friendly, firm enforcement program have *convinced workers and* the union that management is sincerely interested in safety. As a result, our workers demonstrate a greater respect and awareness of potential hazards in their work.

THE PROS AND CONS OF SAFETY MERIT AWARD PROGRAMS

by J. L. RIDINGER

director, Safety & Plant Protection, Inland Steel co., East Chicago, Ind.

Safety awards are token awards helpful in motivating workers to be more safety conscious, not only as individuals but also as co-workers.

Safety award programs at Inland are not new. At the Indiana Harbor Works, in 1917, monogrammed cuff links, tie pins, belts, key rings and pocket watches were awarded workers for safety suggestions and devices. These awards promoted safety consciousness during an era when both workers and supervisors regarded unsafe conditions and unsafe acts as part of the day's work.

Safety is fundamentally a selling job. First management must be sold on the need for safe equipment and safe working procedures.

Top management in most companies prod their staffs to do a better safety job, because they don't want their people to get hurt, and also because a safe plant is good public relations and low injury rates reduce insurance premiums.

Like any phase of the industrial business, safety is expensive. However, one company has as its slogan, "If you can't afford safety you can't afford to be in business." Many companies learned from experience that good safety performances more than offset financial investment with returns such as good morale, efficiency, increased production and better quality.

SALESMANSHIP WITH EMPLOYEES

Promoting safety to management is simple, compared to selling safety to the workers. It takes more than safe equipment and good working conditions to make workers safe on the job. Even with adequate supervision, a screening process for new employees, job placement and on-the-job instruction programs, accidents continue to happen if the workers do not have the proper safety attitude.

During the past 10 years, many industries have reduced their injury rates. But each succeeding year they find it more difficult to reduce frequency rates by one point, than they did 10 years ago by five to 10 points. This is especially true in industries with low frequency rates. As any plant nears the irreducible figure of "0" injuries, it becomes difficult to hold the attained safety position and more difficult to improve.

Management is confronted with similar situations when attempting to establish new safety records. Safety equipment, good working conditions and know how are not enough. Employees must have a continuous desire to work without injuries.

The United States Steel corporation has an excellent safety film, "Knowings Not Enough." This film cautions trained workers against improvising, impulsiveness, impatience, and impunity. Most injuries caused by human failure can be attributed to one of the four "Imps."

It is generally agreed that 85 per cent of industrial injuries are caused by human failures; sometimes the injured is at fault, the co-worker, the supervisor or in other cases combination of human failures. This is the field in which we must do an effective job, if there is to be an appreciable reduction in industrial injuries.

To improve the safety attitude of supervisors and workers, we must use more than the basic reasons for preventing injuries — — — loss of human life, pain and suffering, family hardships, and injury costs. Other forms of motivation can stimulate a continuous safety interest in workers as individuals and a working team.

Since children, we have had some motivation to encourage us to do a better job. In grade school a star would be placed after our name for knowing our lessons and for excellent attendance. In sports we were given numerals and sweaters as individual awards, and for team play we shared in various trophies.

People are only grown up children, and desire and respond to effective motivation programs. This is one reason why the Inland Steel company has had individual safety award programs.

TYPES OF AWARD PROGRAMS

There are many safety award programs, such as national awards, company awards, and individual and company awards. National awards can be obtained from the National Safety Council and trade associations. Your company can win one of the four National Safety Council safety awards if it meets the following qualifications:

AWARD OF HONOR—A perfect record of 3,000,000 or more man-hours brings the award automatically if the record covers an entire calendar year. The award is given on application if the record covers any period greater or less than a calendar year but not less than 30 days.

AWARD OF MERIT—A perfect record of 1,000,000 to 3,000,000 man-hours receives an Award of Merit. The award is given automatically if the record covers an entire calendar year. The award is given on application if the record covers any period greater or less than a calendar year but not less than 30 days.

CERTIFICATE OF COMMENDATION—A perfect record of 200,000 to 1,000,000 man-hours will be recognized by a Certificate of Commendation, to be given automatically, if the record covers an entire calendar year, or on application if the record covers two or more calendar years.

PRESIDENT'S LETTER—A perfect record of 10,000 to 200,000 man-hours is recognized by an appropriate letter from the President of the National Safety Council, automatically, if the record covers an entire calendar year, or on application, if the record covers two or more calendar years.

Most companies usually have two kinds of awards—plant awards of plaques or trophies to plants that improved their safety performance over the previous year. The major safety award is usually the President's award, which is awarded to the safest plant in the company. This award may be in the form of a plaque, trophy or a statuette. Some companies award special safety *trophies to foremen. The most effective* type for any company are those that are tailor made for the needs of a plant.

INDIVIDUAL AWARDS

Lotteries: Many individual award programs are set up on a lottery basis, with a specified number of prizes allotted for a given number of workers. Qualified workers *are given tickets, which allow them to par*ticipate in the drawing.

Safety Buttons: In some companies safety buttons are awarded to workers who complete one or more years without a disabling injury.

Special Awards: Annual supervisors' dinners, short vacation trips for supervisors and their wives, or time off and tickets to a football or baseball game.

Some Other Types: One of Germany's large steel plants has a safety bonus system. Bargaining unit employees are divided into 160 groups, the salaried employees into 10 groups and each group has a handicap, based upon their injury experience of the previous year. During 1956, the first year the bonus system was used, disabling injuries in this plant were reduced by 37 per cent compared with an 8 per cent reduction for the German steel industry. $25,000 was paid out in bonuses which averaged $13.00 per man. An additional bonus of $8.00 was paid to workers in groups that completed both 1955 and 1956 without a disabling injury.

This year the Automatic Transporation company in Chicago gave free coffee to *their employees when they broke their safety* record. Ordinarily coffee costs 7c a cup at the machines, but each machine had a special button switch which poured the free cupfuls all day.

INLAND STEEL COMPANY SAFETY AWARD PROGRAMS

Before the United States went off the gold standard, *the supervisors in each de*partment with the best safety record were awarded a $20.00 gold piece. This program was unsatisfactory because of a limited number of gold pieces and dissatisfaction among supervisors in the departments with several perfect safety records.

Departmental Safety Slogan Contest

(a) *Ten dollar monthly awards.*

Each month a winning slogan was selected from those submitted by workers within each department. The winner received a $10.00 bill, and the slogan was posted throughout the department as the safety slogan for the next month. To check the worker's observance of the posted slogan, safety engineers occasionally would ask workers in each section to repeat the slogan. If they could, they were given a one dollar bill.

(b) Thanksgiving Turkey Awards.

Employees who turned in a safety slogan were eligible for a turkey drawing. An allotment of turkeys was made for each department based upon their work force. However, *this program* was dropped because the drawing methods did not make for proper distribution of turkeys. Too many turkeys were won by one section of a department.

(c) Family Safety Cartoon Contests.

To create family interest in on-the-job and off-the-job safety, we published three safety cartoons from the National Safety Council, in our plant publication. One cartoon described an industrial shop, another the home and the third, traffic conditions. Employees listed the unsafe acts and unsafe conditions they saw in each cartoon. Their lists were turned in to the Safety Department. Their names were put in a container and a drawing was held for turkeys. There

was an excellent response to this program, which helped reduce injuries to our employees and their families.

Safety Smokes Contest

This contest awarded a cigar, a package of cigarettes or two candy bars to each employee in a section or department which improved its total injury experience 25 per cent over its five year average. Since a check of the previous ten years' injury experience showed injuries highest during the months of June, July and August, the contest was started in June. As a result our injuries were reduced considerably during the peak period.

The Safety Smokes Contest ran from June 1950 to January 1, 1956, and during this period total injury frequency rate decreased 278 to 121. This program was dropped because it was losing its effect, and secondly because of award conflicts in production departments. Production record cigars were distributed at the same time Safety Smokes were distributed, and confusion resulted.

MILLION MAN-HOUR AND 365 DAY AWARD PROGRAM

Our present award program, which replaced the Safety Smokes Program in 1956, awards workers who have worked a million man-hours without a disabling injury. The 365 day provision permits smaller departments to qualify for an award within a year, otherwise some departments would have to work 10 or more years to attain the million man hour mark.

All employees are eligible for additional awards if the plant works three million man-hours without a disabling injury. As yet we haven't attained the three million man-hour mark but we have been close twice.

The value of individual awards increases when a department works more than two million man-hours without a disabling injury. In addition supervisors of departments that work two million or more man-hours without a disabling injury can attend a safety dinner.

Million man hour plaques and desk trophies are presented to assistant general managers, department superintendents and foremen with a million man-hours without a disabling injury.

In 1956 our Tin Mill with more than 800 employees, worked three million man-hours without a disabling injury. In 1957 two departments, Mechanical with 1,290 employees and the 76" Hot Strip with 1,156 employees, worked more than two million man-hours without a disabling injury. Nine departments and 12 sections worked more than one million man-hours.

Acts of Merit. Employees may be considered for Merit Awards for one of the following reasons:

1. First Aid. Applying artificial respiration, proper application of tourniquet in cases involving arterial bleeding. Rescuing an injured worker.

2. Reporting unsafe conditions that could cause a serious accident such as defective lifting racks, broken rails.

3. Removing a worker from a dangerous area.

The awards range from $25.00 U. S. Savings Bonds to wrist watches.

4. Suggesting safety gadgets or gimmicks that have proven to be effective. Persons who qualify for these awards are eligible for lesser awards.

Our Local Union Safety Committee, with 22 members, has been quite enthusiastic in supporting our various safety award programs.

During the past 10 years the disabling injury rate at the Indiana Harbor Works reduced from 6.09 in 1947 to 2.24 in 1956. Our frequency rate for total injuries (minor and major) decreased from 347 in 1947 to 104 in 1956.

Because top management emphasized safety in general, a better job has been done on guarding machines and equipment. Working conditions have improved, the plant is cleaner and the morale is better. Fewer unsafe acts are reported and injury and compensation costs have reduced. We are doing a better job of selecting and placing workers and supervisors. Supervisors are doing a better job of training employees.

From the standpoint of good business, the quality of our products has improved. We are producing more steel than ever before and our earnings are above the average for the industry.

For these reasons a safety award program that has produced positive results is worth every cent paid for it.

MERIT AWARD PROGRAMS THE PROS AND CONS OF SAFETY

by D. D. MATEER

supervisor of safety, Jones & Laughlin Steel corp., Pittsburgh, Pa.

HISTORY OF SAFETY AWARD PROGRAMS AS THEY HAVE BEEN INSTALLED IN OUR WORKS BEGINNING IN 1918.

A. Monies paid to "straw bosses" for accomplishing work with their men without lost time accidents (rate of pay about $2.00 per week).

B. Plaques.
   1. Departmental
   2. Plant
   3. Company

C. November "No Accident Month"
   1. Large kick-off meeting usually held outside of the plant with an invitation to men and their families.
   2. Departmental signs, slogans, etc.
   3. Drawings among winning departments.
   4. Turkeys and radios.
   5. Above awards were based on lost time cases—this created condition where every effort was to avoid lost time cases and sometimes things were a bit shady.

EMPLOYEE AWARDS

D. Individual award programs. Considerable criticism was made to a single month safety campaign so then it was spread over a number of months depending on the size of the department, to an individual award program set up in the following manner:
   1. A lapel pin designating the department and indicating that the wearer was a part of a team that had worked 250,000 man hours without a lost time accident.
   2. Watch fobs for 500,000 hours worked without a lost time case.
   3. Mechanical pencils for 750,000 man hours worked without a lost time accident.
   4. Pocket knives for 1,000,000 man hours worked without a lost time accident.

Only two departments in our Works completed a 1,000,000 man hours record without a disabling injury.

This program cost several thousands of dollars and from a review of our accident statistics, the return of investment was not as great as one would expect. There were too many mountains and valleys in our accident curve.

WAR DECREASED PROGRAMS

During the war years, little was done in the way of safety award programs—more stress was put on production for the war effort. In the post-war era, beginning in 1948, our President and Chairman of the Board of Directors, Admiral Ben Moreell, believed that industry could operate with a fewer number of accidents and he made many speeches in favor of our safety movement.

In that year, he inaugurated in the J&L Steel corporation what was known as the Admiral Award Program which constituted the presentation formally of a placque bearing the likeness in bronze of Adm. Moreell with a famous inscription on this plaque "If we can't afford safety, we can't afford to be in business." This was awarded on a basis of 1,000,000 man hours worked without a disabling injury, and a unit which worked one year without a disabling injury was awarded a plaque.

This program received a wide acceptance among the employees of the J&L Steel corporation and at our plant it created the spark needed in our accident prevention work. At that time, we had operated more than 90 years in the manufacture of steel and steel products and for the first time it was recorded that during an operating period our Works completed 1,000,000 man hours without a disabling injury. With this interest by top management and the

award program in full swing, some people doubted the intentions of management—that it was more for money rather than for humanitarianism.

In the issue of our J&L Steel corp. magazine in 1949, Admiral Moreell made the following statement:

"Jones & Laughlin does not want to make money out of safety, nor do we want to profit from our Safety Campaign insofar as safety contributes to the health and contentment of our employees and their families.

"So, in order to clarify this matter, the corporation is instituting a procedure whereby savings which are effected in our insurance and compensation payments on account of reduction in the number and severity of accidents, as compared with the average record over the previous five-year period, will be used for improving welfare and hospital activities in the communities where we operate."

These awards were based on a record for any one year that was better than the record of the past five years, having a fixed amount set in the reduction of fatalities, permanent disabilities, etc.

AWARDS TO CHARITY

E. The awards to charities were designated and agreed upon by a committee of Union-Management representatives. In our Works in 1949 to 1952, we gave to charities $30,625.00. This money was used for iron lungs, special operating rooms in hospitals, special care for deaf people, training for deaf people, the cancer fund, the heart fund, the boy scout movement and the crippled children. All, you will agree, are worthy of help. In those years mentioned, the J&L Steel corp. in all of its operations and in the communities where our plants are located, distributed $211,675.00 in the ways in which I have related to you.

As you know, all programs tend to run stale after a period of time regardless of how worthy they seem to be. That was true with this program so in 1953 we inaugurated a new program of safety awards and this was on an employee basis. The procedure used was to split up major departments into 100 man units.

The unit that would accomplish working a calendar month without a disabling injury would be eligible for participation in a drawing of prizes. The number of prizes covered about 10 per cent of the unit. The units that failed to complete the calendar month without a disabling injury had their awards divided up among the other eligible groups in the major department. This created a constant challenge, unit versus unit.

DISADVANTAGES OF PROGRAM

There are three disturbing factors in an award program of this kind.

1. It was possible for a man, under the laws of chance, to win more than once. This created dissension. Some people wanted to disqualify the man after he had won once in a year. This could not be done for the reason that the unit depended on him to work safely as an individual for all to participate.

2. The integration of transferred employees into a unit. For instance, an employee would have a three-day disabling injury in No. 1 unit, causing them to lose their chances of receiving awards. Then, due to production conditions, he would be transferred to No. 2 unit the same calendar month and be eligible to participate in the No 2 unit drawing for awards.

3. Only 10 per cent of the employees in a unit received an award. This award program continued until 1955 when it, like many others, lost its popularity. Management decided after considerable deliberation that an award program would be inaugurated where the steel plant divisions would compete with each other for the lowest severity record and an appropriate statue representing the steel worker be awarded to the division having the lowest severity for the calendar year. This program is continuing.

In 1956, one department at our Works was permitted to operate an award program of their own. This was set up where supervision had an award given to them for the foremen that had no disabling accidents in his division. The men in his division were also given individual awards; this was not on a drawing basis where chance was the factor. The results in 1956 in this department were most encouraging both in frequency and severity of disabling injuries. In 1956, we had a production pattern which gave us a regular work force with a minimum of personnel changes.

The forecast of production for 1957 indicated that we could have a high frequency of transferring people from one production unit to another. The 1956 safety award program would be difficult to administer in 1957; therefore, it was not adopted. So far in 1957, this department has had a most disturbing increase in severity and frequency in disabling injuries.

EMPLOYEES LACKED EXPERIENCE

The first reason given for the reverse of our experience was that we discontinued the safety award program. After a careful analyses of the circumstances surrounding these accidents, we felt that a safety award program would have been of little or no help. The primary cause was the injured employee lacked experience. The procedures that we must follow in transferring employees up and down the job line and from unit to unit causes a condition where an employee may work one turn at one job, the next turn on another job.

The frequency of these changes in job assignments make it difficult for the foreman to carry on an effective training procedure. We felt the increase of accidents was due to lack of experience and training by supervision. If we had carried on the 1956 safety award program in this department in 1957, it would have been interesting to observe the results obtained by it under changed working conditions.

USED CARTOONIST

We have tried essay contests and limerick contests where employees and their families have participated and one time we had a well-known cartoonist draw a figure of a person who we were going to use as a safety reminder and asked the employees to participate in the contest and give this person an appropriate name. We did not get the participation we wanted; however, we did get a good name for the individual—Ray Minder.

I believe that from 1918 to the present time we have used all of the known means in producing safety award programs. True, we have had a nice reduction in frequency and severity of accidents; however, we cannot point to any one of the programs mentioned as the one that has given us the most help. The greatest award that can be given one of our employees or the families of our employees is the ways and means of living without injury. We have in 1957 inaugurated certain programs in training in our company that we believe will have a far reaching effect and a lasting one on our employees and their families.

As we see it at this time, based on our recent experiences we feel that if in the future we again try individual employee safety award programs they must be designed to include the employee on the job, the employee on the highways, and the employee in his home—and his family. We can only visualize that the future participation of the worker must be with the worker and his family.▲

ELECTRICAL HAZARDS IN ALUMINUM REDUCTION

by G. B. S. RICKETTS

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To quote our Director of Safety—"People get hurt because either they do not recognize or they underestimate a hazard." It is a simple statement, but it sums up a complex situation. As you think about it you might wonder why the hazard existed in the first place. However, experience tells us that no matter how much engineering effort is exerted to design and build a safe plant, we will wind up with some hazards in the project as completed. It is unreasonable and imprudent to go beyond a certain point in our striving to build a safe plant.

The need for emphasis on the reduction of electrical hazards becomes apparent when statistics show one fatality in every 15 electrical injuries as compared to one fatality in every 200 industrial injuries of all types. To achieve this emphasis requires that the problem be attacked as a joint effort of all concerned—we must build plants as safely as possible—then we must train the workers in the plants in the ways of safety.

To guide us in the general design of plants, we have various sets of nationally recognized engineering and operating standards ordinarily known as codes or safety orders. Regardless of whether or not they are designated as safety codes, they all represent the conscientious and considered effort of people with specialized knowledge to guide us toward building safer plants. Rigid adherence to these codes as a minimum standard normally produces a design that represents good industry practice and good safety practice.

In special situations the opposite may be true—particulary when a code is adapted to an area it was not specifically designed to cover. In many locations this situation only calls for careful review by the design engineer and the safety engineer (and possibly others) to establish the safe practices to be followed.

FACE LEGAL PROBLEMS

In those locations where adherence to the applicable code is enforced by law serious legal problems arise. For an example, look at an aluminum reduction potroom. The approach here is to avoid all possible points of contact with ground and thus keep to a minimum the possibility of a worker completing the circuit through his body from the potline to ground. In essence, we try to operate the potlines in an insulated box.

From time to time it is necessary to use AC-powered arc-welding equipment in the potroom for special repairs. We do not ground the case of the unit since to do so would make continuously available, within our insulated box, a point of contact with ground. On the other hand, the National Electrical Code specifies that the case of such equipment be grounded—this is to protect against the hazard of insulation failure within the unit putting the case at AC source potential. In the potrooms this is, by far, the lesser hazard.

This, in an area where the National Electrical Code is enforced by law the safe approach is legally wrong—and the whole problem arises because the Code is being applied in an area it was not designed to cover.

INTERSTATE POLICY CONFLICTS

Such occasional special problems only emphasize the need for better codes—codes, for instance, that have sections written specifically to cover the peculiarities of electro-chemical plants in their many variations. In the meantime, a company operating in several states has other problems. As previously mentioned, some states enforce the National Electrical Code by law; some states have their own electrical codes which have legal status; yet others have no electrical code requirements.

Thus, an interstate company, to avoid internal confusion must adopt some policy. Ours adopted (in 1951) the California General Industry Safety Orders as minimum safety standards for plant design. These Orders are more comprehensive and more exacting than the National Electrical Code which governs in most states in which we operate. In this way we give our people the best protection we reasonably can, and at the same time are not likely to find ourselves in violation of future codes in other states.

Recognizing (as pointed out earlier) that codes must sometimes be followed in principle rather than "to the letter" our policy includes this paragraph:

> "If for any reason compliance with these standards is impractical, the matter is to be reviewed by those concerned and the Safety Supervisor in order to plan for other equivalent practical protection or control."

No matter what code or policy may be adopted as a guide there is still no substitute for a clear concept of the major principles of safe electrical design. This is especially true in aluminum reduction plants, or for that matter in any other branch of the electro-chemical industry, where none of the recognized codes makes provision for conditions peculiar and necessary to the potroom or cellroom. In our thinking, these major principles are four:

1. Insulation—Covering conductive surfaces with materials through which electricity will not travel in sufficient quantities to create a hazard.
2. Isolation — Making energized parts inaccessible to accidental contact by persons or objects—this can be by distance or grounded metal enclosure.
3. Overcurrent Protection—This is the function of a device designed to de-energize an electrical circuit when the circuit is subjected to excess current.
4. Grounding—The providing of a low resistance path through which current may flow to ground in the case of a fault.

Principles 1 and 2 have to do with electrical protection during normal conditions. Principles 3 and 4 have to do with electrical protection during abnormal conditions and I do not plan to discuss them. They are no less important than the first two, but they have received much publicity and attention in general industry literature. As a result there is more general understanding of them—therefore they get better attention than the first two in practice.

INSULATION

Our first principle is of prime importance to aluminum reduction plants—in fact it is the basis of electrical protection in the potrooms. Since it is so important in this area, we need a reasonable basis for evaluating it to determine what "sufficient quantity" might be. Here are some figures on human reaction to direct current taken from a paper published by Prof. C. F. Dalziel of the University of California. Dalziel reasoned that electric shock is a function of current flow and not a voltage effect.

The figures are based on tests on human subjects at the let-go threshold and below —on data from accidents and animal subjects for the higher values. However they were obtained, they are only a guide since people vary so widely in physical condition. As a guide they are valuable since they at least give us a starting point.

All the current values are in milliamperes, and one milliampere equals 1/1000 of an ampere. Generally there is no sensation up to one milliampere. In the range from one milliampere to nine milliamperes we have the transition from a slight tingling to a mild muscular reaction. Above nine milliamperes the muscular reaction becomes stronger, finally reaching the let-go threshold with painful shock at about 75 milliamperes.

In the common multiple Christmas tree lamp—the type where when one burns out the others stay lit—the current could cause painful shock in many people and is close to the let-go threshold. This is not to say that the Christmas tree lamp is dangerous, but to point out how really sensitive the average human being is to the flow of electrical current. Returning to the let-go threshold, as we pass beyond the region of 75 milliamperes the victim can no longer let go and, unless something is done to interrupt the current flow, a fatality can occur under these conditions at currents not much above 75 milliamperes.

SHOCK AVOIDANCE

If we are to avoid any shock hazard, there must be no way in which a worker can become part of a conducting system where the current would be more than one milliampere; that is, our insulation must not pass in excess of one milliampere. When I say any shock hazard, I am thinking of the accidents that can and do happen when a person only senses the passage of current. The surprise frequently produces an involuntary reaction that results in physical damage—such as a worker stabbing himself with a screwdriver, hitting himself in the face with a wrench, or losing his balance and falling, in which fall he is hurt.

If we are to hold insulation leakage currents to less than one milliampere, we must use insulation resistance measuring devices. The device selected must use a test voltage in excess of the line voltage. The practice of using test lamps or a voltmeter to determine the quality of insulation produces unreliable results and therefore is hazardous.

An example of this approach in testing is found in the wall-mounted "air drops" common to many potrooms. The details vary, but generally a short length of rubber air hose is used to insulate the portable hose connection from the air header which is grounded. Several potroom workers received mild electric shocks when, in the course of their work, they touched the pot and the "supposedly" insulated air hose con-

nection at the same time. Preliminary tests revealed that the air hose section that was supposed to do the insulating was not doing the job well enough.

Since there were many of these drops in each potroom this meant that they all had to be tested. We calculated that if no more than one milliampere was to flow with the possible maximum potline voltage of 750, then the resistance of the piece of air hose must be no less than 750,000 ohms. As a safety factor we doubled this value to 1,500,000 ohms or 1.5 megohms.

Using a resistance measuring device we quickly and reliably tested all the insulating hoses—replacing all those that had resistances lower than 1.5 megohms. It turned out later that instead of the hose originally specified, some hose with a high carbon black content had been used on a number of the drops and this was the cause of our trouble.

COLOR CHART EXPLANATION

Before discussing my first example, I will take a moment to run over the configuration of a typical potroom— and before doing so I will explain the color code system used on the charts which I will describe.

RED indicates exposed electrically energized items. For maximum safety the adjacent areas should show as insulation.

BLACK indicates metal neither grounded nor electrically energized. Such conditions should be kept to an absolute minimum as they are hazardous due to their uncertain nature. Generally, such items should be treated as though they are electrically energized.

BLUE indicates metal at ground potential. Any area where blue shows up close to red indicates a hazard. On the other hand, an area that shows all blue equipment has its electrically energized parts well isolated.

YELLOW indicates insulation which we would look for around exposed electrically energized equipment.

GRAY indicates masonry, or concrete which, depending upon the circumstances, can be considered as a practical substitute for better grades of insulation.

BROWN indicates soil.

So much for the chart color coding system. Now let us take a look at an aluminum reduction plant's best claim to uniqueness from the electrical safety standpoint—the potroom. This chart shows a typical potline, with walls and roof omitted, consisting of, say, 144 pots distributed in two potrooms. Here is the bus in red under the floor at the ends of the potroom and at the center passageway. Elsewhere it is attached to the pots (shown here in red) and exposed. Each pot operates at a nominal 5 volts.

POTLINE VOLTAGE

With these pots connected in series, and allowing for a few volts drop in the interconnecting bus, the total potline voltage is about 730—current about 70,000 amperes. Practice in a large portion of the industry is to have no intentional ground on such a system, so the midpoint of the line is usually at ground potential or close to it—and the ends of the line are at a potential to ground of one-half the line voltage.

If we should happen to get a ground at one end of the potline, then the pot at the other end goes above ground potential by the full line voltage and the pots at the physical midpoint of the line are now above ground potential by approximately one-half the line voltage. Thus we must assume that any pot may at sometime be at a potential of several hundred volts with respect to ground. To protect the potroom workers when in the immediate vicinity of the pots, we must plan so that no points of contact with ground are within easy reach.

The usual solution is to cover with insulation all potential points of contact with ground. Some aluminum companies ground the midpoint of the potline through a low resistance which means that no pot can ever be at more than one-half potline voltage to ground. This safety feature is achieved at the cost of other problems which are beyond the scope of this discussion.

INSULATION METHODS

The next chart is a section through the potroom here looking toward the rectifier station. This serves to illustrate the insulation methods used. The pot, supported and reinforced by its cradles, sits in the middle of the room on a concrete slab which acts as insulation. Frequently concrete piers are placed on the slab under the pots to improve the insulation. With or without piers, the quality of insulation at this point has no bearing on safety in the potroom.

On each side of the pot are aisles about 10 feet wide. The floor in the aisles is brick over a reinforced concrete base. The brick (shown in yellow) is installed primarily as a matter of reduced floor maintenance. A secondary benefit is that it also provides better electrical insulation than bare concrete. Many potrooms have been built without the brick as a matter of reduced first cost. A potential hazard with concrete floors is that spillage of molten bath or metal causes spalling. This can result in baring the steel reinforcing bars which, of course, are grounded.

Returning to this particular example—the distance from the pots to the wall is such that wall insulation is not deemed justified. An additional margin of safety comes from the opening for the ventilating doors being continuous, with the doors almost always open. The concrete sill against which the door fits when closed is topped with a heavy timber (shown in yellow) as, during the servicing of the pots, there is a short period when the "butts" or used carbon anodes are placed with the rods resting on the sill.

Without the timber the repeated laying of these rods on the sill would result in chipping of the concrete with ultimate exposure of the steel reinforcing. A rod in contact with this reinforcing would bring a source of ground contact several feet closer to the pot.

CRANE COLUMNS

There is left then the question of the building and crane columns. In our typical potroom these would be sheathed in plywood from the base of the column to a point six feet or more above the floor. Where we have experienced excessive damage to the wood, the base of the column has been encased in concrete for the first 30 inches. Our success with this method has led us in a recent design to insulate with concrete for the full height of insulation required.

To illustrate the real electrical hazard in extending sources of pot potential and ground contact beyond their normal planned position, here is an artist's rendering of the scene of an accident in a Soderberg potroom. In the Soderberg potroom the pots are arranged end to end in two rows with a wide center aisle and relatively narrower side aisles. Note that the channel cart is next to the pot and in contact with it through the gas-hole bar, bringing pot voltage several feet closer to the potroom walls.

Note also that the stud cart is next to the wall with its tongue resting on the only grounded item in the vicinity—the exposed door frame. Now pot voltage and a source of ground contact are within a foot or two of each other—a space easily bridged by a man.

Unfortunately, a potroom worker came along while this condition existed and *attempted to walk through the space between* the two loaded carts. He was found with one arm on each cart corner. Following the accident the potential between the two carts was measured at 260 volts. Note the series of events preceding this accident:

1. The channel truck left adjacent to the pot.
2. The presence of a device (the gas-hole bar) to connect the truck to the pot.
3. The stud cart left adjacent to the door at one of the two pots out of 72 in the room where the exposed metal door frame existed.
4. The tongue leaned against the grounded metal door frame instead of on the floor or back against the cart.
5. The electrical hazard present in the exposed grounded door frames (there were a number of them) had existed for a number of months before it was recognized. An order had been written to correct the hazard but the accident happened before the work was completed. As a matter of background, these doors were not part of the original design and for some unaccountable reason did not receive the same treatment as the two insulated columns that flank it.
6. The failure of the accident victim, despite his training, to recognize the hazard to him and exercise normal caution—also the quirk of human nature that caused him to try the

congested route as compared to ready passage around the other side of the channel cart.

With this example in mind, let us observe that there is a trend, dictated by economics, to potline voltages well above those now common in the United States. Industry literature has carried articles on potlines built or building outside the United States with ratings of 850 volts—970 volts—and 1,100 volts—all in the 100,000 ampere range.

VOLTAGES INCREASING

With this trend in mind, some engineering and safety people are inclined to take the untenable position of crying "unsafe" when we talk of potline voltages appreciably higher than 750. The fatality cited occurred at 260 volts—many occur at potentials common to every household. We know that any voltage in excess of some point below 100 volts is hazardous—and it is up to us to cope with these higher voltages with better engineering standards and improved safety practices.

Returning from my digression on potline voltages to the subject of insulation, let me explain an aspect of the use of concrete for which you should be on the alert. For an example, in one potroom the concrete slab is in contact with the soil underneath it. We used to store the week-end's supply of new rodded anode carbons on the floor a few feet from the end pot. The area used was bare concrete. Due to the necessity for keeping the potroom aisles open, as well as the end aisle between potrooms, the first row of carbons began just a few feet away from the end pot. One day an operator in the course of his work happened to touch the carbons while he was also in contact with the pot—receiving a severe shock.

Investigation revealed that the same hazard existed in other potrooms. As a result this procedure was stopped and arrangements made to store the week-end's supply of rodded anode carbons in locations that did not create a hazard even though they were less convenient.

CONCRETE ABSORBS MOISTURE

To understand what happened, consider that concrete is porous and contains a certain amount of free alkali. With the soil covered, moisture is no longer removed by evaporation from the surface of the soil, thus moisture is available to be absorbed by the concrete. As long as the surface of the concrete is exposed to air of relatively low humidity or in some other way is kept dry, it will act as an insulator.

As soon as we store an object on top of the concrete, the evaporation of moisture from the surface layer of concrete stops and we have moisture extending from the soil through the concrete to the surface of the object. The free alkali in the concrete combines with the moisture to make a pretty good electrolyte (a solution in which current flows readily).

Depending upon the amount of moisture in the soil, the area of the object in contact with the concrete, the porosity of the concrete, and other variables, the object may or may not present a point of ground contact. In any event it does present a hazard due to its indeterminate nature. Certainly when the area of surface covered is in excess of several square inches, let alone several hundred square inches, as it was in the case of the anode carbons stored side by side, the item becomes a point of ground contact within our insulated box.

With all this talk about concrete conducting you may wonder why we consider it acceptable as column insulation. Remember that it takes area of contact and moisture to cause current flow through concrete. Certainly if we rest a steel handled rake against a column insulated with concrete we aren't going to get much area of contact. In addition, concrete in this position is going to be relatively dry due to the potroom heat—the only source of moisture is up through the concrete footing.

INSULATION—CRANE HOOKS

Before leaving the potroom area in our discussion of insulation, a few points relative to crane hooks are worth looking into. The crane hooks must be insulated from ground not only as a safety measure but also to avoid shorting out the potline when performing such operations as filling the ore hoppers, installing crucibles, and so forth. A mechanical hazard also enters the scene at this point, since if current flows up through the hook to the cables, to the drum, and then to the steelwork, and to ground, the arcing at the pulleys and the drum will damage the cable. This can mean sudden

failure of the cables the next time a heavy load is lifted.

Providing insulation is easy until we see what conditions must be met. The installation must be rugged, it must present a minimum hazard to the man handling the hook (setting carbons for instance) and the required increase in building height over that for an uninsulated hook must be held to a minimum.

So far our insulating has been done between the lower block and the hook. Here are some examples of insulated hooks in the range of six to 10 tons. All three are adequate from the standpoint of voltage alone. The "A" hook accomplishes insulation (note the yellow area) without requiring an increase in building height—but look at the hazard it presents to the man handling the hook. A slight miscalculation in placing a sling or otherwise engaging the hook would result in the man being in contact with ground.

If he should happen to be standing with any part of his body in contact with a pot (such as when digging a pot) he would be a candidate for electrocution. There is also much danger of grounding a piece of energized equipment through the grounded part of the hook when engaging the hook with resultant damage to the cables. You wouldn't expect us to use such a hook in our plants and we don't. However, such a hook could be acceptable under conditions I will outline later.

REDUCES HAZARDS

The "B" and "C" hooks greatly reduce the hazards present in the hook on the left. The distance between the point of the hook and the nearest grounded part is several times that of the "A" hook. The "B" hook has an additional feature in that the insulation projects slightly, making is difficult to develop a leakage path across it and making the insulation readily apparent, thus tending to remind the man handling the hook of the hazard.

Note that with the "B" and "C" hooks that some 13 inches and 18 inches, respectively, of addition building height is required (for a given hook to ground maximum distance). This will add in the order of $15,000 per potline (two rooms) for increased building costs.

Primarily to obtain increased safety, but also to avoid spending some of the $15,000 per potline, we are considering insulating the drum and gear box while using the simplified insulated hook as per "A". Then the insulation at the drum and gear box protects the potroom worker and the hook insulation protects the crane cables. With the insulation so arranged there is virtually no hazard to the regular potroom workers who constitute the major exposure.

Since the crane only has workers on the bridge when it is being serviced, the exposure to the hazard is greatly reduced. Also the crane service crews specialize in that activity so they can be more readily made cognizant of the possible hazard. The insulation at the hook keeps the cables from being energized when the load is touching some part of the potline. Then if the crane men break the rules of good crane operation with a sidewise pull there is no arc as the cables touch the bridge girders.

There is one note of caution about insulated crane hooks—assembly must be to exacting standards with respect to clearances and cleanliness of the insulated areas. We had an insulation failure recently in a type "C" crane hook that caused us both equipment loss and production loss—no one was hurt fortunately. It turned out that incorrect clearances at the ends of the center bolt (black) plus dirt had caused the breakdown.

The hooks are tested regularly with a resistance measuring device—and this one had passed its last test. Subsequently it was determined that the test voltage used by the resistance measuring device was of the same order as voltages that the hook insulation would normally experience—so there was no safety margin.

In the future the hooks will be tested with voltages at least twice the potline voltages to provide a reasonable margin of safety. The dirt and incorrect clearances in the assemblies was due to our failure to impress on the outside machine shop doing the work the exacting standards needed for this assembly. So it is not enough to design a good safety device—it is necessary to see that it is built the way it was designed.

Another area in aluminum reduction plants that has stressed the insulation aspect is the rectifier station. In this elevation of a

common rectifier station arrangement the major electrical elements have been depicted with some artist's license. To run over them briefly, one block represents the rectifier frame which consists of a steel framework mounted on insulators. Installed on the framework are 12 steel rectifying tanks with associated bus-work, and various auxiliary devices.

The entire assembly operates at the positive bus potential with respect to ground. There is no enclosure which you might be led to believe by this simple block. On the right there is the anode breaker and on the left the cathode breaker. These breakers operate to disconnect part or all of the frame under various abnormal conditions.

These two breakers probably should be shown in red rather than yellow since, even though a large part of their structure is of insulating material, in most equipment some of the metal parts protruding through or past the insulating material are energized. The cubicle shown in blue to the left of the frame houses all the electrical auxiliary and control equipment for its associated frame. As indicated by its color, it is grounded. It is apparent then that the major hazard is presented by the proximity of the grounded firing cubicle and the energized frame.

Before going to the next chart to discuss the safety measure taken in this area, let me just point out a few areas where we use isolation as a safety measure. Due to the relatively low floor to ceiling height in this area, the two bus systems below the floor are surrounded with expanded wire mesh. The negative bus near the ceiling of the second floor is also protected by isolation—this time by location.

On a plan of the operating floor of the same rectifier station are the firing cubicles and the rectifier frames. The yellow strip represents the rubber mat kept in the operating aisle. Between the cubicles and the frames we also have these rubber mats indicated by these yellow strips. To be sure that in the course of normal operation somebody does not walk from the operating aisle to the hazardous area, we have a movable barrier between each cubicle as indicated by these yellow lines.

When work is to be done on a given frame, plywood insulating barriers are installed in these locations so that there is virtually no opportunity for anyone to make contact with the surrounding energized equipment. In addition certain test operations are performed with the energized frame under test, surrounded with part or all of these guards. To date our accident experience with this type of construction has been very good.

RECTIFIER STATION—ENCLOSED FRAME

In my last two charts we stressed the matter of insulation as the principal protective device. Now let us look at a rectifier station of a newer type which stresses the principle of isolation almost exclusively. In this section you will notice that all energized parts are completely isolated. The buses on the ceiling of the first floor are isolated with guards as before. The buses on the ceiling of the second floor are isolated by distance, and the rectifier frame and breakers are all installed inside a grounded metal enclosure.

All of the doors on the metal enclosure are suitably interlocked with the breakers so that when they are opened the breakers are tripped—de-energizing the equipment. Arrangements have been made to perform various test procedures with the doors closed; that is, leads will be brought out from test terminals through special openings to the test equipment.

We expect that certain service operations previously performed on energized equipment can be performed with equipment de-energized by revised techniques. This particular approach to rectifier station design is slightly controversial, but on the other hand so was the transition from motor controllers mounted on slate panels to the present accepted practice of metal enclosed motor controllers.

This plan view only serves to emphasize (by the lack of red) the complete absence of exposed electrically energized equipment on the operating floor. This is not the whole story for new procedures must be worked out for some of the normal test and service operations. Experience will tell us if we have gone forward in rectifier station safety.

I have linked this discussion of electrical hazards in aluminum reduction with the four principles of electrical protection in order to bring up the subject of a new electrical safety program planned to start on a company wide basis in the near future.

With the aid of several consultants, this electrical safety training program has been developed on a framework of these four principles. This program is aimed at increasing the worker's electrical safety consciousness. We do not expect to make electrical engineers out of each worker. We do expect to develop each principle in layman terms for a clear understanding by the individual worker.

SAFETY CONSULTANTS

I might also mention that within the Reduction Division we have already placed additional emphasis on electrical safety by forming an Electrical Safety committee at each plant. This committee, constituted of electrically qualified people, functions in addition to the General Safety Committees. With this function assigned to technically qualified people we expect much more rapid progress in the recognition and elimination of electrical hazards—as well as the training of the workers.

And I bring this matter of electrical safety training in so that I may make the point—no matter how much effort we put into designing electrical safety into an aluminum reduction plant, that is only half the job—the other half is an effective electrical safety training program—and a continuous one.

This is the more important half because without it, we can spend capital funds for electrical safety until we are no longer competitive and still not produce the electrical safety record we are striving to achieve.

A SAFETY PROGRAM FOR AN EXTRUSION PLANT

by R. L. DEBENON
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A business analyst described the sort of safety program needed to handle employee health and safety in an extrusion plant. In addressing executives from the industry he pointed out that competition and a definite market made it imperative that ineffective production methods be scrapped.

"The time has come," he stated, "that every individual, department, plant, works, or company in the extrusion business become more productive. This will require greater maturity of business concept and better economy in work programming.

The history of business shows that with good, stiff competition, economic survival depends upon sound business management. Every individual and department must meet the economic and moral responsibilities owed the investment and people served, or fall by the wayside.

This includes all safety people and their respective safety programs.

In the face of this challenge, a good safety program of any extrusion plant has the maturity of concept to know the purpose for which the business was established and to detail its particular activities to insure the success of that enterprise.

What constitutes maturity? When do we judge a safety program has graduated from the level of the juvenile?

A MATURE SAFETY PROGRAM

Many safety programs have a false appearance of maturity. In reality they are juvenile. They possess high organizational status, command a respectable budget, and boast considerable action programs. Tests show however, they are babes in the woods in inspiring people to the proper attitude towards safety.

Age is not a reliable gauge for measuring maturity. A safety program may be of ancient age but in controlling unsafe plant conditions and unsafe acts of people it is still in swaddling clothes.

Bulkiness of organization and procedure does not insure a successful safety program.

What is the plant frequency and severity rate? How much do accidents cost? How much human suffering are accidents and occupational diseases inflicting upon our employees? These things determine how successful is a plant safety program.

An extrusion plant safety program is mature if it successfully contributes economically to the investment supporting it; if it makes reasonable provisions for the safety and health of employees; if it commands respect and has the cooperation of management, supervision, workers, and the union. If it merits and enjoys the prestige so hard won by the safety profession, it must establish its reputation on the basis of quality performance.

In short, it must justify its existence by showing all plant personnel how to discharge the legal, economic, and moral responsibilities to provide a safe work environment and how to perform safely in that environment.

SAFETY BRINGS PLANT PROFITS

In many industrial plants today, the safety programs are little value to the successful operations of those plants. Such reputation is gained because the purpose for a plant safety program is unknown.

Some imagine the sole functions of safety programs are employee benefits. They visualize the plant safety program as nothing more than an industrial welfare unit.

Certainly, a plant safety program has the responsibility for the health and safety of the employees. But, it has an equal responsibility to help the plant make a profitable return to the investment. This is done by reducing the cost of industrial accidents and occupational diseases.

For an industrial safety program to have "rank," "status," or "recognition," it must have this dual concept ever in mind and furnish activities which reduce human suffering and control the high cost of work accidents.

It is impossible to eliminate the physical risks of living. A mature safety program does not carry the torch or wave the flag for such a hopeless cause. Someone has well suggested that only the dead are safe from the perils of life. The only 100 per cent safe plant is the one shut down. We must continue to provide practical physical safeguards. But our big job is to teach and inspire people to live wisely in the presence of danger.

SAFETY CAN'T REST IN BALCONY

Another reason why a plant safety program does not command respect is that it speaks the balcony language. Not long ago, an extrusion plant safety engineer made a speech. He maintained that a plant safety program would be as successful as the safety department was in selling the line foremen on the importance of accident prevention. He also said operating personnel should not be allowed to let production have precedence over safety. He said safety should be first and production second in all work planning and function.

This is balcony language of the first magnitude: The success or failure of a plant operation does not rest upon supervision. The man who sits in the front office must shoulder that responsibility. Therefore the success of a plant safety program depends on the attitude of the plant or works manager.

What about safety vs production? These two terms do not denote different and distinct things. The principles of accident prevention are nothing but the best, the more efficient, the most economical way to do a job or perform a work. An accident is a work disruption. It is truly an unplanned and unwanted event, causing people to be hurt, increasing the cost of producing, and wasting materials, machines, and men.

The sooner we start convincing management and department heads that safety is built-in operating efficiency, the sooner we will bring our plant safety programs down from the balcony and into the arena where they belong.

Did you ever hear a safety man complain that he could not get things done—that he did not have proper management support or cooperation of department heads and supervisors? Did you ever hear the folks in the plant say "Safety in this plant is a big joke. Nobody pays any attention to safety rules"? This is prima-facie evidence the safety program is still perched in the balcony.

What is needed to correct this? We must present a program that will help each department head get his production job done safely and economically. We must provide the tools which safeguard the welfare of our people.

We must evaluate and grasp the full impact of the economic and moral value of our work. When we realize safety has the greatest potential for future growth and recognition, and when we prepare for greater responsibilities, we are definitely on our way to success.

SAFETY—THE TALK OF THE COUNTRY

Safety is becoming a most important subject in the American consciousness and vocabulary. The hue and cry for greater safety in the American way of life is constantly heard. Industrial managements consider it a must. Unions demand it in every labor contract. Government is enacting more and more legislation to insure it. In business, schools, homes, farms, clubs, associations and in every human activity today we find strong, active safety programs.

Safety people must meet the leadership requirements to pilot a quality safety program in the extrusion industry. Every safety program must function on a sound business basis. This means greater conceptual, technical, and human skills be acquired by safety specialists.

What are the marks of maturity in an extrusion plant safety program?

1. When our organizational unit has all the related plant activities under the jurisdiction of the plant safety administrator.
2. When we have a team of management, supervisors, employees, and union which work together to insure plant safety.
3. When we have an action program which produces a safety record that denotes success.
4. When the plant safety administrator has been moved into staff position in the plant organization.

A divided world cannot solve international problems. Neither can a safety department function intelligently and efficiently when broken up into separate sections under departments of unrelated interests and activities. For efficiency of operation, we group related functions.

It would be just as reasonable to break up the plant accounting department and place accounts payable under the engineering department and accounts receivable under the purchasing department. To separate these activities is to create organizational boundaries which slow down functions necessary to plan and execute adequate accident-cost control measures.

No one individual or group can carry on an effective control program alone. Management, supervision, workers, and the union must recognize that each group is an integral part of the safety team. Each group must face its personal, legal, moral, and economic responsibilities to cooperate fully, within the boundaries of its prerogatives and duties. The successful safety program will weld these groups into a task force for a solid frontal attack upon accidents.

TEST SAFETY PROGRAMS

The old saying "the proof of the pudding is in the eating" can determine whether the plant safety program is doing a man's job. What is our standing in the National Safety Council contest for the Non-Ferrous Metals Section? Are we winning our share of the Awards presented by the Council? How does our plant frequency and severity rates compare with the National average—with the rates of other units, works, or plants within our own company? Do our monthly and annual reports to management show decreasing accident costs?

What about attitudes? Is management receptive to our budget recommendations? Do department heads and supervisors regard us as worthy help and call on us for solutions to health and safety problems? Do the workers speak of "our safety program?" Has our safety activity gone from the plant into employees' homes? Are we as plant safety people discharging our civic duties by joining the forces combating all accidents in our communities?

The answer to these questions will indicate the success of any extrusion plant safety program.

The final mark of identity to show that maturity has come to the plant safety program can be resolved upon this question: "where is the safety department located on the plant organization chart?" Does the

safety administrator have prestige? Does he report directly to the plant manager or has his department been relegated to the sub-department status? Has he been made to report to a department head who neither understands nor is directly concerned with efficiency of plant operations?

In the smaller plants, it is practical to combine the safety activities with the functions of some other department. When any plant can economically justify a safety department, however, the safety administrator should not be cluttered with red tape, nor forced to battle frustrations which inevitably arise when he must report to a department head who is not conversant with the principles of administering a plant health and safety program.

Here is a simple formula to insure getting plant safety programs out of the balcony and into the arena.

First, every person in the safety business should hold the strong convictions that his profession is one of great worth and value. He not only contributes to the economic success of his companies, but he is making a vital contribution to enhance human values. Be proud of your profession.

Second, be a booster of your profession. It is very obvious why the great state of Texas has become so well known. Yours is a noble and most useful endeavor. Make its virtues known wherever you go.

Third, have confidence that you can and will bring to your particular safety program the respect and dignity justly entitled.▲

TOP MANAGEMENT'S RESPONSIBILITY FOR SAFETY

by HUBERT C. SMITH

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Industrial safety is simply applied common sense and good business. Naturally, we are concerned with costs. A poor safety and accident record is a very expensive thing. But we are more concerned with the health and welfare of our employees, and with the reputations of our companies as good and safe places to work.

To succeed, a safety program must be well organized and carefully run. However, in any social grouping an element of danger exists because of people moving and working in close proximity. Their very lives may depend on their knowledge of the situation, and their treating it with the seriousness it deserves.

Safety is a joint responsibility and is unique because accident prevention cuts straight across every industrial organization and involves everybody—without exception. Management has the responsibility for developing an effective safety program, one that will furnish the necessary guidance and direction to make our plants safe places to work. The employee must accept and utilize the advice and guidance offered and follow the rules and regulations prescribed.

CREATE "SAFETY CLIMATE"

However, management has a further responsibility in accident prevention—it must establish and maintain the proper "safety climate." The climate must create a condition will induce every employee from top management down the line, to think, breathe, feel and live safety at all times.

This climate, if properly developed, will be reflected in safe practices at work and also in the home and the community. An employee who trips on a tattered stair carpet and injures himself is just as much a loss to the company as one injured on the job.

American industry has accepted and promoted this idea of a safety climate throughout the years. American management recognizes that failure to create and maintain such a climate is dangerous to management and labor alike.

Success or failure depends upon a close working relationship between management and the employees. There can be no disruption of communications, none of the "let George do it" attitude, no abrogation of the mutual responsibility for accident prevention.

Since management directs the safety program and the employee cooperates by following the direction, who administers the program, calls the signals and runs the plays?

Most ideally situated in the management structure is the supervisor. His position as first line of management with direct contact with the employees makes him the ideal person to implement a safety program. But he must have complete support of all levels of management.

GOOD HOUSEKEEPING

A plant manager or department superintendent who condones cutting safety corners, who procrastinates remedying a dangerous condition or feels human lives are secondary to production cannot justifiably criticize his supervisor if he acts in a like manner. The practice of safety is a continuing process for all levels of management. It is mainly in the normal things a supervisor does that his orientation shows through, and he sells or destroys a safety program.

A high correlation exists between a good safety program and a good housekeeping program. We want our people to think and act in an orderly fashion. A plant with strict housekeeping standards is conducive to such thinking, and to such behavior. We are often judged by employees and visitors on the basis of our appearance.

But in addition to appearance, a good and continuing housekeeping program means everything in its place, and the by-products of work promptly removed. Things are not left around to become hazards and our people are trained in orderly methods of doing things.

A safety program depends on seriousness of attitudes; there is no room for pranks or horseplay. The factory clown is a menace to every other job, and a menace that is accentuated when he is the foreman. If the supervisor approves, or actually participates in jokes or horseplay, they may spread to uncontrollable proportions. There's nothing as tragic as a little joke which backfires and brings pain instead of laughs.

The one irreplaceable essential value is human life. An organization exists only for what service and value it can give to humanity. We can replace anything in our concern within a matter of days except our people. A safety program is essentially designed to protect our most valuable assets.

STEEL MILLS ABOVE AVERAGE

Statistics indicate that today's steel mill is about twice as safe a place to work as an average mill or factory. Year after year the accident rate in the steel industry has been reflecting the efforts of management and labor alike to make our plants safe.

The watchword "Safety First" was born in the steel industry around the turn of the century and the industry has continued to lead the way in teaching safe practices to its people.

In 1955 steelworkers suffered 4.16 accidents for every million man hours worked compared with 6.96 for all industry. In 1950 statistics reveal that steel workers suffered 4.63 accidents for every million man hours worked. Continued diligence and application of safety principles will result in even more remarkable records of achievement for safety in our industry.

A carefully organized and well managed plan must meet certain specific criteria.

SAFETY PROGRAM CRITERIA

1. It has the complete and enthusiastic endorsement of top management. This does not mean that management issues some vague statement or appears periodically at dinners to present awards. Rather, it should make its support of the safety program clear, forceful and unmistakable, and emphasize safety as a management function.

2. Collective bargaining representatives should be included in planning and promulgating a safety program. Their support and ideas should be actively solicited.

3. The individual charged with the maintenance of the program must be qualified and imaginative. He must be a person of vision and a super-salesman; a person short

of this, means a program short of full success.

4. A safety program is a moving and continuing thing. As well as the constant program to create the proper attitudes, each job must be *continually studied, and the entire force continually on the alert to eliminate hazards and make the plant a safer place.*

5. Front line management must be continually sold and resold on the basic need for good safety practices and an active safety program. Further, they must be continually trained themselves in safe practices. They cannot spread the safety doctrine unless they understand it, and they will not unless they believe in it. Without their active and intelligent support, your entire program is doomed to failure.

6. An active program for helping the accident-prone employee should exist. Very often it develops that he is not accident prone at all. He just has never been trained to work safely.

To those responsible for maintaining a safety program, I recommend a policy of the same combination of firmness and fairness *evident in all employee relationships.* You must insist that safety is taken in the utmost seriousness, and never is allowed to become a joke or a light matter.

All safety rules and procedures must be followed, and supervisory employees reflect, by their attitudes, what safety means to them. Fairness in listening carefully to all safety complaints, investigating promptly, and correcting immediately where necessary will help make a successful safety program.

To be effective, you must seek and earn respect as an individual and also command professional respect. The National Safety Council, through its conferences, publications and displays, offers you excellent opportunity to do this.▲

SAFETY COMMUNICATIONS IN THE FOUNDRY

by EDWIN W. BURNE

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Everybody enjoys a smorgasbord since it affords him the opportunity to select as much or as little of a variety of foods according to his own tastes and needs. What I offer is a smorgasbord of ideas—ideas for reducing foundry accidents by communication techniques. Every idea has a valid use in accident prevention. Some cost money, others cost the time and effort of management. Some will be adaptable to your business, others you will find less useful.

There is important money to be added to the profits of your business by effectively preventing accidents and occupational disease. Important and appealing as the humanitarian aspects of safety may be, the fact is that a safe foundry pays off in cold, hard cash, and can be sold to management on that basis.

Most effective methods and techniques used to create and maintain interest in accident prevention are not new. Many are used in industry and practically all are included in the National Safety Council's bag of tricks.

COMMUNICATION METHODS

New, novel, and fresh approaches and variations can be used to maintain employees' and management's interest in the safety program. *But, too often, a safety director's* desire to be original closes his eyes to the true value of the more basic parts of a safety program.

A comprehensive communication program should include both individual and group approaches. The personalized approach takes into account individual differences in ability, interests, and learning time. However, most people are gregarious by nature and respect the group's opinions. Thus it is also necessary to use the group approach.

The combination of methods and techniques should provide for periodic repetition of safety messages that motivate and instruct. Forgetfulness, and carelessness daily underscore this need. A safety rule is worthless *if it is merely words on a paper, circulated* to management by the safety director and then forgotten. It must be taken out of the files and made into a living thing. Safety rules should be formalized, put into writing, explained to employees, and then re-explained when necessary and on a regular basis.

FACE TO FACE COMMUNICATION

Face to face communication is the oldest method and remains one of the most effective. In industry this type can be used best *by the employee's immediate superior* because he is closer to the employee, knows him best, and has the greatest opportunity for establishing rapport. To the average employee his foreman *is* the company, and it is essential that a good job of communication be done at this level.

Where face to face communication fails, other methods are of questionable effectiveness. For example, if a first-line foreman merely gives lip service to safety, if he is unconvinced of the moral and economic necessity of a safe operation, then any printed or spoken word from top management would probably be meaningless to his employees.

Other distinct advantages of using face to face communication are: a personal approach enables the communicator to tailor his communication to the individual, and it appeals to the employee's pride and prestige, for almost everyone likes to be consulted personally. It's a quick way to deliver the safety messages included in the daily instructions to employees. It disseminates information when it is impractical or inconvenient to bring the group together. For best results the foreman should talk to each employee individually at least once a week.

Face to face communication is one of the most effective ways to instruct an employee on the safety precautions for his particular job. The first-line foreman must know what the hazards are. To assist our foremen in detecting these hazards systematically, we instructed them in the technique of making a job hazard analysis for each job they supervise.

The form used questions the hazards involved in each important step of each job, the safe work habits to teach the worker, and the safety equipment needed. Foremen are encouraged to enlist their employees' aid *in making these analyses.* In this way the employees' job knowledge is utilized. It is easier to convince an employee to abide by the safety rules if he helps formulate the rules.

When an analysis is completed it is used to instruct new employees and re-instruct old employees. Only if safety rules are soundly conceived, thoroughly understood, and strictly enforced by disciplinary action when necessary, are they effective tools for prevention of accidents.

Group behavior can differ widely from the behavior of individuals who make *up* the group. Everyone is subjected to the opinions, taboos, prejudices, and propaganda of his group. The round table discussion is a group approach potentially one of the most effective techniques to communicate with the employee.

ROUND TABLES

These small, informal group meetings are held by the foreman for his workers and should be conducted in a friendly atmosphere. This is conducive to a free discussion of the operations, *and questions* are welcomed and completely answered, suggestions solicited, discussed, and appraised. Usually round table meetings are held in a conference room, in the boss' office, or some other place with privacy.

The main danger in this communication technique lies in the fact that round tables are actually guided conferences and can degenerate into time-wasting gripe sessions if not skillfully handled. The degree of success achieved is determined by the skill of the conference leader.

WORK PLACE SAFETY MEETINGS

A short safety meeting on the factory floor is another valuable communication technique. It is one of the fastest means for a foreman to deliver an urgent message to all his employees. When these meetings are held often, but on an irregular schedule, the urgency of the meeting may be concealed if desirable.

These informal meetings are easy to hold since no advance preparation is needed inso-

far as meeting room facilities are concerned. However, the content of the meeting should be carefully planned. Such a meeting can follow an accident or near accident somewhere in the shop with an analysis of the causes and steps necessary to prevent a recurrence. The National Safety Council has available ten books of canned five-minute safety talks. They also publish a new talk every month in INDUSTRIAL SUPERVISOR.

The canned talks are excellent when used as source material. But when they are merely read to the employees, they are of questionable effectiveness. The more closely a foreman can relate the subject matter of these meetings to his own problems, the more effective they can be.

BULLETIN BOARDS AND BILLBOARDS

Bulletin boards and billboards are two other communication methods which successfully sell everything from toothpaste to automobiles. They are also being used effectively to sell safety. For several years the National Safety Council has offered a variety of colorful, eye-catching, bulletin and billboard posters and cloth banners with terse copy and vivid illustrations. Some are dramatic, some are comical—all are effective.

These posters are changed semi-monthly. For best results bulletin boards should be located at the ends of aisles where employees see them while walking towards them, near drinking fountains, lunchrooms, or wash rooms, or in any location frequently passed or visited often by the employees.

The center of the board should be located at eye level approximately 60 inches from the floor. The board should be attractively painted, glass enclosed, and restricted to safety posters exclusively. Posters should be changed frequently for they lose their effectiveness if left up too long. It's best to "program" the posters to make certain that the major hazards of a given area such as back strains and eye injuries, are covered periodically and given proper emphasis.

One effective way to stimulate employee interest in posters is to conduct a poster contest and award a suitable prize to the best poster submitted during the contest period.

Letters from the manager mailed directly to the employee's home are well received This personal contact with the manager appeals to the employee's pride and desire to be consulted. The safety letters work best if they are part of a systematic letter campaign covering all phases of the business.

SAFETY SUGGESTION PLANS

Another valuable aid that enables employees to communicate with management about safety hazards or improvements in the safety program is the suggestion plan. Suggestion boxes well supplied with blank forms are placed throughout the plant. Posters on the boxes urge employees to turn their ideas into cash.

Good posters promote participation but the best advertisement for any suggestion plan is the way it is administered. If the suggestions are promptly acknowledged, thoroughly investigated, carefully evaluated, equitably awarded when adopted and thoroughly explained when rejected, employees will have confidence in the plan and participate frequently.

Employees have used the suggestion plan to pressure foremen to correct certain unsafe conditions. A few employees told investigators that they notified their foreman of the hazards but the foreman failed to take corrective action. They say that their reason for submitting the idea as a suggestion is not to collect the $5 or $10 safety award, but rather to get the hazard eliminated or minimized.

There have also been instances where the award has been made before the suggested work was completed. The suggestor complained that he turned in the suggestion not for the award but to get the unsafe condition corrected.

SAFETY COMMITTEES

A communication technique that has been tried and talked about often during recent years is the use of safety committees. These committees may be comprised of employees from a single foreman's group, from several foremen's groups, or even from several departments within a given plant.

They assist in solving the safety problems encountered when they inspect their facilities, or in solving problems presented to them by other employees or by management. The major advantages of this approach are that the employees accept the safety program more completely because they are a part of it. It is also a good way to teach safety.

In the General Electric company the basic responsibility for safety lies with the foreman or the first-line supervisor. For that reason we do not advocate the use of safety committees in the generally accepted sense of the designation. However, our foremen are helped by safety observers.

The number of observers a particular foreman appoints would depend on the layout of his facilities, the number of employees he manages, and the extent of the hazards. Our safety observers accompany the foremen on their weekly safety inspections, and also conduct their own daily inspections. Safety observers are also trained in the back pressure arm-lift method of artificial respiration.

MANAGEMENT NEWSLETTERS, MEETINGS

Many companies send management newsletters to their foremen and first-line supervisors. When the newsletters are carefully edited to ensure a balanced, complete, brief coverage of timely, interesting, informative, and helpful items, they are well read and are a valuable communication media.

If you have or are planning a management newsletter, include an item in every issue which deals with some phase of the safety problem. There are newsletter services available, such as *Management Information For Foremen and Supervisors* published weekly by the Elliott Service company, Inc. *The Foreman's Letter* is published bi-weekly by the National Foremen's Institute and features articles on safety regularly.

Regularly conducted safety meetings with foremen and first-line supervisors is another effective communication technique. They afford middle and top management an excellent opportunity to re-emphasize the importance they place on their safety program.

The foremen discuss their safety problems, or problems that affect the entire group. Most important—it is an opportunity to emphasize to management that the impetus for a safety program comes from the top man.

We use this technique and call our meetings "Quarterly Program Reviews." It takes approximately one week to prepare this meeting which is partly based on a quarterly safety inspection.

Each foreman's area is inspected individually by the foreman, his safety observer, and the staff safety man. The inspections are thorough and include a careful examination of the facilities, housekeeping, personal protective equipment, unsafe work habits, and an appraisal of the safety consciousness as revealed by spot interviews with employees.

PLANT INSPECTIONS

The safety specialist takes extensive notes on each inspection. After the foremen's areas are inspected, the safety specialist submits a written report to the manager of the foundry operation. The report classifies the observations as being items requiring routine maintenance or major problems.

Routine maintenance items, such as replacing a broken guard or repairing defective equipment, are the foremen's responsibilities and usually the orders are placed or the work is done before issuing the written report. However, they are still included so the report fully indicates the condition of the foreman's area at the time of the inspection.

Major problems are momentarily unanswered since they are intricate and involved. They require intensive investigation, or are problems which at first seem to involve sizable expenditures to correct. The report is carefully studied by the foundry manager and by other interested members of supervision. Then the meeting, or quarterly review, is called.

At these reviews past performances are compared, significant mistakes and revealing successes analyzed and future plans introduced and explained. Suggestions in program administration are solicited and the report on the quarterly safety inspection is thoroughly discussed. Most of the discussion centers around the items classified as major problems.

COMPANY NEWSPAPERS AND MAGAZINES

Company newspapers and magazines can be important parts of a safety communication program. Top management can use them to tell employees, middle management, and first-line supervisors simultaneously their desire for an accident free operation. They can stimulate interest in the various clubs

established to encourage employees to wear their personal protective equipment.

A picture of a new member of the Wise Owl Club holding the shattered safety glasses that saved his eyesight or an employee showing the dent in his hard hat that saved his life and gained him entrance into the Turtle Club impresses employees. Another picture of the safety shoe that protected a worker's foot from injury and qualified him for membership in the Happy Foot Club provides documented proof of the wisdom of dressing safely.

Company newspapers and magazines can also promote safety contests and report on significant safety achievements. Cartoons help train and motivate employees to work safely. The National Safety Council will provide several excellent cartoons drawn by nationally known cartoonists free of charge for use in company newspapers or magazines.

They also have mats available for letterpress publications and proofs for reproduction by other methods. In addition they offer a monthly newsletter for industrial editors with valuable suggestions on how their publication can effectively teach and promote safety.

INSPECTIONS REVEAL TRUTH

When safety and housekeeping inspections are conducted regularly by experienced investigators, accurate written reports to middle management reveal objectively and clearly the current condition of all facilities. The inspections may be organized to cover safety alone, safety and housekeeping, or housekeeping alone.

The inspection teams may be composed of employees, foremen and first-line supervisors, safety personnel, or other members of management. The methods to conduct the inspections also vary. Some teams tour the facilities as a group, others separately.

Some teams hold meetings after the inspection and issue a joint report; others hold no meetings and submit written reports individually. Some assign a numerical score to each section inspected based on a predetermined value for each of the basic parts of the inspection.

Written safety and housekeeping inspection reports provide information that the busy members of middle management, the general foreman and the superintendent might not otherwise receive. However, reports are a poor substitute for actually "walking the shop" informally and on a regular basis.

PERSONAL CONTACT BEST

This old and effective technique keeps both employees and first-line supervisions on their toes. Often problems are more clearly discussed when the facilities in question are observed first hand.

When this technique is applied better understanding results in improved employee relations. The employees' confidence in management is strengthened when they know the boss is concerned over their personal welfare and determined to stop the needless human suffering from accidents.

EMPLOYEE NEWSLETTERS

Another effective way of communicating safety messages to employees is through the employee newsletter. The copy used should be brief and to the point. Here also safety cartoons can be used successfully.

The Alfred M. Best co. Inc. offers a four-page employee newsletter for industry to use called *Your Safety News* that deals exclusively with safety. The copy is excellent and the art work and the layout make easy reading.

Successful safety programs motivate employees to work safely to eliminate injuries. Safety programs that stress good health as the sole reward for working safely can actually fail to be effective. The employees may unconsciously and unrealistically regard the reward as something they already have, always had, and always will have.

SAFETY CONTESTS

Thus it becomes expedient to offer additional recognition. Safety contests provide an effective method of offering such additional incentives. Contests are usually based on the accident experiences of a particular group during a given period of time. The group usually competes against other similar groups or against its own previous record. Most contests require the contestants to operate accident free during the contest period to qualify for an award.

Often when several groups do this, the one with the most man-hours without an accident is declared the winner. Some contests are more liberal and in addition to accident free performance also recognize and reward significant improvements.

Contests are available in a variety of sizes and shapes. Some are national, some industry wide, others for plants in a multi-plant company, departments within a company or foremen's groups within a department. Each year the National Safety Council's contests involve more than four million workers and nine billion accident free man-hours to win hundreds of awards.

Many industry associations, such as the Steel Founders' Society, conduct annual safety contests for their members. The Associated Industries of New York State conducts state-wide safety contests annually to "lower the accident rate in the Empire State."

WIN A CHICKEN DINNER

For almost two years a contest has been a key part of our safety program.

On the premise that our employees associate themselves more readily with their foremen's groups than with the department or company, we organize our Chicken Dinner Contest. Here is how the contest works:

Whenever all the employees of a foreman's or first-line foremen's group work for 12 consecutive months without a disabling injury, they are their foreman's guests at a chicken dinner. If a disabling injury occurs, the contest starts anew. Our contest is specifically designed to encourage friendly competition between different foremen's groups.

The winners usually remind the losers of the fine time they had and express *concern* over their missing the affair. However, the secret of the the contest's success seems to be that one employee's negligence can postpone the dinner for all for 12 months. As a result, our employees *are* becoming their brothers' keepers. If one employee observes another exposing himself to possible injury, he is warned with our battle cry, "Take it easy! Don't kill *our* chicken."

No one wants to take something away from the entire group. When a disabling injury does occur and the employee is at fault, his coworkers usually reprimand him before the foreman has had an opportunity to do so.

BULLETINS PROMOTE CONTEST

To assist our foremen and first-line supervisors in generating interest in this contest, bulletin boards were erected in each foreman's section. These bulletin boards show the group's progress toward a chicken dinner on a 12-months bar graph.

They show employees that they personally can help their group win by learning and obeying safety rules. A terse statement of a different safety rule and a photograph of a worker complying with the rule is posted on all of the bulletin boards every two weeks.

We send the pictures and posters stating the rules to our foremen with a canned presentation about the rule to use for their own meetings. They are encouraged to conduct their weekly 10-minute safety meetings around the safety bulletin board and use the board as a visual aid.

The 12-month bar graphs on the bulletin boards have at three months a picture of an egg, at six months a small chick, at nine months a larger chick, and at 12 months a roasted chicken. The publicity gimmicks for such a contest are endless. We have used pictures of eggs in a nest, pictures of live chickens taken at the home of one of our employees, and countless trick shots.

THE PAY-OFF

The results we achieved from a planned communication approach are sufficiently substantial to indicate its effectiveness. During the 15-year period immediately preceding 1956 our Schenectady Foundries had an average frequency rate of 18.75.

We ended 1956 with a frequency rate of 4.16 which was by far the lowest rate we had ever achieved in our 58-year history. That is conclusive proof that something has happened and we believe the planned communication approach is primarily responsible.

If your foundry has a frequency rate of more than zero, there is work to be done and dollars to be added to the profit side of the ledger. No safety program will work unless it has the active interest and backing of the man in the front office. Secondly, the best safety program for your foundry is the one you conceive and develop to meet your own needs.

INVESTIGATIVE PROCEDURE AND REPORT WRITING

by WILLIAM H. CORRIGAN
manager, Security department, Ford Motor co., Dearborn, Mich.

The word "investigation" means "to follow up or make research by patient inquiry and observation, and examination of facts." The investigator must be patient and methodical to insure thoroughness and his efforts must be directed toward the gathering of facts. Investigation is fact finding.

In his fact finding, an investigator must be impartial. He is not out to obtain a one-sided story to make a case for his company. He is seeking the exact facts of a situation to determine a course of action. In the safety field, the safety investigator must find out exactly what happened and why it happened. It would serve absolutely no purpose to obtain a biased story which would tend to whitewash any individual or group of individuals.

INVESTIGATIVE PROCEDURES

To guarantee best results and be certain all proper investigative steps are taken, an investigation must be planned in advance. The emergencies in a plant require immediate action from the investigator to obtain facts and interview eye witnesses, but he must not stampede into impetuous or illogical action. He must train himself to follow a logical planned procedure which becomes habitual to the point that he can determine and record vital facts almost automatically.

However, the investigator must never allow his actions to become completely automatic. He must retain a natural curiosity and an inquisitiveness to distinguish one incident from another. An investigator must not slip into a rut giving minimum attention to each incident and furnishing standardized or trite explanations which offer no basis for corrective action.

NOTE TAKING

Because the human memory has its limitations, the investigator should record his findings at all times. At the Ford Motor company, we found that a small bound notebook serves the purpose and is convenient to carry. When completely filled with investigative notes, the notebook can be filed as a permanent record of the investigative findings; and, if necessary, used in court to refresh the recollection of an investigator.

In taking notes, our past experience has established certain principles:

1. When investigating a major case, such as a fire or explosion, start with a fresh book for only that one investigation.

2. Use a separate page for each person interviewed in any investigation. This will prevent intermingling of the facts from different persons, and will simplify assembling notes and dictating from them.

3. Indicate the date of each interview or investigation at the top of each page since it may differ from the date of the case.

4. Identify each interview with full name, badge number, and title or classification of the person, and his address if he is not an employee. In obtaining the person's surname, spell it back to insure accuracy. It is advisable to include the business telephone extension and the home telephone number of the person interviewed so he may be reached quickly.

5. Notes should be made unobtrusively and the person interviewed should never be interrupted merely to fill out the notes. The original story can be recorded in the form of key words or phrases and the entire story filled out later by the investigator for a complete recollection.

The notes taken during the interview help you to question him further on details. Make as many notes as possible on what he tells you, and add notes to remind you of the questions you wish to ask later. A good idea is to identify these reminders by some simple symbol such as a star.

6. If taking notes creates any reluctance in the interviewee, stop taking notes immediately and talk freely with the person. Thereafter, when you must write down a name or number, start taking notes at that time and work gradually into a more complete recording.

You also can tell a reluctant witness that notes prevent misquoting or misunderstanding what he says. In cases of extreme reluctance, it may be advisable to dispense entirely with note taking during the interview. In such cases, the investigator should save sufficient time after the interview to record all pertinent details before proceeding with the investigation.

7. Do not neglect to record negative information. Where persons interviewed say they did not observe the accident or can furnish no information, identify these persons and note that fact. This may not help determine the cause of the accident, but it can later prevent these persons from giving false testimony that they saw the accident and that they noted it was caused by a particular set of circumstances.

INTERVIEWING TECHNIQUES

At least 50 per cent of interviewing is being a good listener, and recording what you hear. You must make interviewees want to confide in you, by creating mutual respect and trust between yourself and the person being interviewed. To reach this objective, the following procedures are suggested:

1. Identify yourself with credentials if necessary, to the interviewee leaving no question in his mind who you are, and which component you represent. Speak clearly and with authority. You must sell him the idea that you know your job and you can be trusted.

2. Explain the purpose of your work. Confide sufficiently in the person so he knows what you are trying to achieve, and will feel he can help by furnishing information. Show him that safer working conditions can be created for all employees, including himself, by determining the causes of accidents to eliminate them.

3. Control the course of the interview. When interviewing eye witnesses, ask the person to tell you, in his own words, what he saw. Do not interrupt him at any time, even if he strays slightly. If he rambles entirely away from the subject matter then insert sufficient comment to bring him back to the proper course. This should be confined, however, to a minimum of questioning.

Remember you are there to hear what he has to say, and you will not obtain any information listening to yourself talk. Although you may have vital questions to ask on a particular phase of an accident, do not interrupt him when he is telling his own version of what happened.

4. When the person finishes talking, go over the entire story to fill in any gaps, and to make sure you correctly understand what he said. At this time ask specific questions to obtain greater detail and any additional facts he may have overlooked. This is the time to ask questions which occurred to you while he was telling his story.

As you ask each question you starred for a reminder, check off that reminder so you can review the sheet quickly to see all desired points were covered.

5. In interviewing witnesses, be sure you get all primary details, such as:

   a. What he and the injured employee were doing immediately before the accident.
   b. What did he observe at the time of the accident itself.
   c. Was he close enough to hear what the injured employee said immediately after the injury. Usually statements made immediately after an accident are the truth, as they are made on the spur of the moment. They reflect the first thing that comes to the injured employee's mind, and are usually different from those logically thought out many moments or hours afterward. Examples of such statements could be: "The darn thing repeated itself." "I knew I should have kept those glasses on."
   d. What happened immediately after the accident.

This line of questioning gives a complete picture of the facts. If you record only the witness' or the injured employee's statement, he will tell only what he thinks important and may neglect to relate pertinent facts.

6. Witnesses may tell conflicting stories regarding an accident. You must determine how much weight their version should carry by:

   a. Asking what they were doing when the accident occurred.

b. What was their position at the time—how far away were they?
c. Were there any obstacles to prevent seeing the accident as described by the witness?
d. Was there any noise to interfere with their hearing statements they claimed to have heard?

7. In talking to a witness or an injured employee regarding an accident always find out: Who was involved, What happened, when, where, and why it happened.

If you secure these answers, your investigation will reflect the facts as they actually exist.

ATTITUDE OF THE INVESTIGATOR OR SAFETY INSPECTOR

Be aggressive without being antagonistic. Remember, you must obtain a clear picture of what actually happened. You are the person to determine who is to be interviewed and what must be reported. Take suggestions from others but if you feel they will not help, continue on your own plan of investigation.

Be impartial. Your purpose is to get the facts as they actually exist. Do not try to whitewash either an employee or the company. If your facts show an accident was caused by the failure to install proper safety precautions say so—this is the only way to prevent future accidents.

Do not ask leading or negative questions, such as:

"He slipped and fell, didn't he?"

"He didn't forget to put his goggles on, did he?"

It is your function to be impartial and seek the truth facts. Your opinion is not to be reported—only the facts as they exist.

Be inquisitive. Do not rely on one man's opinion that no witnesses are available. Inquire for yourself in the vicinity of the accident and take down the name and badge number of persons. Your report should show each witness and his story, and also that no witnesses were obtained if such is the case.

Do not accept a statement as fact without checking it. If a person says something happened, ask him if he saw it personally. If so, you can place him in his position at the time of the accident so his version may be properly evaluated. However, if he says this was told to him by others, it is only hearsay and not important. Determine who told him and locate this person. Trace facts to the one who started the story. His personal knowledge may be far different from the repeated version. *Stories magnify with repetition.*

Express no opinions to those you are interviewing. Take facts as received and report them as such.

Be methodical and thorough. Attempting to move rapidly usually results in overlooking important facts. Don't stop at the first possible cause found. A more thorough investigation may reveal additional and more serious factors.

Treat each investigation alike. Do not classify them into minor or serious accidents. Handle the minor accidents properly and the more serious ones will follow naturally in proper fashion.

If you ever doubt what actually occurred, have the injured employee go over the incident step by step, or have a witness take you to his position of observation so you can better see and understand his story.

REPORT WRITING

A perfect investigation is of absolutely no value, unless it can be communicated to the person who will determine whether or not any administrative or corrective action should be taken. Because such facts are kept on record for future reference, and also routed to more than one person, most companies use written reports.

Form Reports

Where the volume of investigation justifies the practice, it is customary to set up a standard report form for reporting various incidents. In most larger companies a separate report form is provided for safety investigations.

In our company, this report first identifies the basic company location where the accident occurred; with spaces for the plant and department and the shift of the accidents. We next have spaces for identifying the employees involved and classification, age, and badge number of each employee. The next line is for the specific location of accident and the date and time of the injury.

A larger space is provided for describing the extent of injuries, and a still larger space for the causes of such injuries. Following this, approximately one-third of the page is set aside under the label, "Describe What Happened." The next labeled spaces are for identification of witnesses by name and badge number.

Approximately one-quarter of the page then is reserved for actions taken to prevent recurrence of the accident. Space is then provided for the name of the supervisor where the accident occurred, plus the signature of the safety engineer making the report and the date. The final line is for a code number for statistical purposes.

AVOIDING LIMITATIONS OF THE FORM

In providing this form to safety engineers, company representatives emphasize that the form is a guide and convenience, not a limiting, inelastic container of information. The safety engineers are instructed to fill out each and every space and encouraged to add additional relevant information. For example, they indicate the length of time the injured employee spent on the job he was handling when the accident occurred. This could indicate whether or not failure in supervision or training might be involved.

The safety engineers are also instructed to elaborate on any part of this report on the reverse side or on additional blank sheets.

The safety engineers are told not to list the witnesses merely by name and badge number, but to show what facts can be attributed to each witness. When witnesses duplicate facts from another witness, the safety engineers indicate that the second story confirms the first instead of recording the facts a second time. In such cases, they identify each witness preferably by full name and badge number. In a case where witnesses disagree, the safety engineer highlights the variance by a short notation showing the essential point of disagreement.

Negative information is listed, which prevents rebutting a later fictionalized report by such persons, and indicates the thoroughness of the investigation.

While it is not usual for signed statements to be taken from witnesses in safety investigations, the safety engineer or investigator should know how to prepare such statements to present to a witness after an interview. A statement should be prepared after an interview, when the facts have already been obtained. Don't begin an interview by asking a witness to sign a statement, because some witnesses may be reluctance to furnish information on learning the facts will be embodied in a signed statement.

SIGNED STATEMENTS

A signed statement can be justified by telling the witness that the investigator would like to record the entire story to insure he does not misquote the witness. If the investigator prepares a statement for a witness who then refuses to sign, the investigator can ask the witness to read it. The investigator then notes, above his own signature, that the witness read the statement and acknowledged it is true, but does not wish to sign any statement.

If a stenographer records and transcribes the statement, it can be in question and answer form, or in a first-person narrative statement. Where a statement is taken under emergency conditions, the investigator can write a short narrative of the facts, which is then signed by the witness.

Regardless of the type of statement, the date and place should be shown in the upper right hand corner; and the beginning should identify the witness by his name and badge number or addess. The investigator should be identified by name and title or position. The first paragraph also should mention that the statement is being made voluntarily.

The second paragraph should begin the narrative of the witness. If the witness uses bad grammar, so should the statement. This is necessary to present the actual story of the witness, without any interpretation of the investigator.

OBTAINING SIGNED STATEMENTS

The statement should close with a paragraph which reads: "I have read the above statement consisting of three pages, and find that it is correct to the best of my knowledge," followed by the signature of the witness on the right and of the investigator and other witnesses on the left.

The statement should be submitted to the witness for his reading and approval. Inci-

dentally, the investigator should make sure the witness can read. Where a witness cannot read, the statement should be read in the presence of at least one witness, and the closing paragraph reworded to show that this procedure was followed.

If the witness, upon reading the statement, finds any error, a hand-written correction should be made in ink, preferably by the witness himself; and the witness should initial the statement opposite the correction In a statement covering more than one page, have the witness sign his initials at the bottom of each page as he reads it.

Again, investigation is fact finding. You must find the facts, and then pass on the same facts, through whatever type of report is desired, without coloring them with opinions, interpretations, explanations, or excuses. In safety investigations, of course, there is a place for interpretation and explanation. But those functions must be kept in their proper places, and not interfere with or obscure the basic facts which you obtain from your witnesses.

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where ere we go
Regardless of amounts.
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

A PLANNED GAS JOB
(A Skit)

CAST

Narrator ..... John Lowey, Cleveland
Superintendent of power & steam ..... John Alexander, Cleveland
Superintendent of industrial relations ..... Edward Mandry, Cleveland
Superintendent of blast furnace ..... P. Johnson, Chicago
Superintendent of coke ovens ..... H. Kelly, Chicago
Superintendent of combustion engineering ..... G. Gockstetter, Chicago
Superintendent of mechanical department ..... R. Kraus, Chicago
Safety Supervisor ..... Philip Lapish, Cleveland
Superintendent of engineering ..... C. W. Bruce, Chicago
Pipe foreman ..... W. Ryder Chicago
Demonstration of the job cast:
Pipe foreman ..... W. Ryder, Chicago
Man on manometer and telephone ..... R. McConnachie, Chicago
Safety man ..... P. Lapish, Cleveland
Four men in pit ..... P. Wright, Chicago
G. Cox, Chicago
N. Wiberg, Chicago
W. Heitner, Chicago
Man on oxygen tanks ..... J. McCaslin, Chicago

NARRATOR (Spot on narrator, alone at lectern. Stage is dark.): Gas is one of the most useful fuels available to man. It is also one of the most dangerous. Today we are going to consider a typical problem involving gas. There are a number of ways to tackle this problem, but for demonstration purposes, we shall show you how it would be tackled at the Cleveland district steel plant of Republic Steel corporation.

Similar methods are employed elsewhere in the corporation. This demonstration is a joint effort of the Cleveland and Chicago Districts of Republic Steel corporation.

(Spot fades; light comes up on meeting of committee on stage, all face audience). At the Cleveland plant, any problems involving gas are handled through our gas committee. A typical meeting of the Gas committee would look like this.

The chairman of the gas committee is the superintendent of the department in which the work is to be performed. In this case, the power superintendent, a regular member of the committee, is also chairman.

The other members are the blast furnace superintendent, the coke plant superintendent, the combustion superintendent, the mechanical superintendent, the safety supervisor, a representative from the engineering department, and the superintendent of industrial relations.

The main purposes of the committee are to eliminate, where possible, working on gas mains which are under pressure, or, to set up safe proceduses where this is not practical; and to make any recommendations that it feels necessary to insure safe operation, isolation and repair of the gas distribution system.

The committee passes on all procedures, breathing equipment, scaffolds, and gas pressures prior to starting any job. No work shall be done on any gas main under pressure, or where it is necessary to use gas masks, or on any questionable job involving gas, without the approval of this committee. A very important function of the chairman is to see that minutes of the meeting are kept carefully. Eventually these minutes will be the "bible" of the job and they must be accurate and complete.

But the meeting is getting underway. Let's turn up the sound and hear what is going on.

POWER SUPT.: (Project map of area; point out places mentioned.) I have called this meeting to find a safe way of blanking under pressure a 24 inch gas line carrying coke oven gas from the No. 1 coke battery to the main power station. I want all of you to be aware of what is involved, so we can provide gas connections to tie in the new C boiler.

This will involve two additional connections to the 24-inch gas main to extend the gas to the main burners on C boiler. The end of the existing line has a 24-inch blind flange. This connection involves no welding or burning, but will involve opening the end of the line to remove the flange and the blank.

The second connection is to make a six inch saddle weld connection to the existing eight inch line, which supplies coke gas to the pilot on A and B boilers. The six inch gas connection will supply coke gas to C boiler pilot.

This work will be done by outside contractors after the line has been isolated and purged. This means that the coke gas line must be shut down. Inasmuch as this is an old valve, we cannot rely on the valve to give a positive shut off so we'll have to treat this job as a gas job.

Now our problem is this—the 24 inch valve won't shut down completely. We know this because when we tried to shut off the valve, we can give it only 53 turns when we should be able to make 56. I believe we can do this job with gas under the maximum allowed four inches of water pressure, by shutting the valve, dropping the pressure and inserting a blank.

INDUSTRIAL RELATIONS SUPT.: If we are going to have outside contractors in, we should have a meeting between our people and the contractors to see they thoroughly understand their job.

POWER SUPT.: I've already made arrangements.

COMBUSTION SUPT.: Where are you going to get gas to operate the power house while this is going on?

POWER SUPT.: We will fire coal on A and B boilers to replace the gas and provide a positive flame in case we lose our blast furnace gas supply.

SAFETY SUPVR.: What do you intend to use for a purge on the line? And where do you plan on bleeding gas?

POWER SUPT.: Because of the great volume of gas in the length of the pipe, we do not believe either steam or nitrogen gas should be used. There will also be a great loss of the purge gas during the time the blank is inserted, so we will use our purge machine set up by combustion department.

(Project map of this area) We'll have the purge machine at the west end of the River Terminal bridge and we'll tie it in to a 12-inch stub on coke oven gas line at that point. The purge gas will flow about 200 feet northerly to the shut off valve and about 2,000 feet to the power house.

It will take about an hour to do the purge job. The combustion department will regulate bleed off at the shut off valve. We'll purge through the pilots on A & B boiler.

COKE OVEN SUPT.: How long will this take? There will have to be some arrangements made to take care of the surplus gas that I will have at that time.

COMBUSTION SUPT.: We will dispose of your surplus at the strip mill by using it to replace natural gas. If you have more than they can use, you will have to make arrangements to bleed and burn it. All in all, we'll have about 300,000 cubic feet of gas per hour to handle.

MECHANICAL SUPT.: Let's look at the job. It involves work in a pit and we can't do much until the power house drops the pressure down.

POWER SUPT.: I can do that in half an hour.

PIPEFITTER FOREMAN: It will take my pipefitters about 15 minutes to close the valve. By having every other bolt out of the flange prior to the actual blanking, we can speed up this first part of the job to about an hour at most.

COMBUSTION SUPT.: I reviewed the blanking job with the mechanical department and I believe this will take approximately four hours.

ENGINEERING SUPT.: Why not try a water seal? This is a dual type gate valve with tapped connections provided on the bottom between the gates and also with tapped connections on the bonnet. We could supply city water on the west side of the valve and putting a 10-foot riser pipe on the other connection would give us 4.3 pounds pressure. That's 1.3 pounds in excess of the coke gas pressure on the oven side of the valve.

POWER SUPT.: We can try water seal for blanking, but we must have a blank in the line at the time that burning and welding is done. I don't believe a water seal would be safe for the burning and welding work on the pipe line.

BLAST FURNACE SUPT.: What day of the week are you planning on doing this job?

ENGINEERING SUPT.: The contractors will have their work completed by Tuesday and I think we should start this job Tuesday afternoon.

BLAST FURNACE SUPT.: We will have a stop on #4 furnace on Tuesday to repair a cold blast valve. You better do this job on Wednesday if you want normal blast furnace gas to the boilers.

INDUSTRIAL RELATIONS SUPT.: This job had better start first thing in the morning. As you know, we do not normally plan gas work after dark. We'll have to complete this work before dark.

SAFETY SUPVR.: I just want to remind you fellows that this is a gas job and you know what that means. The pipefitters will have to wear work masks and you will have to supply your own standby safety men to work in the pit.

INDUSTRIAL RELATIONS SUPT.: All these men should be reminded of the safety aspects of this job and have their equipment inspected before starting work. We want to be sure that these men know what they are doing and how to do it.

SAFETY SUPVR.: Who is going to supply the manometer?

COMBUSTION SUPT.: We'll supply the manometer. We have to tie in the coke plant and check the pressure so the power house can bleed on the other end. We'll set up sound-powered phones so we'll have instant control at all times. I believe that we will be able to regulate the gas pressure down to within one inch of equivalent water pressure. We shouldn't go below this because of the volume of the gas and the possibility of drawing air into the line and creating an explosion.

POWER SUPT.: We'll regulate pressure in the gas line at the boilers with our valves to the burners. We will compare pressure readings with the combustion manometer at the job.

MECHANICAL SUPT.: Inasmuch as this is a coke gas job, we'll make sure that all of our people have nonsparking tools and spreaders. We certainly don't want any explosion or fires.

BLAST FURNACE SUPT.: Why can't the pipefitters change all bolts prior to the job and then remove all but four prior to the actual shutting down of the valve? Won't be down so long that way.

MECHANICAL SUPT.: We'll go along with removing every other bolt, but I won't go along with removing all but four. There is too much change of gas leaking that way, and the men in the pit might get hurt.

INDUSTRIAL RELATIONS SUPT.: We certainly want the job done as quickly as possible, but we are not going to sacrifice safety for speed.

BLAST FURNACE SUPT.: Why not arrange to have gas checks taken in the pit while the men are removing the bolts and at the first trace of gas, put their masks on?

SAFETY SUPVR.: That's OK while the men are removing every other bolt, but once that's done, the masks must go on.

MECHANICAL SUPT.: Who is going to be there from the safety department? And who is going to be the coordinator to be sure the job is done in the proper sequence?

SAFETY SUPVR.: I'll be on the job representing the safety department.

POWER SUPT.: I have lined this job up to coordinate between combustion, mechanical, engineering and the outside contractors. I will be in a position to call all signals on this job. If you have any questions, see me.

SAFETY SUPVR.: Since this is going to involve burning and welding after the line has been purged, the combustion department should have their heat prover available to analyze the purge and I will check the analysis against the explosimeter. (voices fade to mumble as . . .)

NARRATOR: And so the meeting continues until all plans are prepared and the minutes which have been taken distributed to all concerned after the meeting. These minutes are extremely important as they are the bible of the job. Now all the preliminary work has been completed, and we are ready to shift to the pit where preparations for doing the actual blanking are just getting underway. (Lights fade on committee and come up on pit scene.)

PIT SCENE

NARRATOR: This is a model of the 24 inch gas line discussed a few moments ago in the gas committee meeting. To those of you who are accustomed to gaining access to

pits from manholes, this pit may look a little ovesize. At our Cleveland district, however, we do not do any gas work through manholes. Over the years, as it became necessary to do any work in pits, we dug out and enlarged them. The openings were then covered with large plates which could be removed easily.

(Over-all lighting dims, and spot picks out two access ladders.)

Let's just take a closer look at this pit for the moment. You will notice first of all that there are two means of access to the pit . . . here . . . and here. There is also a safety block and tackle to remove an injured man. This is a must in our district. We also have fire extinguishers, brass wedges, scrapers, hammers and wrenches which minimize the possibility of sparks and eliminate a fire hazard.

On every job of this type we always have a manometer. We install the manometer to know the exact pressure reading in the line and hence to regulate it accordingly.

These manometers are capable of reading down to one-tenth of an inch of water pressure. You will note, too, that as an additional safety feature the man at the manometer has a sound-powered telephone which permits him to talk directly to the spot where the gas is being bled and regulated. This gives him instant control at all times.

The men working on the line are using gas masks of a constant-feed positive-pressure type. The masks are fed from oxygen cylinders with 2,200 pounds pressure roughly equivalent to 200 cubic feet. No manifolds are used. Nor do we use compressed or washed air.

Each two oxygen cylinders are carefully watched by another workmen to see that the proper pressure is maintained at all times and to adjust it if it is not. This man is also responsible for notifying the man in the mask when supply falls to 500 pounds. That gives the man in the mask ample time to leave the area. Normally we keep the flow reading on the dial at 15 to 20 pounds per square inch.

Each employee checks his gas mask before he puts it on. After it is on, the foreman checks it and a final check is made by the safety man. Each man's oxygen cylinder is identified with his name to simplify regulating the oxygen to him.

Each man actually working on the job is guarded by a co-worker in a chemox gas mask who acts as that worker's personal safety man. At the first sign of trouble, he can take the necessary steps to remove the man on the job from the area. The safety supervisor or one of his assistants is present to check the job and the equipment being used. One man is appointed as a coordinator of the entire job.

No burning, welding or open lights are permitted in the near vicinity to this work. Any electric lights needed are of the explosion-proof type.

All bolts around the flange were changed the day before this job to simplify their removal today as well as their tightening after the blank has been put in place. Every other bolt is removed prior to starting the actual blanking. A few bottom bolts are left in place to keep the pipe in line.

(Use CO_2 bottle to simulate escape of steam as line is opened.)

After the bolts have been removed, spreaders and wedges are used to spread the flange. Scrapers are used to clean the joint and to remove any old gaskets. After the joint is cleaned, the blank is inserted and a new gasket is inserted on the pressure side of the line. Now the spreaders are removed and every other bolt replaced. When the bolts have been tightened, the safety man takes a check of the air to be sure that it is clear of gas.

If the air is clear, the gas masks may be removed by the workers. Now the remaining bolts are replaced and tightened. Gas pressure may now be put against the blank. You have just witnessed one way to do this job. As an alternate method we have also developed a means of swinging large goggle plates which we will also quickly demonstrate for you.

The common practice is to remove all the bolts except the pivot bolt. Then by means of chain falls which require a double hookup and, in some cases, sledging, we swing and position the plate.

We have fabricated a circular channel around the goggle plate and have wrapped a rope cable around this channel.

The end of the cable is fastened to a block and tackle rigged up outside the gaseous area. This can be pulled by an employee without fear of gas exposure which eliminates the need for him to wear a gas mask.

This method requires only one man in a work mask to be present in the actual gas area. That man is there to direct the actual spotting of the plate and to drop the bolts in when the plate is positioned. When the plate is in place the remaining work crew returns, puts in every other bolt and tightens them. This same method was demonstrated previously.

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CURRENT SAFETY TOPICS

Volume 18

GREEN CROSS FOR SAFETY

METAL PRODUCTS

AUTOMOTIVE AND MACHINE SHOP SECTION
POWER PRESS AND FORGING SECTION

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

AUTOMOTIVE & MACHINE SHOP SECTION POWER PRESS AND FORGING SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Automotive and Machine Shop Section and Power Press and Forging Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Automotive and Machine Shop Section and Power Press and Forging Section carry on in behalf of their members, and for the benefit of accident prevention work in automotive and machine shops and power press and forging operations. These Sections give guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of plants operating automotive and machine shops and power presses.

The activities of these Sections are under the direction of their executive committees, the members of which are listed at the close of this volume.

Automotive and Machine Shop Section

SUPERVISING THE YOUTHFUL WORKER

by R. L. HARGRAVES

district engineer, Hartford Accident & Indemnity co., St. Louis

The key to a good department safety record is a good department supervisor. Therefore, if safety people raise the quality of supervision they can achieve a better safety record.

It is an axiom of modern industry that the supervisor is responsible for the conduct of his department. A supervisor gets results through people. Essentially the "people handling" part of the supervisor's job breaks down into two parts. He must instruct or train and he must lead. Some large plants may have training departments. But in the final analysis, the supervisor is responsible for training—passing his knowledge of the job to the people who do the work.

Up to now, the term "people" has been general. There is a special group of people, however, who deserves special attention—the youthful worker.

WHY SPECIAL ATTENTION?

These youngsters enter a strange new world when they take their first jobs. It is a change from their usual way of life and changes usually cause problems. Learning to be good workers means not only acquiring job skills, but developing safe work habits and constructive attitudes. It is a chance for them to grow up, a chance to fulfill their desire for adulthood.

Good supervision can aid youth by developing work habits and attitudes which will help them throughout life. For management, this supervision can be the foundation of good employee attitudes and job relations. The youthful worker of today is the adult worker of tomorrow. Negative attitudes developed from dissatisfaction and frustration may carry over into the whole field of labor-management relations. Good supervision can develop wholesome, constructive attitudes and habits that will last a lifetime.

All business needs youth. Their sharp eyes, quick fingers, energy and readiness to learn are assets. Yet young workers on unskilled entry jobs account for much of the labor turnover and high accident frequency.

So whether you have a few or many young people working, whether they work part or full-time, it's important that they get started right. Important for them. Important for you. Important for our country.

WHO ARE THESE YOUNG WORKERS?

Each year one and half million young people take their first job. During one year, seven million teenagers work part or full-time.

Some are school dropouts—about three out of five are boys who think they will be happier working than going to school. Some are temporary school vacation workers. Some are high school graduates with serious career plans. Apprentice machinists fall in that category.

One principle of good supervision is that people are individuals and must be treated as such. So it is with youth. Each one is different.

How Do They Grow?

During the teens physical growth may be steady or in spurts. Some muscles may grow faster than others—this makes young people awkward and unsafe on some jobs. Long bones may grow faster than muscles and a tall boy may not be as strong as he looks. Doctors say the heart doubles in size during this period and the tall boy's heart may not yet have started its spurt to growth.

If a small heart must pump blood through a grownup body, the youth tires quickly. This is not laziness. The alert supervisor must be aware of, and give consideration to such physical characteristics.

Glands too develop unequally, and could make the youth emotionally unpredictable. It doesn't mean he is basically undependable. Growing bodies need plenty of sleep and rest. Their reaction time and capacity for speed and coordination in small movements are fully developed, but they need training on specific jobs.

How Do They Think and Learn?

The young adult, especially the young man, wants to reason things out. He wants to know *why*—not just how. He may ask questions such as "why do you want it that way?" "Why should I do so and so?" He wants and needs to understand the principle behind the action.

You'll probably find a sharpness of mind—if you look for it. A bright lad may resent being talked down to. Establish good relations by respecting and letting him know you respect *his* opinion.

Judgment may be poor. Getting youth to accept the fact that judgment is gained only through experience, will save them from many mistakes. They will learn from and imitate other workers—especially those they admire—as well as you.

Youth—boys especially—do a great deal of intellectual and emotional exploring. This is what adults call day dreaming. They search for ideals, values and understanding. This idealism makes them responsive to appeals for team work, loyalty and high standards.

How Do They Feel?

They may feel insecure. If so, they hate to be laughed at. They may act grown-up and self-reliant one day and like children the next. When in a confident phase, they are prone to treat all adults as old fuddy-duddies. In this mood, the world is their oyster. Everything to them is so simple.

At another time they may be very critical of themselves. Even when self-critical they are reluctant to admit errors to others and are easily discouraged if ridiculed or criticized too harshly.

Youth wants and needs to be accepted as a person in his own right. When treated as an adult, he usually responds with adult behavior. If he knows you are for him, he will accept you as a friend and advisor.

What Does Youth Want?

They don't really know, and are a bundle of contradictions. They want to be treated as individuals but are fearful of being considered a square by their crowd. The fear of being an outsider compels them to conform to current trends and customs in dress, slang, even the way they stand and walk.

Still they want to be accepted by adults on equal terms, and this sometimes results in ridiculous attempts to appear sophisticated. To cover lack of self-confidence, they may resort to slang, profanity or affect "toughie" mannerisms. Human relations are important to them. They want to like the people they work with and to be liked by them.

If boy-girl, girl-boy relations look silly to you, change your perspective by remembering your own youth. They must learn, however, that social interests must not interfere with their jobs. Their sense of values has not been fully developed and they may need your help in getting the right perspective.

HOW CAN SUPERVISORS DEAL WITH YOUTH?

The formula is simple. Apply all principles of good supervision, but remember some principles take on special importance when dealing with youth.

The youth has no shop "know-how." He has never experienced what an older worker takes for granted. You can expect him to react differently from an adult. Remember your first days on your first job. Develop good attitudes by making him feel he belongs. Stress the "we" and not the "I".

Show him how his work is important and fits into the overall job. If possible, tell him in advance about changes that will affect him.

The language and behavior of fellow workers will influence the youthful worker's behavior too. Encourage the kind of atmosphere you'd consider suitable for your own sons and daughters. Attitudes are caught, not taught. If you command respect, you won't need to demand it.

Start Them Right

You probably have a well planned indoctrination routine for all new employees. Take special pains and pay special attention to details with the young worker. They are probably scared stiff so it's up to you to relieve the tension. No one can learn while frightened. A friendly word can be a life line . . . a friendship line.

If possible, segment beginners' jobs into short units. Young people are not used to sticking at one task for eight hours. Don't just tell them how to do a job. *Show* them —one step at a time—no more than they can master. On the other hand don't underestimate their capacity to learn and do. They will respond quickly and enthusiastically to a challenge.

Explain the purpose of the steps. Remember they want to know *why*.

Encourage questions and then let them try it, so you can put them on their own soon. *Of course, it is important to check* frequently at first, and often reinstruct if necessary. However, you should remember—"if the worker hasn't learned, the instructor hasn't taught." Haphazard instructions to young workers often result in a serious personal injury or accident.

Safety Guidance

Young workers need more guidance in safety measures than adults. They are curious. Lack of experience and judgment can make this curiosity a dangerous handicap. They like to experiment. With proper guidance experimenting may be useful—without guidance it can result in disaster.

They take more chances. Physical exuberance leads to "horse play" and other dangerous practices. Be certain they understand safe practice rules and regulations, and remember—youth wants to know *why*.

Show Them How

Show them how to lift and carry and be sure they understand. The safest jobs are best for young fellows. Safety habits learned on first jobs pay off for young workers and their employees for years to come.

*Special attention to supervising the youth*ful worker is vitally important to the youth of this country, to management and to the promotion of safety. By recognizing and understanding how youth grows, thinks, feels and wants, the supervisor is equipped to do a better job. Special emphasis should be given to indoctrination, work attitudes, job training and safety.

If you wish to improve your safety record this year and guarantee a better record in years to come, see that more attention is paid to the supervision of the youth in your organization. ▲

Joint Sessions

POSSIBILITIES VS. PROBABILITIES

REMARKS OF J. B. HYNES

safety supervisor, Oldsmobile division, General Motors corp., Lansing, Mich.

This topic covers some of the basic fundamentals of safety.

The primary objective is not to present new basic elements in safety but rather to establish a practical viewpoint of safety elements as they show up in the early stages of planning for new and rearranged facilities.

In addition, this will establish a plan for progressive improvement in the over-all safety climate in plants.

To begin with, any plant, regardless of size, has a master operating plan. Such a plan involves a definite capacity to produce certain specific products. It involves production schedules, and quality standards, and sales objectives.

It also involves labor contracts, employee relations, and public relations. The safety of employees and the provision of safe facilities in the plant is a combination of employee and public relations. It is a management responsibility which must be interwoven into the master plan.

A safety program should not be an extra activity divorced from the master plan of operation. If it is a casual activity, emphasized only when accidents domineer, the safety program loses its effectiveness.

On the other hand, with safety part of the master plan, there is no need for safety drives and campaigns or safety weeks and contests to keep it going. Safety is a day in and day out job.

With safety a part of business in plants, someone must have the job of safety coordinator. In small plants this may be a part-time job combined with other responsibilities. In other cases, the plant may be large enough to assign several people to the job.

CENTRALIZE SAFETY JOB

In any event, a person should be assigned as the safety spokesman to see that safety is integrated into the everyday operating practices of the plant. This person should study safety objectively and put himself in a position to advise management on safety policies. His decisions should be based on studies of accident causes, hazards and safety devices. However, even after sincere consideration of the safety problem, accidents do occur.

Any safety effort, a weak gesture or a concentrated drive, will reduce accident-frequency. But to reach the goal of a perfect safety record is another story.

Apparently the approach we have used is effective, because industry has become the safest locale known to man—safer than our homes and many times safer than our highways.

But we are not satisfied with being the best in an area where there is so much left to be desired. We must be just as keen in our search for better safety as we are in solving other problems confronting industry. Far too many safety decisions are made as "hindsight" instead of "foresight."

Hazards that are as plain as the nose on your face are somehow overlooked until an accident investigation. In many cases, repeaters occur where exact duplicate circumstances account for a second accident. We do a lot of re-doing in programs too, such as replacing safety devices lost in the shuffle.

In this never ending fight for life, we consistently go back to the ABC's of accident prevention in the cause analysis of accidents. We follow the dictates of the same ABC's when we act on the accident cause to prevent a recurrence.

Decisions are made hundreds of times *each day by many individuals. The big* question is whether these basic safety facts, the ABC's are in true focus in the picture.

We say "No" because many people doing the planning have never been asked for basic safety as a part of their plans.

The next two writers are engineers, who have had what, in the career of the average engineer, might be a lifetime of experience in their fields.

These men feel that the safety coordinator can get about what he wants in physical plant safety if he gets to the right people with the right safety story.

BEGIN WITH BASICS

Since engineers work with the basic principles of chemistry, physics, and the other sciences, the science of safety would be readily accepted by them. These two gentlemen have torn safety apart to see, first hand, what it is, what it does and how it could be made to perform better in industry.

To them, safety is no big, insurmountable problem. They feel that certain knowledge gained from this study of safety, accidents, and hazards makes the problem relatively simple—providing a common understanding is reached with safety people about the ABC's of safety. ▲

REMARKS OF W. A. CRICKMORE

supervisor, Plant Layout, Material Handling & Special Assignments, Oldsmobile div., General Motors corp., Lansing, Mich.

In applied accident prevention, one must diagnose the cause before prescribing a cure. After a lifelong study of accident causes in industry, H. W. Heinrick, superintendent of engineering and inspection for Travelers Insurance company, concluded there are really a limited number of ways to get hurt. He contends and our experience at Olds-

mobile backs him up, that there are only *10* ways to get hurt in industry.

The safety department at Oldsmobile analyzed 1,738 Oldsmobile accidents, and found the percentages lined up perfectly with Heinrick's. At Oldsmobile 7.55 per cent of injured people were hurt in falls. The 10 ways to get hurt are:

1. Falls 7.55%
2. Struck by an object 41.00%
3. Striking against an object..... 15.00%
4. Caught in, on, or between objects 23.00%
5. Exposure to temperature extremes and radiation 1.70%
6. Strain or overexertion 10.00%
7. Exposure to electricity ..... .50%
8. Inhalation, absorption, ingestion ..... .20%
9. Exposure to chemicals 1.00%
10. Explosion ..... .05%

The safety devices are designed to guard against one of these 10 different exposures.

● A guard over a pair of gears will keep employees from being "caught between" the gears at their mesh point.

● An air hoist installed on our cylinder block floor prevents "strain or overexertion" when it is necessary to remove manually a block from the roller conveyor.

● The ventilation system in our assembly plant repair pits prevents the "inhalation" of carbon monoxide gas from automobiles driven in the area.

Every safety effort in our plants is directed at one of these ten exposures.

Any engineer in industry, regardless of his particular capacity, should be familiar with these 10 accident types and use this knowledge in his basic designs and plans. The solution to most safety engineering problems is simple if recognized or anticipated before the engineer has gone too far in his thinking or in his design.

BET ON POSSIBILITY

So far, we have covered the high points of safety engineering theory down to the concrete hazards. Now we must recognize a hazard and know how people get hurt. We must visually place an employee in the picture to see what will happen—or *could* happen—or might happen.

It's a question of probabilities weighed against possibilities. There is a little gambling spirit in all of us but in safety engineering, you are in a position to put your chips on a *sure* thing.

In safety engineering, it is advisable to bet your life on *possibilities*. When a question arises about guarding a power saw blade, it might be assumed that the hazard is so obvious it couldn't be ignored. It could also be assumed that any employee assigned to such a machine would be experienced and probably would not be injured on the saw.

This is a decision based entirely on *probabilities* and when an engineer thinks in terms of probabilities, he gets us all in trouble. The same engineer would order parts for a machine on the assumption that the parts would probably fit.

A safety engineer thinks in terms of *possibilities* no matter how fantastic. If it can be done, he must assume that it will be done and prescribe accordingly. This line of thinking should be followed by all engineers because safety engineers are not unreasonable in asking for designs, guarding, and machine controls. They merely say that if the pendulum swings long enough, a hazard will pop up and an employee will be injured.

That's why the safety engineer says "it may not be probable but it is possible." That's why he is asking engineers to be alert for hazards in the design stages of engineering.

PLANNING MACHINES, CHANGES

In long range planning for new machines, plant rearrangements, processes, buildings and other changes, safety should be a factor in every decision. If safety is not satisfied in each step of the plan, it becomes lost and trouble is inevitable. In such cases, somebody is usually injured before the hazard is recognized.

Many factors must be considered before large expenditures are made for machines, tools and buildings and safety is only one of numerous problems.

Time and money are saved, and accidents prevented when safety requirements are "built-in" instead of added. "Built-in" safety enhances both the productivity and dependability of the finished equipment.

On the other hand, the slow and costly process of re-engineering new equipment for safety is an expensive, time consuming delay which usually does not completely satisfy the requirements of either production or safety.

This waste of time and money can be greatly reduced and safety improved during initial runs on new or altered equipment if the planning group understands the basic principles of mechanical safety and their application.

DEFINITION OF HAZARDS

To understand the problem, we must first define the terms used by safety engineers in describing hazards and their elimination. We must then analyze typical safety problems to see how the various terms are used.

There are two varieties of controllable hazards, mechanical factor hazards and personal factor hazards.

Mechanical factor hazards are usually created during the basic design of equipment, machine tools, buildings and layouts. "V" belts and sheaves, chains and sprockets, gears and racks, are examples of mechanical hazards. Mechanical hazards account for about 20 per cent of all industrial accidents.

Personal factor hazards are those created by people in their behavior while in the plant. Examples of personal factor hazards are running to the time clock at the end of the shift, unsafe piling of material, poor housekeeping in the plant, reaching into dies instead of using tongs. Personal factor hazards account for about 80 per cent of all industrial accidents.

In some cases, a fine line of demarcation exists between mechanical and personal factor hazards. For example at Oldsmobile, we have a "hands out of dies" policy. Dies are designed on this basis and production standards established accordingly.

If an employee has been instructed to use tongs in closing dies but he ignores the instructions and reaches into the dies exposing his hands, the hazard is a self-created or personal factor hazard. However, any injury he might receive would be a mechanical hazard.

Operating policies established to avoid mechanical hazards are not nearly as positive as guards and safe engineering. People "goof" but well designed safeguards serve faithfully.

An engineer is very realistic about the physical strength and properties of the equipment he designs. He is very exacting about the size of bolts, rivets, braces and other parts forming the complete assembly of a roof truss or a bridge crane. In his designs, he deals in the known facts of chemistry, physics, and mechanics.

When his designs are completed and the equipment installed, he is positive it will serve its intended purpose. However, the one factor some engineers pass over lightly is the association of the equipment with the employee who must operate it.

An engineer deals with facts concerning the inanimate things of his work. Where people are concerned, he often expects too much from them.

ABOUT THE MECHANIC

Here are certain facts about the operator of the machine that the engineer must consider in his design:

1. People make mistakes
2. People forget
3. People take short-cuts
4. People do not always do what they are told
5. People do not always do what they know they should do
6. Some people feel an immunity to accidents
7. Obvious hazards are not obvious to all people
8. People are subject to preoccupation

This is an average employee. This is the person who will operate or work on the engineers' finished product in the factory, on the highway or in the home.

Engineers must develop the skill of recognizing hazards in their designs. At the pace we are moving today, in technological advancement at Oldsmobile, we expect our engineers to become just as skillful at this part of design as they are at mechanization.

Engineers, as members of the planning team, must recognize a hazard and do something about it in their basic planning.

There are five things that can be done about mechanical hazards in general through engineering.

ABOUT THE MECHANICALS

1. We can *eliminate* the hazard—
2. We can *guard* against the hazard—
3. We can *reduce* the hazard—
4. We can *avoid* the hazard—
5. We can *ignore* the hazard—

Naturally, the hazard that is eliminated is no longer a problem. In this manner the engineer is in a good position to do away with hazards before they present themselves by altering basic plans.

- When a choice is made of a machine using a water soluble coolant over one using a kerosene base coolant, a fire hazard has been eliminated in the planning.
- When a layout of a grinder floor is made so that the operators stand out of line with the grinding wheels of his or other machines, the hazard of flying wheel fragments, should a wheel break, has been eliminated —in the basic layout.
- When an industrial washer is specified instead of open vats for cleaning parts, a hazard has been eliminated in the processing.
- When hazards cannot be eliminated, the engineer must guard against the hazard by boxing the hazard.

When a hazard is accepted as a necessary evil and the engineer must include it in his design, he must make provisions for guards, two-hand controls, and barriers to cover the hazard. If possible, *in the design*, the hazard should be located remote from the operating station for the equipment. But even though isolated, the hazard must be guarded.

When a hazard can neither be guarded nor eliminated, it must be *avoided* by the employees exposed. This technique is *questionable* because of the high degree of personal factor involved.

For instance, on a foot pedal operated punch press where both of the employee's hands are "free," he is apt to reach between the dies even though he knows without question what the result will be should the dies close on his hands.

For safety to be "built-in" in industry, designers, engineers, and technicians must reflect in their planning activities a conspicuous interest in, and appreciation of the fact that safety cannot be an accessory but must be a basic ingredient applied constantly.

To summarize the principles of safety, there are two kinds of hazards:

1. Mechanical factor hazards—20 per cent of all industrial accidents—

2. Personal factor hazards—80 per cent of all industrial accidents—

A mechanical factor hazard can be—

- Eliminated—best approach
- Guarded against—second best approach
- Reduced—better than ignoring the hazard
- Avoided—questionable as to effect—no good (we do not recommend it)
- Ignore the hazard

The reasons for not favoring the "avoid" method of hazard control are:

——People make mistakes
——People forget
——People take short-cuts
——People do not always do what they are told
——People do not always do what they know they should do
——Some people feel an immunity to accidents
——Obvious hazards are not obvious to all people
——People are subject to preoccupation

Around these facts and through these few techniques is built the entire complexity of accident prevention. It's not really a complex problem. Instead, it is a multitude of simple little problems involving a mixture of buildings, equipment, machines and people.

When members of the planning team keep safety alive in their thinking and faithfully build safety into their designs, layouts and alterations, the problems dissolve. Instead of making expensive changes in a plant "at a later date," we do it economically and intelligently—in the planning.

REMARKS OF R. H. MOONEY

senior methods engineer, Oldsmobile div., General Motors corp., Lansing, Mich.

A safety engineer is required to study all new and revised installations to weed out hazards. He searches for pinch points, catch points, shear points, squeeze points, the possibility of flying objects, falling objects, run-in points, exposure to electricity, harmful gases and other atmosphere contaminants.

Heavy objects manually lifted, unsafe storage and handling of chemicals, the possibility of exposure to temperature extremes and radiation, the possibility of striking against sharp or pointed objects and exposure to slippery surfaces are also checked.

If none of these physical hazards present themselves, the installation is considered safe. It is a safely designed and installed piece of equipment.

At the pace of modern industry, especially in General Motors, we do not have time to do things twice. We cannot keep on doing safety work on a re-engineering basis because in so doing, we pay twice for the same thing. We pay once when a hazard is engineered into a piece of equipment and then again to re-engineer the hazard out of the equipment.

This is not good business and cannot go on forever. Our management expects all engineers to reduce to a minimum, through intelligent planning, the necessity for making basic changes and doing basic guarding on equipment.

This is done through recognizing basic hazards and applying basic accident prevention principles by all members of the planning team.

HAZARDS ARE CREATED

There are 14 basic hazards:

1. Pinch points
2. Catch points
3. Shear points
4. Squeeze points
5. Flying objects
6. Falling objects
7. "Run-in" points
8. Electricity
9. Gases
10. Heavy objects
11. Chemicals and flammables
12. Hot and cold objects and radiation
13. Sharp and pointed objects
14. Slippery surfaces

Hazards are never things apart from other objects. A hazard is a condition created by the relationship of objects and their association with one another. Therefore it's an abstract thing—sneaky, maybe uninteresting, but vicious.

However, to eliminate hazards through engineering, we must have a clear understanding and a vivid mental picture of the constituents of all the hazards.

Pinch points are formed when two separated objects move and come in contact with one another. Examples are: dies, riveters, spot welders, machine stops, clamping and holding fixtures, chucking and centering devices on machines.

To keep this hazard under control we can:

1. Eliminate it—in design
2. Guard it
3. Install two hand controls to occupy employee's hands and control the position of his body while the pinch point closes
4. Reduce opening to ¼" or less

Catch points are created by objects, either stationary or in motion, which have sharp corners, splines, teeth, or other rough shapes and surfaces, capable of catching the operator or his clothing.

Some examples are: rotating drills and reamers, spline shafts on radial drills and lathes, milling machine cutters, broaches, nails sticking inside of kegs, keys and keyways.

Action on such hazards include 1. eliminate it or 2. guard it.

Shear points are created by two objects, one or both in motion as they pass one another. The two objects are close enough together, as they pass, to cause a shearing action on fingers, hands, feet and legs inadvertently placed in the shear point.

Examples are: shears, dies, paper cutters and reciprocating mechanisms.

To stop "nip and cut" when they form a shear point:

1. Eliminate it
2. Guard it
3. Install two hand controls

Squeeze points are created by two objects, one or both in motion, as they move toward one another. The objects do not come into actual contact but the distance between them reduces. A crushing injury will result if an employee is caught in the reduced area.

Examples are: machine tables when at extreme traverse position form squeeze points with other machines, building columns and walls. Large transfer type machines and objects moved by power conveyors create squeeze points with fixed objects along the conveyor.

To guard against this hazard:

1. Relocate equipment to provide 18 inch minimum operating clearance
2. Install sweep bars with micro-switches wired in series with the control circuit of the equipment
3. Provide tunnel guards with 18 inch minimum clearance at guard entrance

GROUND FLYING OBJECTS

Flying objects are encountered on some operations because of the equipment used and the material processed.

Examples are: wood working operations, forging operations on power hammers, grinding operation, drilling and tapping operations, concrete breaking, impact hand tools, chipping operations and compressed air ejection and cleaning.

To ground flying objects:

1. Eliminate if possible
2. Guard against them

Falling objects are encountered when tools or equipment used overhead are dropped or when equipment loosens from its fastenings. It is good safety engineering to anticipate such conditions and to plan accordingly.

Examples are: press drive motors working loose from mountings, hoists and balancers falling at mounting, counter weights becoming detached and falling, parts falling from poorly designed storage racks and containers, unit loads of material collapsing when tiered, tools and equipment dropped through floor openings and parts dropped from conveyor hangers.

Action on hazard is to:

1. Provide guards to catch and hold parts carried overhead by conveyors
2. Provide safety cables and chains to catch equipment when it falls
3. Over-engineer all mountings for overhead equipment, conveyor hangers and hooks
4. Provide toe boards and screen panels at all floor openings
5. Design material handling containers, racks and unit loads to assure against falling objects

ENCLOSE "RUN-IN" POINTS

"Run-in" points are created by two objects in contact with and rotating toward one another. Some examples are: belts and sheaves, chains and sprockets, gears in mesh, rolls, conveyor chains and traction wheels, ropes and pulleys, cables and drums, gears and racks.

The best way to guard against "run-in" points is by complete enclosure. If equipment can be reversed, all "run-out" points should also be guarded.

Electrical hazards are usually the result of careless use and faulty maintenance of electrical equipment. However, the engineer must make certain provisions in his design if the original installation is to be safe.

Examples are: poor quality electrical apparatus, poor quality cords and cord fittings, poorly located electrical equipment and wiring, electrical equipment not grounded, high voltage at control buttons, lack of conveniently located lock-out type disconnect switches, border line horsepower of motors specified, exposed instead of buried high voltage lines and conventional instead of vapor proof electrical equipment in high hazard areas.

There are several precautions necessary with electrical hazards:

1. Specify electrical equipment according to J.I.C. standards
2. Guard and isolate electrical lines and equipment
3. Keep the machine operator and the maintenance man in mind when electrical equipment is specified. Remember that they are exposed to the hazard while operating and repairing the equipment

HARMFUL GAS, VAPORS

Gases and vapors capable of causing industrial illness or injuries are considered occupational hazards. Explosive gases and vapors are fire hazards.

Examples of hazardous gases and vapors are: carbon tetrachloride, trichlorethylene, cyanide fumes, chlorine gas, hydrogen gas, acetylene, propane, carbon monoxide, hydrocyanic gas, caustic soda fumes, city gas, gasoline and kerosene vapors, lacquer thinner vapors, ammonia gas and acid vapors.

The hazard of harmful gases can be controlled as follows:

1. Eliminate hazardous gas or liquid if possible
2. Ventilate all points of usage
3. Provide for fixed fire extinguishing equipment if liquids or fumes are flammable
4. Isolate incompatible chemicals in the design of the equipment

Heavy objects, either parts or tools, are hazardous if they must be manually handled. These hazards cause back, abdominal, and foot injuries.

Examples are: broach bars, crankshafts, lathe chucks, plating racks, forgings, dies—or in general—heavy objects weighing over 50 pounds.

To prevent accidents resulting from this hazard provide hoists, balancers or conveyors to handle heavy parts and tools.

Chemicals and flammable liquids used as industrial processing materials are trouble potentials.

Examples are: plating chemicals, solvents, cleaning agents used in industrial washers, pickling acids, heat treat salts and paint stripping chemicals.

Action on this hazard are:

1. Identify components of all chemical compounds purchased under trade names
2. Select low hazard chemicals when a choice is possible
3. Isolate as much as possible in storage and use
4. Provide adequate ventilation where necessary
5. Provide emergency equipment such as deluge showers, fire blankets, masks and fire extinguishers
6. Establish definite procedures and facilities for storage and use of chemicals and flammable liquids and supervise accordingly

Objects which become extremely *hot or cold* during industrial processing are dangerous. Some are: forgings, forging flash, parts being heat treated, parts reduced in size through refrigeration in assembly process and parts soldered and welded.

TEMPERATURE EXTREMES

To reduce the hazard of temperature extremes and radiation provide:

1. Personal protective equipment such as gloves, aprons and masks
2. Mechanical handling devices such as conveyors, special tubs and racks
3. Heat shields for controlling radiant heat
4. Radiation shields

Sharp and pointed objects are naturally dangerous, such as: sheet metal trimmings, sheet metal stampings, parts made of glass, nails and tacks, rough forgings and castings.

Action on such hazards is to:

1. Design dies to eliminate needle pointed trimmings
2. Handle trimmings mechanically
3. Personal protective equipment such as gloves, wrist protectors and aprons

Slippery surfaces are the last hazard such as: oil, grease, compound and water on floors, slippery stair treads, work and walk surfaces, hand tools with slippery handles, parts in process with slippery coatings, ice, snow, sleet and rain.

Action on this hazard is to:

1. Install slip-proof surfaces on stair treads, work platforms and catwalks
2. Provide slip resistant floor coverings and surfaces
3. Provide drip pans and splash shields to keep coolants off the floor

4. Design hydraulic equipment to cause hydraulic fluid leaks to drain back to equipment and not on the floor

Now that we have had a good look at these hazards, we should strive to eliminate re-engineering machines, plants and equipment through more attention to safety in the original design. We must remember to count possibilities—not probabilities— and as members of the planning team, we should keep safety in mind while making every decision. ▲

STANDARDS (A SYMPOSIUM)

TRADE ASSOCIATION STANDARDS

by HENRY G. LAMB

safety engineer, American Standards Assn., New York city

A standard is a solution of a recurring problem. For instance, if the boss says that beginning Monday morning you will receive a 55-gallon drum of trichloroethylene for degreasing, how do you know how toxic it is or what ventilation is needed for its use? If you can find a technical society standard, a trade association standard, or even an American Standard Maximum Allowable Concentration of Trichloroethylene, you have a good start to the solution of your problem.

If in addition to this you know that standard requirements for the ventilation of open surface tank operations, such as degreasing, are included in the American Standard Safety Code for Ventilation and Operation of Open-Surface Tanks, Z9.1-1951, then you probably have the facts to decide whether you can use this new chemical in your present equipment or whether you must request the plant engineering department to provide you with additional ventilation. Many others have had the same problem before you and have already developed a standard solution to the problem.

In general, trade association standards are developed by committees, as the result of discussion and agreement. If each organization on the committee sends its best qualified technician as a member of the committee, then the final standard is the best agreement that can be developed on that particular subject. The standard represents good sound technical advice.

As a comparison, trade association standards are available for voluntary adoption; whereas, government standards may have the full force and effect of law. Trade association standards are generally on subjects of broad over-all interest; whereas, an individual corporation makes its own corporation standards to fit its own needs.

These latter standards may be better solutions for that particular company than either government or trade association standards. But the corporate standards of one company may not be much use to any other corporation.

For instance, one company may make a company standard not to purchase or use carbon tetrachloride at all in any of its operations. This may work out very well for that corporation, but it might not be the best answer for many other companies.

AVAILABLE STANDARDS

Joint Industry Conference

The Joint Industry Conference developed electric, hydraulic and pneumatic standards for industrial equipment. These standards provide specifications for the application of electrical, hydraulic and pneumatic devices to industrial equipment to promote safety of personnel.

The standards also promote uninterrupted production, long life of the machine, equipment or tool. They will not limit or inhibit new developments. Copies are available from Joint Industry Conference, Post Office Box 182, North End Station, Detroit 2, Michigan.

Association of Casualty and Surety Companies.

This Association has put out many helpful publications for accident prevention. One is the "Handbook of Industrial Safety Standards." The ninth edition was published in 1954, and is available from the Accident Prevention Department of the Association of Casualty and Surety Companies at 60 John Street, New York 38, New York, at $1.40 per copy.

Manufacturing Chemists' Association.

This Association has a series of safety data sheets for an individual chemical such as sulphuric acid or metallic sodium. There are now 68 data sheets available. They cover such subjects as: properties, hazards, engineering control of hazards, employee safety, fire fighting, handling and storage, tank and equipment cleaning and repairs, waste disposal, medical management, and first aid. These may be obtained from the Manufacturing Chemists' Association, 1625 Eye Street, N.W., Washington 6, D. C.

American Society of Mechanical Engineers.

This is a technical society rather than a trade association. They have developed and printed many standards which have a bearing on safety. Perhaps the best known is the ASME Boiler and Pressure Vessel Code. This has been developed by the ASME, but because it has been so widely adopted by state regulatory bodies, this code could be considered a governmental standard.

These are illustrations and examples, and the list is far from complete. There are also standards of such groups as the Associated General Contractors of America, the National Electrical Manufacturers Association, the Compressed Gas Association, and the Powder Actuated Tool Manufacturers Institute. This latter group published their recommendation for a "Uniform State Code Relating to Powder Actuated Tools Using Studs, Pins and Fasteners." Their address is 250 East 43rd Street, New York 17, New York.

I have refrained from listing standards approved by the American Standards Association because these are not trade association standards. Safety standards approved by the ASA are developed by joint committees including representation from trade associations, technical societies, employee organizations, governmental groups, insurance groups and independent organizations such as the American Society of Safety Engineers and the National Safety Council.

These standards, when approved, are available for voluntary adoption and are acceptable to all parties concerned. Many form the basis of state regulations, and practically all are widely adopted by industrial organizations on a voluntary basis because they represent good sound technical information.

Another group is now getting into the picture. The International Organization for Standardization includes representation from the national standardizing bodies of the various countries throughout the world, and they are beginning to approve recommendations. One of their projects is on safety color codes, and the work done by the ASA project on Safety Color Code, Z53, sponsored by the National Safety Council, is used as the basis for the international study of this subject. ▲

CORPORATE STANDARDS

by J. A. CHURCHILL

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The need for standardization on a national and international basis is well recognized. In the past 50 years thousands of standards have been developed covering materials, engineering specifications, and methods. The American Standards Association, index of available standards, alone covers 13 double column pages. Add to these standards the multitude of standards or codes sponsored by Federal and State

agencies, trade groups, insurance and engineering societies and other sources, and the number of items covered by existing standards is astounding.

In view of this, why is there a need for corporate standards? Particularly why is there a need for corporate *safety* standards?

The Magazine of Standards July issue contained an article entitled"The 'Not Invented Here' Problem." This article by L. B. Moore was slightly critical of corporate standards. One part of this article states, "Important to every company are the many standards that are available externally and that are in some fashion appropriate to its operations. Typically, however, these standards never seem to fit, and too often need re-work to be acceptable to the company standards group. The explanation given is "The external standards are too general or too all embracing. Our company situation is different and unique and its needs are specific. We must have our own standards to suit our own conditions."

NEED FOR CORPORATE STANDARDS

In my work as a safety engineer, I lean heavily on existing external standards of all types. Use of such standards eliminates countless hours of investigation and research and utilizes the ideas and skills of numbers of people who are experts in their field. Nevertheless there is also a need for corporate safety standards to guide and direct the safety effort for the following reasons.

1. In spite of the large coverage of existing standards, there are numerous problems for which there are no standards available. In fact, there are less than 200 American Standards Association *Safety Standards* available today to cover the wide range of safety problems encountered in industry.
2. A national standard must be broad in scope and therefore is frequently not in sufficient detail or leaves an area of selection of approved construction or method open to the user. The ASA "Safety Code for Industrial Power Trucks B-56.1" for example covers six means of providing acceptable steering mechanisms.

   It may be that your plant experience has shown a definite preference for one type of steering and indicated that this preferred type must be covered in greater detail for uniformity of operation. This, along with other items of truck construction, then indicates a definite need for a corporate standard.
3. The benefit of actual use of safety standards depends on the distribution and acceptance of the standard throughout the many levels of industrial management. With the stress of other supervisory activities is there any reason to believe that such supervisors will be able to read, digest, and remember much of the 74 pages of information contained in the ASA code for "The Use, Care and Protection of Abrasive Wheels," for example?

   The need for corporate safety standards therefore is to supply the manufacturing, engineering, and purchasing sections with short, yet clear, regulations, tailored to the specific needs of the corporation, written in clear terms and available in a form which will promote their active use.

FOUR PUBLISHED STANDARDS

To supply these safety standards at the Allis-Chalmers Mfg. co. we have a choice of four methods of publishing standards material.

The first type is the Allis-Chalmers Process Standard which is issued through our Standards Department. As the title indicates, this group is composed of process specifications which potentially may have general application. This method is used when the use of the standard will be largely confined to engineering departments. For example ACP 6-25 covers "Radiographic Inspection of Alloy Steel Chain." This standard covers:

1. Scope
2. Requirements
3. Preparation for radiography
4. Radiographic technique
5. Acceptable quality
6. Inspection records

Another type of standard issued through the Standards Department is the Allis-Chalmers Material Standard. This group of standards controls the type and quality of purchased materials. Allis-Chalmers Material Standards are issued for items of protective equipment such as gloves, ACM #67 for instance covers specifications for grain leather mittens for use by railroad switchmen in our yards. This standard covers:

1. Material—leather, thread, binding
2. Size
3. Construction pattern—welting, seaming, stitching
4. Workmanship

Use of these standards by the Purchasing Department to obtain competitive biddings on glove requirements has enabled us to hold glove costs closely in line with costs incurred in years prior to 1950 in spite of increased coverage on many operations and increased general glove manufacturing costs. More important, it has provided hand protection of uniform quality to do the protective job required.

SAFETY HYGIENE DATA

Several years ago a third type of standard was started originating directly in the Safety Services Department. This group called "Safety and Hygiene Standards and Data" covers items of equipment, processes, or materials which through their use have been shown to be a safety problem.

The investigational work and preparation of these standards is done in the Safety Services Department or may be done by one of the plant committees designated by the Works Safety Council. In either case, the first draft of the standard is referred to interested parties in management for comment and the final draft is then recommended for approval by the Council.

Since these standards are used by both shop and engineering personnel, the standard drawing form was adopted because it is the usual form from which they obtain information and is therefore familiar to them. It also lends itself to revision or correction and subsequent re-issue without confusion.

As an example of this type of standard "Steel for Fabricating Hitching Equipment," standard 95-100-012 covers:

1. Scope
2. Application
3. Specifications—physical properties
4. Welding procedure
5. Inspection procedure

for all types and shapes of acceptable material.

The fourth type of standard is that published in handbook form covering a group of operations particularly important in the safety program. Such standards cover methods and use of equipment and are intended for application by manufacturing supervision and for employee distribution.

These standards are prepared as a committee function as directed by the Works Safety Council. Typical membership of such a committee would include supervisory members of the affected manufacturing sections, one or more tool engineers or maintenance personnel, and a member of the Safety Department who acts as secretary of the committee. Where indicated, representatives of Plant or Product Engineering sections, Research Department specialists or other specialists may also be requested to serve on these committees.

Standards manuals of this type have been prepared for:

1. Crane Operation & Hitching
2. Maintenance and Construction
3. Trucking
4. Grinding Practices
5. Railroad Rules
6. Field Service

Corporate standards of the types mentioned have, we feel, filled the need which as stated earlier was to supply short but clear standards, tailored to the specific needs of the corporation, written in easily understood terms and made available in a form which will promote their active use.

FIRE STANDARDS

by ALLEN L. COBB
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Fire standards in the United States and Canada principally are produced by the National Fire Protection Association, 60 Batterymarch Street, Boston, Massachusetts. These standards have been used as the basis of state and municipal codes and often are adopted by means of an enabling act indicating the "compliance with NFPA standards is evidence of satisfactory installation."

When standards are used with almost the force and effect of law, they must be developed under democratic procedures with ample opportunity for free discussion and by committees composed of technically competent personnel.

The National Fire Protection Association was formed in 1896, urged by fire protection insurance organizations, industries, particularly the electrical industry enforcement officials and individuals.

The Association has two classes of membership: organization membership limited to associations, and associate membership of individuals. There are now about 200 organization members including the American Institute of Electrical Engineers, American Management Association, National Board of Fire Underwriters, National Electrical Manufacturers Association and the Association of Canadian Fire Marshals.

ASSOCIATE MEMBERSHIPS

The most important NFPA membership is the 18,000 individual associate memberships. The majority are individuals who either pay dues in the Association or have their organizations pay dues. Associate memberships are held by industrial concerns. However, most industrial concerns assign memberships to individuals who represent the company. Many companies have more than 50 associate memberships.

More than 100 technical committees set up the standards. They report to the Board of Directors and their membership and scope is directed by a Technical Advisory Committee. Technical secretarial and editing assistance is provided by the paid staff of the Association, under the direction of Robert S. Moulton, technical secretary of the National Fire Protection Association.

Each committee has representatives to serve public interest, insurance interest, equipment manufacturing groups and consumer or user groups such as industrial concerns. A balance of interest is established. In the case of manufacturers, committee membership is limited to representatives of associations. Such a representative, of course, may work for one of the interested concerns. But in the committee he represents the entire group, not his individual company. Often committee members even agree to changes which have an adverse effect on their own business, to achieve the best fire standards.

VOTE AT CONVENTION

After developing a draft, approved by a majority of the committee, the committee submits it to the National Fire Protection Association office by March 15 of the year it is to be considered. It is printed in Advance Reports, and distributed to all interested NFPA members.

Each committee report is voted on by the annual membership. Often vigorous discussions develop on the convention floor, modify the standard, refer it to committee, or to the Board of Directors to adopt after certain changes have been made.

The Association guards this democratic feature of standards procedure to give everyone interested an opportunity to be heard, and to see nothing is overlooked. Sufficient safeguards prevent hasty modifications of a standard at a general meeting. An actual modification is seldom made at a general meeting except for a very minor editorial point. The work is referred back to the committee with suggestions, sometimes to the Board of Directors.

New standards must remain tentative for at least one year before final adoption. Revisions of standards, however, can be made without going through this tentative adoption procedure.

For convenience, some of the committees are grouped, such as, the Electrical Section with jurisdiction over the National Electrical Code. Another group of committees with jurisdiction over types of extinguishing equipment, is the Special Extinguishing Methods committee.

Some other groupings are Standard #10 on Portable Fire Extinguishers, Standard #13 for the Installation of Automatic Sprinklers and Standard #101 for Building Exits Code. One which caused much discussion recently with many revisions is Standard #58 on the Storage and Handling of Liquefied Petroleum Gases.

The standards are useful in fire protection and safety work, and everyone in this work should become familiar with them. These are intended as standards, not texts or installation manuals. In a number of cases, appendix material is attached to help understand and use these standards. But each person using a standard must have a good general knowledge in advance. The standard simply states the performance and material requirements for good installation or satisfactory fire protection. They are minimum standards and in many cases additional protection should be provided.

The National Board, a member of the National Fire Protection Association, helps develop these standards and prints them over its own name as "Regulations of the National Board of Fire Underwriters."

These Underwriters' regulations, therefore, are identical with National Fire Protection Association except for the format, wording on the cover, and the printed foreward attached to the bulletin. In a few instances minor text changes were made, such as the type of authority having jurisdiction. These are issued for implementation by the National Board and its associate organizations.

Some of the National Fire Protection Association standards are also listed as American Standards. But the certification procedure of the American Standards Association requires a considerable amount of time and in this field it is exceedingly important that the standards be issued at the earliest possible date. Acceptance of the standards, promulgated by the National Fire Protection Association, has been entirely satisfactory and American Standard Association certification is not required in most cases.

Other information on fire protection is issued by a number of organizations. One is the loss prevention bulletins of the Factory Mutual Insurance Companies, issued as a guide to industries insured by these organizations but based on broad experience in fire protection. They supplement and extend the National Fire Protection Association standards and include a great deal of explanatory material which is most useful. Data sheets are also prepared, some by the Manufacturing Chemists Association on the storage and handling of a wide variety of chemical materials and include fire protection sections. In general, however, the basic fire standards most useful to the safety engineer and particularly to the fire protection engineer are the standards of the National Fire Protection Association.

Power Press and Forging Section

OPENING REMARKS OF GENERAL CHAIRMAN

C. H. DUGGER

director, Health & Safety Div., Albuquerque Operations, U. S. Atomic Energy Commission, Albuquerque, N. M.

This year marks the 30th anniversary of the Power Press and Forging Section as a separate section of the National Safety Council.

I am proud to have been associated with the men on the Executive Committee of this Section during the past nine years. I am proud also to be associated with an organization which can boast of having had among its members such men as August Kaems of the State Industrial Commission of Wisconsin, and for many years safety director of the Simmons Co. in Racine, Wisconsin. Kaems was the father of most of the semi-automatic power press feeds we think so highly of today.

ACTIVE MEN IN SECTION

Such men as George S. Thompson of the Detroit Insurance Agency, now the Michigan Mutual Insurance Co., who made the first formal speech on the Power Press and Forging Section's first National Safety Congress program in 1927; Ted Meisner, safety director for the American Can Co., who was the first General Chairman of the Power Press and Forging Section Executive Committee; J. W. Henning of the Automatic Electric Co. of Chicago, who was the first Vice Chairman and the second General Chairman of this Executive Committee; Robert A. Shaw of both the Murray Corp. and the Ford Motor Co.; E. F. Clark of the Ternstedt Manufacturing Co. of Detroit; A. F. Dunnebach, safety director, General Motors Corp.; and Gus A. Kichenmeister of Dominion Forge Limited, Walkerville, Ontario.

My own tenure with this group dates back to 1948, and there are several men on the Executive Committee today who were active long before I became a member. In fact, we still have one active charter member, Edward J. Wallman, district safety supervisor of the American Brake Shoe Co. I could name others but the list is too long. These men promoted the use of safeguards on power press operations, and devised most of the methods and feeding devices in use today.

ACCIDENTS LIKE HEN'S TEETH

In 1919 Kaems made the first speech on power press safety ever made at any National Safety Congress. In that year, for want of a better place to schedule this speech, it was included in the Automotive Section's program. From that year on, there was constant agitation for separate Sectional status.

Seven years later, at the 1926 National Safety Congress, Kaems made another speech. *His subject this time was:* "Why a Power Press Section." In his speech, Kaems mentioned that in 1919 he had brought two wooden models of press feeding devices to the National Safety Congress. He mentioned how the exhibit had grown between 1919 and 1926, because of the contributions of many of the progressive companies in the United States. Then he said, and I quote:

"There is no doubt in my mind, and I know that there are at least a dozen men in the audience today who will stand up and tell us that punch press accidents in a few years from now will be as scarce as hen's teeth."

If only Kaems had been a better prophet . . . I don't know what happened between 1926 and now . . . Kaems must have had some sound basis for his optimistic prediction . . . The sad facts are these:

1. We are saying exactly the same things today that were said 38 years ago. The only way to eliminate power press injuries is to keep the hands out from between the dies.
2. There is no panacea—no cure-all, there is no universal guard. Every job is a little different, but every job can be, must be, made safe.
3. Safe tools and safeguards cannot be built unless the head of the firm is interested and willing.

We must all confess some responsibility for the over-all failure to sell the idea of power press safety to plant executives—the only people who can establish the policies and authorize the expenditures necessary to safeguard power press operations.

MUST APPLY IDEAS

It seems pretty clear that we do not need to find more and better guards and feeding devices to eliminate power press accidents. The thing we do need to do is to find some factor—some appeal which will make plant management really apply what we already know about guarding power press operations.

In his speech in 1926, Kaems mentioned that the exhibit of guards that year was much larger than the original exhibit of two wooden guards in 1919, that they intended to make the exhibit five times larger, and that it would be housed in a room where someone would be on duty at all times during the Congress—a place where anyone, who came to the National Safety Congress, could go and talk over his power press safety problems and there would be someone present to help him.

Somehow—over the years—this project died. It is the hope and intent of the present Executive Committee to revive that service, and we intend also to reinstitute the power press guard exhibit. We aren't quite sure yet just how we will manage it, but we have made a start.

Now—this is my swan song as General Chairman of this Executive Committee, but I am not through as a member. I'm happy to report that in the nine years I have been a member, I have seen steady improvement in the functioning and in the accomplishments of this committee. This year it completed a difficult three-year project in developing a Power Press Safety Manual which will be published soon. I am sure you will find it helpful.

Over the years, this committee has developed most of the power press and forging safety material available from National Safety Council. It furnishes the material for the Power Press and Forging Section Newsletter which is edited by one of our members and published by the Council. It has a long range program that will keep it busy for years to come. The only thing wrong with this program is that the materials, Newsletter articles, and Congress programs are what the committee members themselves think will be the most useful and interesting to you.

To render better services, this committee needs your help. It needs to know what types of materials and what subjects should be covered to best meet your needs. Please write in and tell us.

The Power Press and Forging Section Newsletter is your Newsletter. We believe that most of you have, or have had, incidents in your plants, the knowledge of which would be helpful to others. I am sure that many of you have ideas that you want to pass along. I am sure also that most of you have developed some safety gadget that has done a good job for you, and you would like for others to benefit from it.

SAFETY MATERIAL

I beg you to participate in the exchange of power press and forging safety information through your Newsletter . . . Please write up these incidents, ideas, and gadgets and submit your drafts, along with appropriate illustrations, to the Power Press and Forging Section at National Safety Council headquarters. Your contributions will be passed on to our Editor for inclusion in the Newsletter at the first opportunity. Through the free exchange of ideas and information you can contribute much toward the realization of August Kaem's dream that in a few years power press accidents will be as scarce as hen's teeth.

SAFE OPERATION OF INDUSTRIAL FURNACES AND HEAT EQUIPMENT

by LARRY I. JAFFE

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General Motors, several years ago became aware of the increased frequency of explosions and fires due to industrial furnaces and heat treat equipment. In the past three years, they have had two very bad accidents: an explosion in a core baking oven injuring 27 men, and a still more serious accident in an atmosphere brazing furnace which exploded and killed three men.

These two major explosions are not the only accidents due to furnaces and heat treat equipment however. During the second quarter of 1956, according to the Fire Protection Bulletin published by G. M., there were nine other explosions and fires in heat treat departments in General Motors plants. Two of these accidents were explosions of considerable extent caused by furnaces. One caused $2,500 damages, and the other a $10,000 loss.

Six others were fires involving heat treat quenching oil. Most were minor, the most costly having $2,000 damages. However, such a fire can get out of control. These quenching oil fires have one thing in common—they have plenty of fuel on which to feed.

The reason General Motors' data is cited here instead of industry-wide data is because the information is readily available in the G. M. Fire Prevention Bulletin. G. M., as a manufacturing organization, has a wide variety of manufacturing operations and should be fairly representative of all metal fabricating plants.

WHY MORE EXPLOSIONS?

Why use data for the second quarter of 1956? Actually, that was the latest data available last year, and is very representative of G. M. plants at that time. Since then, a strong campaign was instituted to promote safe operation of industrial furnaces and heat-treat equipment, and the figures for 1957 are considerably improved.

We are having more explosions and fires from furnaces and heat treat equipment than in the past, even though more and better safety devices are available today than ever before. Examining the facts, the reason becomes obvious. There has been a tremendous increase in the number of furnaces and other heat-treat equipment in use the past few years and the furnaces themselves are becoming increasingly complicated and diverse.

The Buick plants at Flint contained more than 1,000 furnaces and ovens for heat treating and other operations. At the time, 125 new pieces of similar equipment were scheduled for installation. The 1,000 industrial furnaces had more than 80,000 individual gas burners and pilots. In other words, this division, with approximately 30,000 employees, had almost three burners or pilots for every person. The malfunction of any one of these could result in a serious explosion.

This indicates the amount of equipment involved; now look at the variety. The plants had low temperature furnaces, used for paint drying, core drying, tempering, nitriding, stress annealing and many other operations. The division also had high temperature furnaces for forging, annealing, hardening, porcelain firing and porcelain enameling. Besides these, there are the atmosphere furnaces, with associated atmosphere generators, used for bright annealing, brazing, carburizing and carbonitriding.

The furnace atmospheres are usually produced in atmosphere generators. These may vary widely, depending on the raw materials and on the type of atmosphere required. They may, however, be classified as either exothermic or endothermic generators, or as dissociators.

Besides these furnaces, ovens, and generators, there are salt baths, molten metal baths of various types, and the oil quench tanks.

Such a variety and quantity of equipment proves the immensity of the problem of heat treat safety. A furnace is no longer just a heating device. It is a tool designed for a specific purpose. As such, it has its own peculiarities and its own hazards. Each piece of equipment, therefore, must have safety devices designed for the particular things that can go wrong with it.

The hazard common to most industrial furnaces, ovens, and generators, is flame failure. In order for fuel to burn, three things must be present; fuel, air, and a source of ignition. Usually, the source of ignition is a pilot. If it goes out, particularly in furnaces operating at low temperatures, air and gas will enter the furnace unignited, resulting in conditions for an explosion. Most furnace burners are equipped with a flame protective device, which cuts off gas supply if the pilot or flame goes out. This is an absolute must on low temperature furnaces. The gas furnace in your home and your automatic gas hot water heater are equipped with similar devices.

GAS ACCUMULATION HAZARDS

A second hazard is unignited gas from leaks and other causes, which collect in the furnace before it is lighted. If you have ever lighted a gas furnace at home, the instructions told you to keep the furnace door open for five minutes before igniting the pilot. This ventilating period is necessary to insure that gas collected in the furnace from leaky valves or some other cause, is removed by purging. Otherwise an explosion could occur.

The same precautions are necessary in lighting industrial furnaces. With certain types of modern furnaces, the purge time is controlled by an electrical timer interlocked with the starter mechanism. This prevents lighting the burners until the furnace has been properly ventilated.

A third hazard is connected with certain types of operations performed in ovens and furnaces, which produce combustible fumes. Core drying ovens and paint drying ovens fall in this category. For example, thinners are volatilized from paints and lacquers when they are dried. If these accumulated in the oven, they would interfere with proper paint baking, and would build up concentrations within the explosive range of the solvent. Ventilating and exhaust fans are necessary to prevent this. The fans are interconnected with safety devices which prevent the oven being used unless the ventilating and exhaust fans are operating.

This last hazard possibly caused the core oven explosion mentioned above. Fumes from the core baking operation might have collected in the oven and then became ignited. The exact cause of this explosion was never determined.

STILL DIFFERENT PROBLEMS

Atmosphere generators and furnaces have their own peculiar problems and hazards. Most generators use natural gas for their atmosphere. This is combined with a fixed proportion of air in the generator. The type of generator used and the type of atmosphere produced depend on the proportion of air and gas. With exothermic generators, enough air is suppled to burn the gas to a degree where sufficient heat is generated to maintain the reaction. With endothermic generators, the air supplied is insufficient to develop heat of reaction to keep the generator hot, so external heat must be used.

In either case, if the generator loses its heat the reaction no longer takes place and a mixture of raw gas and air is passed into the furnace. The result is perfect conditions for a violent explosion. This caused the brazing furnace to blow up last February. To guard against it, some temperature sensing or flame sensing device must be installed in the generator.

The problems dealing with atmosphere furnaces are principally connected with starting up and shutting down. In starting up, a furnace full of air must be replaced with combustible gas. If done properly, no hazard is involved. If done improperly, anything can happen. The same thing is true when shutting down. The only difference is that the gas atmosphere in the furnace is replaced by air.

Another hazard occurs with certain types of atmosphere furnaces when the front and rear doors of the furnace are opened at the same time so that a draft of air passes through. This air becomes intermixed with the gas in the furnace, and a source of ignition, such as, the hot walls of the furnace can set it off. Interlocks, which keep

the front and the rear doors from being opened at the same time, prevent this.

These are some of the principal hazards connected with operating fuel fired furnaces. There are others. Many of these are associated with the failure of utilities such as gas, air, water, and electricity. Failure of any of these can result in explosions, particularly with atmosphere furnaces. Furnaces and generators, therefore, should be equipped with safety devices which shut off the fuel and air supply if a utility fails.

In most cases, such a shutdown is probably the safest thing that can be done. However, with certain types of equipment, particularly with atmosphere furnaces, it can lead to other hazards. When the atmosphere is turned off on an atmosphere furnace, air begins to infiltrate. The air which enters the hot zone will immediately react with the furnace atmosphere and cause it to burn.

The air, which infiltrates the cold zone, will not react with the furnace atmosphere since a source of ignition is not present. Instead, it will mix with the atmosphere, and might diffuse back into the furnace. If it should travel to the hot zone, it will become ignited and the entire contents of the cold zone will explode.

This can be prevented, when a shutdown occurs, by either replacing the atmosphere in the furnace with a natural or neutral gas, such as nitrogen, or else by removing the atmosphere *from* the furnace by the burn-out method. Any operator properly instructed in the correct methods can do either safely. However, he must be aware of the emergency.

TRAINED WORKERS ESSENTIAL

At no time should an atmosphere furnace be operated unless a trained operator or *someone thoroughly familiar* with the furnace and emergency procedures is present. The failure of a utility or flame or heat failure in the atmosphere generator might lead to a serious explosion if no one were at hand to take the necessary safety measures.

For these same reasons, any safety device should have a visible, audible signal to show the operator the device has acted. The visible signal indicates which device has acted, while the audible signal is a general alarm covering several devices.

Closely related to these hazards are those involved with operating molten metal, salt baths, and oil quench tanks. Molten metal and salt baths have the same hazards as hot molten materials. They splash, burn and form steam or vapor which may erupt with explosive violence when mixed with any liquid, such as water or oil. One exception to this is a low temperature nitrate-nitrite *tempering bath to which water is sometimes* added to lower its melting point.

One hazard of salt baths, which is not too well known, is that the two types of *salts—oxydizing salts and reducing salts*—react violently together. For example: cyanide baths are reducing; nitrate baths are oxydizing. The erroneous addition of one material to a bath containing the other will result in an explosion. Nitrate salts will also react with any other reducing substance, such as, oil, soot, magnesium, or aluminum alloys containing magnesium. Because of this, nitrates need to be carefully identified and it is recommended they be procured containing a red dye for this purpose.

BEWARE QUENCHING OILS

Quenching oils have all the hazards of flammable liquids. When it is considered that red hot parts are quenched into these flammable materials, the possibilities for accidents can readily be seen. Furthermore, these flammable liquids must be close to furnaces and salt baths. This leads to all *kinds of hazards. Safety* devices are used to prevent overheating the oil, but the only real way to eliminate this hazard is by finding a suitable and practical non-flammable substitute. Non-flammable hydraulic oils are developed, so why not non-flammable quenching oils?

Besides fire and explosion equipment and industrial furnaces there are still other hazards connected with heat treating operations. For example, some common salts used in heat treating are cyanides.

They are poisons and should be handled with gloves, kept out of cuts, and care should be taken not to inhale their dust.

Another well known danger found in furnaces and gas generators, is carbon monoxide. If a fuel is burned with a deficiency air, carbon monoxide is formed. This means any fuel burning device, under certain conditions, can produce this poisonous gas.

Unfortunately, it has no odor so the only safeguard against it, *is adequate ventilation.*

Atmosphere generators are particularly efficient carbon monoxide producers. They work on the principle of reacting natural gas or some other hydrocarbon with a deficiency of air. The result is an atmosphere rich in carbon monoxide. A typical exothermic generator operated on natural gas at an air-gas ratio of six to one will produce an atmosphere containing 10 per cent carbon monoxide. Endothermic generators are used at lower air-gas ratios. Such a generator maintained at a three to one air-gas ratio will produce an atmosphere containing 18 per cent carbon monoxide.

Ten minutes exposure in air containing one per cent of carbon monoxide will result in death. Therefore the products of these atmosphere generators are extremely lethal. Any gases from the generators or furnaces should either be vented to the outdoors or burned. Also flame curtains at the outer doors of atmosphere furnaces will prevent explosions, lessen the contamination of the furnace atmosphere and burn *combustible* gases, including carbon monoxide, from the furnace. However, the combustible content of the atmosphere can be so low that it will *not* burn, and yet in the case of carbon monoxide could still be highly toxic. To prevent this, the outer doors of atmosphere furnaces should be surrounded by ventilating hoods.

SAFETY SUGGESTIONS

Six steps should be taken to minimize these various hazards and attain safe operation of this equipment.

1. Make sure furnaces and other equipment are safe and have all the necessary safety devices. Review each piece of equipment to make sure in the event of any utility failure, flame, temperature failure, or instrument failure the safety devices will operate. Much of the safety equipment is required by the insurance companies. But, in many cases it is necessary to go beyond the insurance companies requirements for safe operation.

2. When additional furnaces or heat treat equipment are purchased, make sure that they are adequately protected by safety devices. The safety devices should be considered as an integral and necessary part of the equipment, not as an extra. Be sure that *low bids are not made on the basis of* leaving off some of the safety equipment.

3. Maintain safety devices in good condition, and inspect them at least once a month to see they are operating. Records should be kept of the results of these inspections. The insurance companies have standard forms for such results.

4. Be sure you are *following* approved procedures. Make certain that furnaces and ovens are adequately purged before lighting and that proper methods are followed for *introducing and removing* furnace atmospheres.

5. Make sure all piping and valves are adequately identified. Piping should be identified *by some standard color code.* Valves should be readily accessible and their open and shut positions clearly visible from the floor.

6. *The last and most important factor* of all is well trained operators. This can not be too highly stressed. Even though a furnace has the latest and best safety devices, a *well trained operator* is still necessary for its safe operation. This is particularly true of atmosphere furnaces. No safety device has been invented which will properly introduce atmosphere into these furnaces or shut them down safely.

Similarly, when wrecks occur in the furnace, only a trained man knows how to handle them without causing an explosion. In the event of utility failures or flame failure, the presence of a trained operator is necessary for the required emergency procedures. As mentioned previously, an atmosphere furnace *should never* be operated unless trained personnel are nearby.

PREPARE INSTRUCTIONS

Complete instructions for each furnace should be prepared and the operator should be made thoroughly familiar with them. These instructions should include emergency procedures. A copy of the instructions should be posted near the equipment, and a second copy retained by the foreman. The foreman should review the instructions with the operator at regular intervals.

These are some of the things that must be done to insure safe operation of industrial furnaces. General Motors has gone

beyond this. They hold a series of meetings to outline the necessary precautions for safe operation of furnaces and heat treat equipment. Personnel from many of the G. M. divisions helped in this work. Present at the meetings were safety engineers, metallurgists, plant engineers, heat treat supervisors and others. Their recommendations were *incorporated in the* Heat Treat Section of a G. M. book entitled, *Plant Engineering for Hazardous Materials.* This book is used by all General Motors divisions as a guide in the safe operation of their plants.

Another publication on this subject, recently issued by the Factory Mutual Engineering division is their Loss Prevention Bulletin No. 14.15 entitled, *Safe Installation and Operation of Industrial Ovens and Dryers.* This can be purchased for $1.

G. M. is taking one other step to insure safe furnace operation. An educational course for heat-treat foreman and operators has been organized, and covers all phases of the subject including the principles of combustion and the causes of explosions. In time, this course will be presented at all of the G. M. divisions concerned with this problem.

The latest data available for 1957 show a 50 per cent reduction in fires and explosions in General Motors plants, due to furnaces and heat-treat equipment. We think this is the result of G. M.'s campaign for furnace safety. As the educational program continues we hope accidents due to these causes will become even more infrequent.

You, as safety engineers, know that education along the general lines of safety has paid off. It has saved hundreds or, perhaps, thousands of lives, and prevented the maiming and injury of countless people. Education along the specialized lines of furnace and heat-treat safety should prove equally effective.

CLUTCH—BRAKE CONTROL VALVING

by A. B. HUNTINGTON

chief engineer, Ross Operating Valve co., Detroit

Reduction in the frequency and severity of industrial accidents is of prime importance to everyone. All of us are adversely affected by the real and the intangible costs of industrial accidents. The machine operator wants a full paycheck, safe working conditions and reliable tools and equipment. Management wants a minimum of personnel lost-time, material damage, machine down-time and insurance cost. Down at the end of the line, that old down-trodden character, John Q. Public, is looking for a price tag that is not inflated by accident cost.

Power presses, because of their function, present major industrial hazards. The most disastrous of these hazards can be accidental press stroking, often referred to as a "press-repeat." This hazard is often created unintentionally, or it results from a mechanical, electrical, or pneumatic failure in the press control system.

The application of mass production principles in the metal-working industry has brought about the development of fast-acting pneumatic clutches and brakes for all types of power presses. In the usual device of this type, the clutch is air engaged, spring dis-engaged; the brake is spring engaged, air dis-engaged. This provides a desirable fail-safe arrangement in the event of loss of primary air pressure.

CONTROL AIR POWER

To control the air power, which can disengage the brake and engage the clutch, a solenoid operated, 3-way air valve is usually used.

This is a 3-ported valve, having an inlet, an outlet and an exhaust connection. It can also be described as a normally closed, 2-position valve—in one position, with the solenoid de-energized, the inlet is spring and/or pressure closed; and the outlet, or brake-clutch device, is open to exhaust. In the other position, with the solenoid energized, inlet pressure is open to the brake-clutch device, and the exhaust is closed.

Here again, a desirable fail-safe feature is provided in the event of loss of primary electrical power. Obviously, a valve of this type could control a single-acting cylinder which, in turn, could operate a mechanical or positive type brake-clutch mechanism.

To reduce electrical power requirements, to allow higher maximum cycling rates without unduly sacrificing life, and to improve overall valve response time, press valves are usually an air-piloted type rather than direct solenoid operated.

Where a single valve, as described above, is used to control a clutch, any failure of the valve to return to its normal, or inlet-closed position at the proper time, may cause a press-repeat. If the inlet orifice partially closes while the exhaust orifice remains partially open—the exhausting capacity of the valve may then be enough greater than its pressurizing capacity to reduce the receiver pressure to a safe value. It should be noted that most valves of this type have an oversized exhaust port.

UNSAFE CONDITIONS

In a direct solenoid operated valve, an unsafe valve condition can be caused by a freezing of the solenoid in the energized position, a return spring or linkage failure or some internal mechanical interference. In the more usual solenoid actuated, pilot operated valve, mechanical failure in the pilot section is an additional possibility.

Some presses utilize one simple 3-way, normally closed valve for the clutch and another for the brake. This provides a slight safety improvement due to the improbability of the two valves failing simultaneously. If the clutch valve remains sufficiently open at the end of a stroke, press advancement is powered and opposed by the brake. If the brake valve remains sufficiently open at this portion of the cycle, press advancement is dependent upon the kinetic and potential energy provided for coasting.

To reduce the possibilities of valve failure due to solenoid and pilot section malfunction, a slightly different 3-way valve can be used. This normally closed press value has a clapper or "El" type solenoid, a 3-way, spring-less, pilot section and an over-sized exhaust port.

Normal wear on this type of solenoid or any coil burn-out, is unlikely to cause the solenoid armature to freeze or hang-up in the unsafe or energized position. By inverting the valve from the more usual solenoid-up position, gravity, as well as pressure, will assist return of all the internal parts, including the solenoid, to the safe position upon control circuit opening. Many press valves of this type are used in automotive metalworking shops.

INVERTING VALVE

There are several other methods, beyond good preventive maintenance, of making the pneumatic valving safer for both the press operator and the equipment. These methods rely primarily on the doubling up of valve units, so that failure of any one unit will not unduly jeopardize safety—the possibility of simultaneous failure in both units, causing complete loss of safety is unlikely. If the air flows through the two units in succession, the units may be said to be in series, pneumatically. If the air flows through the two units simultaneously—the inlets interconnected and the outlets interconnected—the units may be described as being in parallel, pneumatically.

One of these improved safety methods is to use two 3-way, normally closed valves in series pneumatically and in parallel electrically. With this arrangement, when either of the valves malfunctions and remains open in the absence of the proper electrical signal, the other valve, operating properly, will exhaust the brake-clutch device and there will be no possibility of a press-repeat.

Unfortunately, in this method, there is little audible or operational indication of a malfunctioning valve and one must therefore rely on periodic and careful inspection procedures to make sure that both units are operating properly. Obviously, with this set-up, whenever one of the units is struck in the energized position, safe press operation then depends entirely on the proper operation of the other unit.

To overcome the principal lack of safety in what we may call the simple "series" method, one press manufacturer has used two valves in series, each modified to in-

clude a valve-parts-position indication stem, in combination with limit switches. With this added and highly desirable feature, the individual valve actions can be electrically indicated and interlocked.

Adequacy of the improved safety here depends primarily on the ability of the electrical circuit to prevent further press cycling whenever one of the limit switches indicates something is wrong. We suspect that it may be difficult to obtain mechanically operated switches with sufficient life for this application. It may be possible in the future, however, to eliminate this problem by using magnetically operated proximity switches.

DUAL UNIT VALVE

A second and more complicated variation of the series method is a multiple, or dual unit valve. This item consists of a 3-way, normally open, so-called "safety-unit," a 3-way, normally closed, so-called "operating unit," a safety verifier, a permissive pilot and various interconnecting passages. The safety unit is ahead, or upstreams, of the operating unit (a series type connection) and the pilot solenoids are in parallel elec trically. The safety unit is a stand-by type and has a feed-back operated lock-out feature.

In the event that pressure remains momentarily on the brake-clutch in absence of the proper electrical signal, line pressure should trip the "safety" or stand-by unit and dump the brake-clutch. Re-setting or re-cocking this valve can be done after removing the inlet pressure on the "safety-unit." The manufacturer recommends that this be done with a manual 3-way valve upstream of the dual valve. A special electrical test circuit can be used to safety-check this valve.

A second simple method of controlling clutch action consists of using two 3-way, normally closed, solenoid valves, in parallel both pneumatically and electrically. With this "parallel" arrangement, a hazardous condition exists whenever either of the two valves malfunctions and remains open in the absence of the proper electrical signal. This condition can be somewhat alleviated by providing each valve with an over-sized exhaust.

If the de-energized valve that is operating properly can pass sufficient air, from the malfunctioning valve, to exhaust—the pressure at the common outlet or clutch connection may be reduced enough to disengage the clutch and engage the brake. If the press action does not indicate a valve failure, it may be noted audibly after completion of a valve cycle when normally there should be no sound of air exhausting.

PRESSURE SWITCH SHOWS AIR LOSS

There is at least one dual, or multiple unit valve of the parallel type presently available. It consists of two 3-way, normally closed valve elements with a common inlet, a common outlet and two over-sized exhaust ports. To lock-out electrically the valve and prevent continued press operation when one of the valve elements has failed, a pressure switch, connected to a reservoir ahead of the valve inlet can be used to signal loss of air to exhaust.

The so-called Lifeguard valve represents another, dual-valve of the same parallel type. It consists of two identical 3-way, normally closed units each with its own pilot section and solenoid, in parallel both pneumatically and electrically. The units have a common ¾" inlet port, a common one-inch outlet port and two one-inch interconnected exhaust ports, the last providing the desirable safety feature of an exhausting orifice considerably larger than the pressurizing orifice.

The two 3-way, normally closed pilot sections are symmetrically supplied through a sensing unit which will cut off the pilot air supply in the event that the two valve units do not open or close together. This sensing unit is a pressure operated spool valve. One end of this spool valve is internally connected to the outlet chamber of one valve unit and the other spool end is connected in a similar manner to the outlet chamber of the other unit.

Even at high rates of press cycling—failure, or sluggish operation of either half of the main valve, due to foreign matter, a broken part, a malfunctioning pilot section or solenoid, will result in a pressure unbalance on the ends of the spool. This will cause the sensing spool to shift, cut off further pilot air supply and mechanically lock-out. Removal of pilot air pressure makes certain that the main dual-valve units cannot thereafter be operated to cause a press-repeat.

OTHER SAFETY METHODS

All of the previously mentioned press valves are electrically actuated control elements. Because of the possibilities of electrical and mechanical malfunctions in conventional type relay circuits, a great deal of development work is underway on what is broadly called "logic function" control. At the same time, and for the same general reasons, much interest has recently been shown in a different approach to safer press control—namely, all-air control circuits.

These circuits can be developed to include such features as two-hand or two-station control, emergency stop, top stop, continuous cycling, inching or jogging, single stroking and guard device inter-locking.

Two valves that can be used in all-air control circuits have special characteristics. The first is part of an air circuit element controlling the starting of a press cycle. This valve is used when necessary—for safety—to make sure that the press operator uses both hands nearly simultaneously to initiate each press cycle.

Because of its function, this valve can be called a "Non-Tie-Down" valve. The right and left hand halves of the valve are identical, each half having its own inlet, and the single outlet, or receiver connection being in the exact middle of the valve. A 3-way, normally closed, palm button pilot valve is used to supply each Non-Tie-Down inlet. If the flow through the Non-Tie-Down valve from each pilot valve is not balanced, one of the Non-Tie-Down valve pistons will shift and vent any outlet pressure to exhaust.

This makes certain that the press operator uses both hands simultaneously to initiate a press cycle. If the operator engages only one of the hand valves, after a very short delay, the Non-Tie-Down valve will automatically prevent downstream pressure build-up until that hand valve is released and both hand valves are tripped in unison. Release of either one of the hand valves will cause the Non-Tie-Down valve to dump any downstream pressure. Similar to some of the other press valves, the Non-Tie-Down valve has built-in "fail-safe" features.

Downstream of the press-starting air circuit element, a second special valve can be used, a "Single-Stroke" valve. This valve can follow a Non-Tie-Down valve or it can be supplied directly from one or more 3-way, normally closed, press-starting pilot valves. The Single-Stroke valve first allows a receiver or clutch valve pilot line to be pressurized and then automatically closes, remaining in this safe, closed, position until the manual start valve, or valves, are released.

Safetywise, the valve can therefore be used to force the machine operator to maintain the manual start valves open until a cam type, top-stop valve is opened by rotation of the press shaft. Initiation of a succeeding press cycle can only be accomplished after the Single-Stroke unit has been re-set by exhausting its inlet pressure back through the 3-way manual start valves.

READ SAFETY CODE

The recently published Canadian Standards Association, Code Z-142, entitled "Guarding of Punch Presses at Point of Operation" is recommended reading for anyone interested in industrial safety. This code establishes safeguarding requirements dependent upon the method of feeding the press, the press operating speed in strokes per minute and the type of clutch used.

Several all-air press control circuits have been developed to meet these code requirements. One such circuit—featuring a Non-Tie-Down cycle starting element and an interlocked, cylinder operated, gate guard—is applicable to positive type clutch presses single stroking at a speed of less than 100 strokes per minute. Clutch tripping and ram motion is accomplished only after the point of operation is completely enclosed by positioning of the gate guard. The operator must trip the manual start valves in unison and hold them until the gate guard is fully extended. When this point is reached, the press action becomes automatic.

Another all-air control circuit, with both Non-Tie-Down and Single-Stroke valves, can be used on positive type clutch presses cycling at a rate of 100 or more strokes per minute.

For presses with pneumatic clutches, still another all-air circuit can provide these major safety features—two hand tripping with a non-tie-down action—and automatic stopping of the ram if either hand is removed from the manual valves during the down stroke of the press. A 2-way cam

valve, operating from the press shaft, is used to interlock this circuit.

There are many different ways to air valve a press clutch or brake. Depending on the specific application, certain ways may be less hazardous than others. For the best in safety, other items, such as adequate guarding and interlocking, are very important and must also be given careful consideration.

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where ere we go
Regardless of amounts,
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

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MINING INDUSTRY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

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THE MINING SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Mining Section. The conduct of these sessions is only one of the many cooperative activities which the Mining Section carries on in behalf of its members, and for the benefit of accident prevention work in the mining industry generally. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of mining companies.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

SAFETY INCENTIVE AWARD SYSTEMS IN THE MINING INDUSTRY

by T. C. HECKER

safety engineer, the M. A. Hanna co., Iron River, Mich.

Safety award systems are the means of offering something tangible to employees. It is difficult for us to understand the intangible benefits derived from safety, but they far outweigh anything tangible. The intangible benefits are, for example, the morale of the employees, the increase in production, and the greater earnings of employees when lost-time accidents or injuries are reduced. The big problem is to stimulate awareness of safety and a safe attitude in employees. To do this, a safety award system is used because of its tangible benefits. However, it should be realized that a safety award cannot replace the constant effort of employees, foremen, and supervisory personnel in maintaining an interest in safety. It can be used only as an aid.

There are various types of safety awards. The yearly award is presented on a calendar-year basis for a no-lost-time accident or for achieving a predetermined frequency and severity and it builds a competitive spirit among groups or organizations. This is good. However, if the group or mine has an accident during the first of the year, there is a letdown because the men have two years to go before they can hope to receive an award.

The safety award that is presented only after a good record has been achieved does not seem to have a lasting effect. It is usually spontaneous and unexpected; in other words, it acts as a slap on the back. This type of an award, however, is good as a supplement to a regular award system.

The individual award or the award presented to an employee working a predetermined period without a lost-time accident is good and has brought about desired results in some organizations. This type of an award, however, stresses individual safety. If we are to be our "brother's keeper," we must have group safety and responsibility for others. Also, in the individual award, the injured employee suffers of hurt feelings when awards are issued. His accident may have been the fault of another employee or due to a condition beyond his control.

Monthly awards tend to keep safety interest alive throughout the year. This type of award can be supplemented with a yearly award. Economically, the monthly awards must be small if the program is to stay within reason. Sometimes the value of the monthly award is increased for a consecutive period. This award is good because employees' interest in safety—with a little additional urging—builds up after an injury occurs.

This type of an award was used by the M. A. Hanna Company in the Michigan District prior to 1952. But due to handling a great number of prizes and the feeling of not receiving the value per cost, it was decided to try a system or combination of systems—using the good points and eliminating the objectionable features of the monthly award system.

We tried a safety award system based on an accident-free period of three months. Each mine in the district would be eligible for a safety award when three calendar months had elapsed since the last lost-time accident. The value of the award would increase with each successive accident-free three-month period. It would become stable at the end of a year's time, or four awards, and continue at that value in each following three-month, accident-free period.

Because the number of employees varies at each mine, amount of the award was determined by setting up a hypothetical base mine employing 300 men. This base mine would receive an award valued at $3.00 for a three-month, accident-free period; $6.00 for a six-month period; $9.00 for a nine-month period; and $12.00 for twelve months with no lost-time accidents. If the mine went 15 months without a lost-time accident, the value would be $12.00.

If any accident resulting in lost time occurred, the mine would start over at the beginning of a three-month period. To com-

pute the value of an award, the average number of employees is multiplied by the period and again by $3.00 and divided by 300 (the exposure or number of men in the base mine).

$$\text{Cost of Award} = \frac{\text{Average number of men} \times \text{period} \times \$3.00}{300}$$

For example, if a mine which employs 239 men goes six months without a lost-time accident, each man would receive an award valued at $4.78. This is computed as follows:

$$\frac{239 \times 2 \times \$3.00}{300} = \$4.78$$

In a mine where only a small number of men were employed, the prize would be of much value, so a guarantee or minimum was set up. This guarantee provides a prize of 75 cents for three months, $1.50 for six months, $2.25 for nine months, and $3.00 for twelve months with no lost-time accidents. Either the guarantee or the result of the formula is used, depending on which one is higher.

After the value is determined, samples of five to seven prizes are sent to the mine for the men to choose. Greater interest was maintained when an employee had a choice rather than one item picked for the group. This entails more work at the mine office, but the results have been worthwhile. In offering a choice of prizes, one item is usually selected for hunting, fishing or some other sport. There is sometimes an item for children; another item for the home workshop; and one item for the home. This last type of award is valuable because it brings industrial safety into the home and to the employee's family. A wife can promote a safe attitude in a man if some of these awards are directed toward her. Some of the prizes—varying in cost—have been fishing reels, fishing rods, fishing creels, hunting jackets, wool shirts, camp stoves, small tricycles, saws, hammers, vises, clothes baskets, step ladder stools, and kitchen knife sets.

One aid we use in conjunction with this safety award system—and is considered very necessary—is a bulletin board showing the number of days worked since the last lost-time accident. This board is mounted in a place—usually the dry or the entrance of the shaft tunnel—where all the men can easily see daily how many days they have worked since the last lost-time accident. They will then go to work with safety in mind and a desire to extend the accident-free period.

Another aid is in our monthly safety inspections with the Union. After inspecting the mine and discussing safety recommendations with the mine supervisory personnel, the safety committee selects a development or stope contract for its good housekeeping. The men working in this contract are awarded a prize—which averages $2.00 in value and is usually a choice of a lunch bucket, jackknife or pocket watch—for having a clean and orderly working place.

We feel certain that the incentive safety system has done much to lower our frequency and create an interest among our employees in our safety program. Lowering the frequency will, in turn, help to lower the severity. It is true that this type of safety award system costs money. In a year's time, the 300-man base mine would earn prizes worth $9,000, but many claims managers or mine superintendents would be glad to have $9,000 as their total liability for a year without a day lost due to an accident. Because of the cost and the intangible benefits derived—such as a high morale among the men and an increase in production—most would welcome the chance.

Any safety award system is only a part of an accident prevention program and it requires the constant effort of employees, foremen, and supervisory personnel to maintain a good safety attitude.

SAFE USE OF DIESEL EQUIPMENT IN UNDERGROUND METAL MINES

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Operators of mines became interested in internal-combustion engines as prime movers for underground mining equipment soon after such devices were invented.

When the Bureau of Mines was established in the United States Department of the Interior in 1910, gasoline engines were being used in mines and tunnels sometimes with fatal consequences. The hazards from these engines in underground service were:

1. Fire or explosion during the handling or use of liquid fuels.
2. Unhealthful conditions caused by the discharge of toxic and objectional constituents of the exhaust into the underground atmosphere.
3. Ignition of flammable atmospheres by the hot surfaces or the intake and exhaust openings of the engine and by its electrical equipment.

From practical experience with gasoline-powered equipment it became evident that these hazards were difficult to control. The exhaust gas contained high concentrations of toxic carbon monoxide which created dangerous local conditions, even when large volumes of air ventilated the mine. These conditions were recognized by state authorities, and most states developed laws or regulations that prohibited gasoline or other volatile fuels in mines except in very limited quantities and under careful supervision. Because of these conditions, gasoline-powered equipment has virtually disappeared from modern mines.

Modern high-speed diesel engines have the same flexibility as gasoline engines and are less hazardous when used underground. As a consequence, the number used in metal mines and tunnels is increasing rapidly. The Bureau began to evaluate their performance in mine service about 20 years ago. Both research and practical experience have shown that diesel engines are not safe in underground operations. However, with proper precautions and adequate ventilation they can be used safely. Although most states prohibit liquid fuels in mines, many permit diesel engines underground through special exemptions, provided that strict control regulations are followed.

Essentially the same hazards exist in mines using either diesel or gasoline engines. However, the less volatile fuel and less objectionable exhaust-gas characteristics of diesel engines, when properly adjusted, reduce the degree of hazard. Bureau of Mines Schedule 24 describes tests design characteristics, and other requirements for approval of diesel-powered equipment intended for application in metal and other noncoal mines and tunnels. The present discussion will consider the need for more important approval requirements, as well as other important practical precautions needed for the safe use of diesel equipment in underground metal mines.

CHARACTERISTICS OF DIESEL FUEL

An important factor in the safety of diesel engines in mines is the characteristics of the fuel. Diesel fuel is a petroleum distillate considerably less volatile than gasoline which has little tendency to form an explosive mixture with air at normal temperatures. To maintain this characteristic, the Bureau recommends that the flash point be 140° F. or higher. Otherwise, the fuel should conform to the engine manufacturer's recommended specifications, except the sulfur content should not exceed 0.5 per cent.

This restriction on sulfur controls concentration of the toxic sulfur oxides in exhaust gas and by this means restricts the concentration of these oxides in the mine atmosphere to safe hygienic limits when ventilation is satisfactory for other constituents of the exhaust. Therefore, this restriction on sulfur is an important part of the specifications for fuel.

All manufacturers recommend diesel fuel free from water, sediment, and dirt. Unless clean fuel is used in the engine, excessive maintenance and malfunctioning of the fuel-injection system can be expected. Badly worn or improperly functioning injection valves increase the hazards from objectionable and harmful constituents in the exhaust gas.

Although diesel fuel is less hazardous than gasoline, it is a flammable liquid and should be handled accordingly. Only limited amounts should be taken underground and stored in a well-ventilated location to restrict the flow of fuel if a container leaks or fails during a fire. Fuel tanks of mobile diesel machines should be filled only near this storage, when facilities to handle spillage are available. Firefighting equipment should be available nearby and on each diesel machine.

The advantages gained from less volatile fuel should not be sacrificed in the starting system for the engine. Electric or hydraulic starting should be used. Electric starting may be assisted by properly installed glow plugs, if necessary. Gasoline starting engines or other devices using volatile fuels are not accepted on approved equipment.

Undiluted exhaust gas from any internal-combustion engine is an unsatisfactory environment for workmen, and that from the diesel engine is no exception. Thus, a safe atmosphere in mines and tunnels can be maintained only when adequate positive ventilation is supplied to dilute and remove the exhaust gas and to maintain oxygen at a safe concentration.

DIESEL EXHAUST GAS

Evaluation of the health hazard involves determination of the concentrations of toxic and objectionable constituents in the exhaust. These constituents include carbon dioxide, carbon monoxide, aldehydes, oxides of sulfur (if the fuel contains sulfur), soot, and oxides of nitrogen. When the volume of these gases has been determined, safe ventilation can be calculated. From engine tests the operating conditions that produce the least quantity of some of the harmful gases can be specified.

At a given speed the normally aspirated diesel engine draws in an essentially constant charge of air. Various load conditions are met by changes in the quantity of fuel injected into this charge of air and ignited spontaneously. Thus, under mine conditions the composition of exhaust gas from mobile diesel machines is changing more or less constantly.

When the fuel : air ratio is below 0.06, the chief gases in the exhaust are carbon dioxide and oxygen, plus water vapor and nitrogen. The last two gases do not have harmful effects when the atmosphere contains enough oxygen. In this range of operation the concentration of carbon dioxide increases as the fuel : air ratio increases, while that of oxygen decreases.

Carbon monoxide is always present in low concentrations, and other products of incomplete combustion may be present in low concentrations, if at all. Engine speed has little effect on these general relationships. However, the volumes of these constituents in the exhaust will increase more or less in direct proportion to engine speed, and at higher engine speeds more ventilation will be needed to dilute and remove these products from the mine atmosphere.

Operation of diesel engines in the range of fuel : air ratios above 0.06 is considered undesirable in underground mines and was achieved in these tests by deliberately increasing the fuel-injection rate. In this range of fuel : air ratios, products of incomplete combustion appear in important concentrations, which increase as the fuel : air ratio increases. Thus, carbon monoxide, hydrogen, and methane increase in concentration while carbon dioxide achieves a maximum and then decreases. These changes in concentration occur because too little oxygen is available to burn the fuel completely. Another characteristic of operation in this range is a smoky exhaust from soot or unburned carbon.

These results show that diesel exhaust gas may contain dangerous concentrations of toxic carbon monoxide comparable with those in the exhaust of gasoline engines. Smoke will create safety problems by decreasing visibility, and the volume of air for safe ventilation must be increased. Therefore, diesel-powered equipment in mines should be adjusted to operate in the normal range of fuel : air ratios below 0.06, where hazards from toxic gases in the exhaust are reduced and the volume of ventilating air to remove exhaust gas from the mine is decreased.

In the normal operating range of fuel : air ratios diesel engines deliver power in almost direct proportion to fuel : air ratio. This direct proportion decreases, beginning at fuel : air ratios near 0.06; but maximum power is delivered at a fuel : air ratio of about 0.08, after which power decreases slowly. The change in fuel : air ratio from 0.06 to 0.08 increases power output about 10 per cent, whereas fuel consumption increases about 35 per cent. Thus the cost for fuel increases, while the hazards from toxic carbon monoxide become intolerable. Operation of diesel engines in mines within this range of adjustment must be avoided.

Even in the normal operating range the exhaust of diesel engines will contain low concentrations of carbon monoxide. Though low, these concentrations generally are greater than 0.01 per cent by volume, the accepted safe hygienic limit for exposure of workmen. Engine speed generally has less effect on the concentration of carbon monoxide than fuel : air ratio.

This relationship for other engines may be slightly different, depending upon the design of the combustion space and the fuel-injection nozzles. However, the concentration is nearly always less than 0.25 per cent in the normal operating range below 0.06 fuel : air ratio.

Because the concentration of carbon monoxide increases so rapidly at high fuel : air ratios, Schedule 24 specifies that diesel equipment be adjusted so the exhaust contains less than 0.25 per cent carbon monoxide. With this adjustment the ventilation of carbon monoxide presents no problem, as the volume of air required will be the same as that needed to dilute and remove the carbon dioxide from the mine.

ALDEHYDES

Odor and nasal and eye irritation of diesel exhaust gas appear related chiefly to the concentration of aldehydes. Observed concentrations are erratic, probably because of the heterogeneous nature of combustion in the diesel engine, and often are higher at low engine loads. In no instance during approval testing has the concentration of aldehydes been the controlling or critical factor in safe ventilation. That is, safe ventilation for some other constituent of the exhaust is always more than adequate to dilute the aldehydes to a safe hygienic concentration for exposure of workmen. Thus, in properly ventilated mines aldehydes are not a hazard from the viewpoint of their toxicity. In any event, they give ample warning of their presence by odor and nasal and eye irritation before the concentration reaches a toxic level.

OXIDES OF SULPHUR AND NITROGEN

Experiments with a high-sulfur fuel have shown that all of the sulfur appears in exhaust gas as sulfur dioxide or trioxide. The relationship of concentration to fuel : air ratio is similar to that for carbon dioxide in the normal operating range; that is, the concentration increases with fuel : air ratio. Hazards from these toxic and irritating oxides can be controlled most easily by limiting the sulfur in the fuel. When the sulfur content of the fuel is below 0.5 per cent by weight, ventilation to control other constituents of the exhaust will be sufficient to control the hazard from sulfur oxides. Fuels with higher concentrations of sulfur may cause hazardous and irritating conditions underground.

Toxic oxides of nitrogen are formed whenever air is heated to a high temperature. Consequently, these oxides are always present in diesel exhaust gas. Their concentration depends partly on the maximum temperature attained during the power stroke and partly on the concentration of oxygen when this temperature is reached. There is little evidence that the chemical composition of the fuel has any important effect on their concentration; the combustion of fuel simply provides the high temperature necessary for their formation.

Two oxides of nitrogen are especially important—nitric oxide (NO) and nitrogen dioxide (NO_2). Initially nitric oxide is formed in the combustion chamber. Subsequently nitric oxide reacts with excess oxygen in the exhaust system of the engine or in the mine atmosphere to form nitrogen dioxide. Exposure to either oxide is hazardous, but the dioxide is more toxic and for safety must be diluted to a lower concentration.

Routine analytical methods are not available to determine each of these oxides, and

possibly others, in undiluted exhaust gas. Instead, the phenoldisulfonic acid method is used to determine all the oxides of nitrogen together, except nitrous oxide (N_2O). The results are calculated as equivalent nitrogen dioxide.

Although the maximum concentration of oxides in the exhaust of each engine is different, the variations in concentration are similar in many respects. Low concentrations are observed at low fuel : air ratios where the combustion temperature is relatively low. In each engine a maximum concentration is reached as the fuel : air ratio increases, after which the concentration decreases.

MINE ATMOSPHERES AND COMBUSTION

The maximum concentration generally occurs at a lower fuel : air ratio in engines with indirect-injection combustion systems and usually is lower than that formed in direct-injection combustion systems. However, the maximum concentration is an individual characteristic of each diesel engine and has been observed to range from 400 to 1,600 parts per million. In most engines the maximum concentration of oxides decreases slightly as the engine speed is increased.

Results of approval tests show that the safe ventilation rate for diesel engines is determined by the concentration of oxides of nitrogen in the exhaust, but the operating conditions that control ventilation are difficult to predict. For this and other reasons it appears undesirable to base practical mine ventilation on limited field tests of diesel equipment. In one instance, approval tests showed that safe ventilation was determined by the formation of oxides of nitrogen at part load and medium speed. It would have been difficult, if not impossible, to discover these conditions in field tests.

Discussion so far has been limited to the operation of diesel engines in normal air near sea level. However, in practical mines using diesel equipment the atmosphere always will contain low concentration of exhaust gas, and local areas may exist where contamination with similar blasting gases is relatively high. Similarly, combustible gas (usually methane) may seep into the mine atmosphere from underground formations. The presence of such contaminants in the intake air of diesel engines will alter the normal characteristics of the exhaust and may cause increased hazards.

Effects From Exhaust Gas

In mines the exhaust from mobile diesel equipment enters the mine atmosphere near the engine. Research has shown that exhaust gas recirculated into the intake air of diesel engines may cause undesirable changes in the composition of the exhaust. Chiefly the concentration of carbon monoxide is increased because the oxygen supplied to the engine is decreased and may cause an increased fuel : air ratio.

However, some carbon monoxide probably is formed by further reactions of the recirculated carbon dioxide. These effects can be extremely important and serious at low engine loads with high concentrations of exhaust gas in the intake, or at high engine loads with relatively low concentrations of exhaust gas in the intake. Under either condition the composition of exhaust gas can be nearly the same as when a diesel engine is operated normally at a high fuel : air ratio above the normal range.

When the ventilation rate is adequate to maintain the mine atmosphere safely, these effects have little practical significance. However, it is desirable to dilute the exhaust gas rapidly so that it cannot recirculate directly into the air intake of the engine. Furthermore, these undesirable effects may develop where ventilation is locally inadequate. Prolonged operation of diesel equipment in such an area causes hazardous conditions that become progressively worse and decidedly dangerous in a short time particularly if the engine is operating at a high load. Diesel engines should not be operated anywhere in mines unless ventilation is positive and adequate.

Effects From Gassy Atmospheres

Operation of diesel engines in a gassy atmosphere was simulated in laboratory tests by adding natural gas to the intake air. The concentrations of carbon monoxide, aldehydes, and oxides of nitrogen in the exhaust all increased more or less in proportion to the concentration of natural gas up to the lower explosive limit. These effects increase the hazards from toxic gases, even when the engine is operated in the normal range of fuel : air ratios.

Combustible gas in the intake air also supplies extra fuel to the engine. This effect raises the fuel : air ratio and at high loads may cause operation in the rich range where carbon monoxide is produced in large quantities. Thus, a serious hazard from toxic carbon monoxide could develop in metal mines where gas may be encountered inadvertently.

It also has been demonstrated in the laboratory that flammable atmospheres can be ignited by diesel engines with unprotected intake and exhaust systems. A full description of these experiments is beyond the scope of this discussion. Diesel equipment approved under Schedule 24 is intended for use only in nongassy mines and should not be operated where a flammable atmosphere may exist.

Ample ventilation obviously will reduce the possibility of serious effects from these sources.

MANIFOLD PRESSURE AND COMBUSTION

Metal mines often are at high altitudes, where low barometric pressure reduces the density and weight of air aspirated by diesel engines. Laboratory experiments simulating operation at a high altitude have shown that the normal relation of composition of exhaust gas and fuel : air ratio is unchanged. However, because the weight of air charge is lowered, the maximum fuel-injection rate must be decreased to prevent operation in the rich range of fuel : air ratios where excessive carbon monoxide is formed.

To maintain operation of the engine in the same desirable range of fuel : air ratios, the maximum fuel rate must be reduced in direct proportion to the barometric pressure. When the engine is so adjusted, the same volume of air will provide safe ventilation at any altitude. The safe-ventilation rate and the maximum fuel-injection rates at various altitudes are given in the caution statement that accompanies all approved diesel machines.

Conditions similar to those at high altitudes will develop whenever the flow of air in the intake system of a diesel engine is restricted. An obvious cause for such a condition is a dirty air cleaner. For this reason, oil-bath air cleaners rather than dry-air filters are required on approved diesel equipment. The maintenance schedule should include regular measurement of the pressure drop in the intake system, as well as periodic cleaning of the air cleaner. The caution statement for approved equipment recommends the maximum pressure drop in the intake manifold for safe operation. Usually this pressure drop is reported for full-throttle, no-load operation, a condition that can be reproduced readily in the field.

Other tests showed that back pressure in the exhaust system, within reasonable limits, had no important effect on combustion in a four-cycle diesel engine. The caution statement also includes a maximum back pressure, which, if exceeded, signals the need for cleaning the exhaust system. Tests have not been made to determine the effect of back pressure on a two-cycle engine. In this instance, back pressure may have a more important effect on combustion because the flow of scavenging air, and hence the fuel : air ratio during the combustion process, would be affected.

Supercharging and turbocharging are two relatively recent developments in diesel-engine design that affect manifold pressure. Each system increases the air pressure in the intake manifold and thereby the weight of air available for combustion. Thus the power output of the engine can be increased by increasing the maximum fuel-injection rate without causing undesirable combustion effects with respect to carbon monoxide in the exhaust.

However, failure of either system to supply extra air to the intake of the engine may cause combustion at high fuel : air ratios, with resulting high concentration of carbon monoxide, as well as smoke, in the exhaust at high loads. Failure of such a system on diesel mine equipment is cause for removing the equipment from underground service immediately. Preventative maintenance on such equipment should include frequent tests for tightness of the intake manifold system.

Although most constituents of exhaust gas from supercharged or turbocharged diesel engines vary with fuel : air ratio in the same manner as in normally aspirated engines, the concentration of oxides of nitrogen appears to be an exception. The results of a few tests have suggested that the increased air pressure causes an increase in concentration of oxides of nitrogen at higher loads.

This effect may require that the safe ventilation rate be increased more than in direct proportion to the increased maximum fuel rate.

Approved diesel machines for mines must be equipped with an exhaust-gas cooling system capable of reducing the temperature to 160° F. under any condition of operation. So far, all satisfactory conditioners utilize the principle of adiabatic saturation of the exhaust gas with water vapor. The hot exhaust gas is bubbled through water to obtain the contact area necessary for rapid evaporation of water and cooling of the exhaust. This design suggests that conditioners also may act as scrubbers to remove some of the objectionable and harmful constituents from the exhaust gas. Both aspects of conditioner performance will be considered.

Conditioners as Coolers

Bubbling-type conditioners cool the hot exhaust gas by transforming its sensible heat into latent heat of evaporated water and thus lower the temperature of the final exhaust. In this process sparks will be quenched, and some of the soot that is a normal constituent of diesel exhaust gas at high engine loads will be removed.

Efficient conditioners may be either a batch type, operating with a variable water level, or a constant-level type, controlled by a float valve supplied with water from a makeup tank. In either type under equilibrium conditions the temperature of the water and cooled gas will be saturated with water vapor. The cooling system on approved diesel equipment is designed to need refilling only after use for an 8-hour shift. Either type of conditioner requires essentially the same amount of available water for the same cooling action.

Conditioners of this type cannot be designed to cool exhaust gas to a predetermined low temperature, because the minimum temperature must be high enough for the cooled gas to remove the evaporated water as vapor. The temperature of the cooled gas is related chiefly to the temperature of the hot gas when it makes contact with the water. However, the fuel:air ratio at which the engine is operating, the humidity of the intake air, and the barometric pressure all have perceptible effects.

When these conditions are known, the temperature of the cooled gas can be calculated. On approved diesel equipment the temperature of the cooled gas will not exceed 160° F. at full load. Within reasonable limits, the volume of hot exhaust gas flowing through a well-designed conditioner has no effect on the temperature of the cooled gas. The weight of water evaporated is directly proportional to the gas-flow rate.

In practical cooling systems the hot exhaust gas loses some heat by radiation and convection as it flows to the conditioner. This desirable effect reduces the temperature of the cooled gas and decreases the water needed for cooling. However, it may be offset by spray loss in the cooled exhaust. Therefore, conditioners for approved diesel equipment are tested to determine the actual water loss when the engine is operated at full load.

The actual and calculated water loss must agree within about 15 per cent. Approved equipment must have an effective cooling-water supply equal to one-third that required for continuous operation of the engine at full speed and load for eight hours. These tests are made at an elevation of 1,000 feet, and the water requirement so determined is more than adequate when properly adjusted, approved diesel machines are operated at higher altitudes.

Conditioners as Scrubbers

Bureau experiments have not verified the popular impression that conditioners remove most of the toxic and objectionable constituents in diesel exhaust gas. Practical conditioners filled with water have a significant effect only in removing aldehydes. Up to 50 per cent of the aldehydes may be removed by simple solution in water, but the solubility decreases at the higher water temperatures associated with operation of the engine at higher loads.

The solubility effect also diminishes as the water becomes more nearly saturated with dissolved aldehydes and increased water temperature may release dissolved aldehydes into the final exhaust. Other observations indicate that there are similar but less pronounced solubility effects on acid gases sufficient to cause corrosion that is eliminated when conditioners are constructed of stainless steel.

Many other experiments have been made on practical conditioners filled with aqueous chemical solutions. Such solutions maintain the cooling action, but only one solution has a significant effect in removing objectionable constituents of exhaust gas. A 10 per cent aqueous solution of sodium sulfite inhibited with 0.5 per cent hydroquinone to prevent rapid oxidation of the sulfite will absorb all the aldehydes and eliminate the odor and irritation of diesel exhaust gas. This effect is not dependent on the design of the conditioner as long as it will cool exhaust gas efficiently.

Caution should be exercised in the practical use of sodium sulfite solutions. In batch-type conditioners evaporation of the water may concentrate the solution and cause precipitation of salts. Ultimately such action may block gas passage in the conditioner. This effect was not observed in the laboratory, where the operating level was maintained by the constant addition of makeup water.

Many other full-scale experiments have been made in a search for solutions effective in removing other constituents of diesel exhaust gas, particularly oxides of nitrogen. So far no solution has enough effectiveness to recommend its practical use. Small-scale tests have been somewhat more encouraging. However, the most effective solutions either lost their activity at temperatures expected in practical conditioners, required multiple absorption units, or were hazardous to handle.

At least one dry-type exhaust-gas conditioner is available commercially that will eliminate most of the carbon monoxide from diesel exhaust gas, if it is maintained at a suitable temperature. No claims appear to have been made for the effectiveness of this device with respect to its action on other toxic constituents of exhaust gas. Unless this device has similar effects on carbon dioxide and oxides of nitrogen, it will be ineffective in reducing the volume of air for safe ventilation of diesel engines in mines. If for no other reason, mines using diesel engines must be ventilated to replace the oxygen used in the combustion process.

Earlier considerations have shown that toxic constituents in the mine atmosphere may be increased when exhaust gas is aspirated into the air-intake system of a diesel engine. To avoid this effect, as well as exposure of miners to undiluted exhaust gas, Schedule 24 specifies that the exhaust gas must be diluted before it enters the mine atmosphere. A very effective means of accomplishing this is release of the exhaust gas into the air from the radiator. A well-designed dilution system can reduce the concentrations of exhaust-gas constituents to nontoxic levels before the diluted gas reaches the mine atmosphere near the machine.

The most rapid mixing of exhaust gas with radiator air is when the gas is released through small holes in a multiported pipe or through a narrow slot. The gas outlet should be placed as close as practicable to the fan and arranged to distribute the exhaust uniformly in the air stream. The diameter of the holes or width of slot should be as small as possible, because the size of the opening affects the distance in which mixing is completed.

Secondary turbulence also is a factor in rapid and complete mixing within a short distance. With a well-designed dilution system there is little possibility that exhaust gas will reach the breathing level of miners or the air intake of the engine in undesirable concentrations.

DILUTION OF EXHAUST GAS

Need for an exhaust-gas dilution system is suggested also by recent developments about the physiological effects of oxides of nitrogen. New information on the toxicity of nitrogen dioxide recommends that the former hygenic limit of 25 p.p.m. for total oxides of nitrogen be changed to five p.p.m. of nitrogen dioxide. Safe ventilation in metal mines is frequently determined from the concentration of oxides of nitrogen in diesel exhaust, and it is important to consider the effect of this change on ventilation requirements.

Chemical and kinetic studies show that nitric oxide (NO) is formed during combustion in the diesel engine. As the exhaust cools, this oxide reacts with oxygen to form nitrogen dioxide (NO_2). The reaction probably begins in the exhaust system of the engine and continues in the mine atmosphere. The rate of reaction is a function chiefly of the concentration of nitric oxide; and, when its concentration is reduced to 25

p.p.m., the formation of nitrogen dioxide is greatly retarded.

Tests of diluted exhaust gas flowing from well-designed dilution systems suggest that there will be few instances where the concentration of nitrogen dioxide exceeds five p.p.m. before further dilution takes place in the mine atmosphere. Thus an exhaust-gas-dilution system is desirable on all diesel equipment used in mines. When such dilution is practiced, the present method for calculating safe ventilation is satisfactory.

SAFE VENTILATION

Information on the composition of exhaust gas makes it clear that positive ventilation must be supplied in mines using diesel equipment (1) to dilute and remove the exhaust gas and (2) to maintain a safe concentration of oxygen. The rate of ventilation for this purpose may be calculated from the results of comprehensive engine tests. Details of the calculations have been reported elsewhere. They involve the volume of exhaust gas generated in a given time, the concentrations of harmful constituents, and the safe hygienic limits of the harmful constituents. From these data the volume of air necessary to dilute the exhaust gas adequately to a condition safe for the exposure of miners can be calculated.

On the basis of physiological effects and quantity in exhaust gas, the important harmful constituents are carbon dioxide, carbon monoxide, and oxides of nitrogen. The generally accepted safe hygienic concentrations for these gases are: Carbon dioxide, 0.5 per cent; carbon monoxide, 0.01 per cent; and oxides of nitrogen (calculated as equivalent nitrogen dioxide), 0.0025 per cent.

The quantity of normal air necessary to dilute a particular constituent of exhaust gas to the safe hygenic concentration can be determined with close approximation from the relation:

$$Q = V \times \frac{C}{y};$$

in which—

- Q = the volume of normal air required for ventilation (cubic feet per minute),
- V = the volume of exhaust gas produced by the engine (cubic feet per minute),
- C = the concentration in the exhaust gas of the particular toxic constituent under consideration (per cent by volume), and
- y = the safe hygienic concentration for the particular toxic constituent under consideration (per cent by volume).

The values of V and C are determined from the engine tests. Results from several operating conditions must be explored to determine which condition and which toxic constituent requires the greatest volume of normal air to dilute it to the hygenic concentration. The maximum volume determined anywhere in the operating range of the engine is multiplied by a safety factor of two to find the safe ventilation rate in mines.

The safety factor of two is used to allow for possible physiological effects of mixed gases. The safe hygienic concentrations of various gases were determined for exposure when only that particular gas was present. Experience with disasters and air pollution in industrial areas during static atmospheric conditions suggests that these concentrations should be reduced when several toxic or harmful gases are present simultaneously.

Investigation after the Donora disaster indicated that no one known constituent in the static atmosphere reached or exceeded the generally accepted safe hygienic concentration. The exceptionally high number of deaths after exposure to the atmospheric environment for several days suggests that effects from mixtures of harmful gases may be additive or cumulative. The safety factor of two will be helpful in eliminating possibly delayed effects where miners are exposed to similar mixed gases daily.

In the foregoing discussion of safe ventilation, certain objectionable constituents of the exhaust gas were not considered. This procedure is possible because of certain interrelationships between the constituents of exhaust gas and other experience from engine tests. For example, carbon dioxide is one of the constituents that uses oxygen in its formation during combustion. With normal fuels it is possible to show that safe ventilation for carbon dioxide will supply enough air to maintain a safe concentration of oxygen in the mine atmosphere.

Sulfur oxides are controlled by limiting the sulfur content of the fuel to 0.5 per cent. With this limitation, ventilation for carbon dioxide also will be adequate for sulfur oxides. With respect to aldehydes, experience in approval investigations shows that safe ventilation for other constituents of exhaust gas is always more than sufficient for aldehydes. In any event, odor and irritation from aldehydes give considerable warning of their presence before dangerous concentrations are reached.

Although general relationships between the constituents of exhaust gas can be predicted, others are variable for each individual diesel engine. Consequently, it has not been possible to develop accurate empirical relationships for calculating safe ventilation. Most frequently, safe ventilation must be based on the concentration of oxides of nitrogen in the exhaust. In a few instances the maximum ventilation required for either carbon dioxide or carbon monoxide. For these and other reasons no diesel engine should be placed in underground service until engine tests have been made from which safe ventilation can be calculated.

Some time ago it was suggested that 75 cubic feet per minute per brake-horsepower at maximum speed and load was enough ventilation for diesel engines in mines. Since then, more experience with a larger number of engines has indicated that safe ventilation on this basis ranges from 100 to 250 c.f.m per b.-hp. Because so many factors affect the ventilation of diesel engines in mines, prediction of safe ventilation from a simple empirical relationship seems impractical, if not dangerous in some instances.

EFFECTS OF VENTILATION

The rate of ventilation specified for approved diesel equipment will maintain satisfactory mine-air conditions under any condition of operation of the equipment, if the engine is adjusted as specified and the air for ventilation reaches the place where the engine is operating. Obviously there will be times when the ventilation appears excessive. For example, when a diesel engine is idling, less exhaust gas is delivered into the mine atmosphere than when it is under load at a higher speed.

The exhaust of many diesel engines may contain a higher concentration of aldehydes when idling; and odor near the equipment may be more noticeable, even though the condisioner water is cooler and should dissolve more aldehydes. For this and other reasons it is recommended that the engine be shut off when diesel equipment is idle.

Ventilation also may seem excessive at times in haulageways. When a diesel locomotive or other haulage equipment travels opposite to the direction of air flow or exceeds the air velocity in the same direction, the effect for a single trip may be the same as though the locomotive were running through fresh air excessive to normal ventilation requirements. However, during cyclic operations the equipment will pass repeatedly through previously contaminated air and ultimately will cause local areas to become hygienically unsafe, unless the overall rate of ventilation is satisfactory. In one instance involving haulage with less than approved ventilation, periodic tests showed that contamination of the air reaching a loading station increased as time passed and occasionally was somewhat excessive by approval standards.

Observations at another mine showed insufficient ventilation by approval standards, but fresh air reached the loading station. Thus the only exposed workmen were the trainmen on a moving trip. Fortunately, the normal cycle of operations involved travel outside the mine portal, so that contamination in the haulageway was less than might otherwise be expected.

In contrast to these examples, areas of excessive local contamination might develop in small haulageways from the ram effect of moving diesel equipment or in very large rooms where ventilation could bypass the immediate location of the machine. An adequate dilution system for the exhaust gas tends to counteract such possibilities.

Reports on practical mining conditions indicate that diesel equipment often is operated in dead ends with little or no ventilation. Simple calculating shows that operation of a 50-horsepower engine at full load in a 10- by 10- by 50-foot entry without ventilation can produce undesirable hygienic conditions in two or three minutes.

In a few minutes more, the nearby mine atmosphere will become decidedly more dangerous because of oxygen depletion and a progressively rapid increase in the genera-

tion of carbon monoxide. Hence, operation of diesel equipment where ventilation is inadequate should be discouraged vigorously. All diesel equipment should be shut down immediately when positive ventilation is interrupted for any reason.

It is self evident that safe ventilation for several pieces of diesel equipment is an additive function of the requirements of each and should be provided in addition to ventilation required for other purposes. It is conceded, however, that, when several diesel units are operated in the same mine, this additive requirement may be relaxed to some extent, if each operates on a different load pattern. Any such relaxation can be decided only after a careful survey and study of individual mines.

MAINTENANCE OF DIESELS

So far the Bureau has had little opportunity to make a carefully planned study of requirements in diesel-engine maintenance. Much more experience is needed before a fully reliable discussion of the many aspects of satisfactory maintenance can be presented. Nevertheless, some interesting information has been accumulated.

Obviously, fuel injection may have an important effect on combustion. Bureau of Mines laboratory tests have shown that identical injection valves in proper mechanical condition and adjustment can be used interchangeably without causing a significant change in composition of exhaust gas. Also, the opening pressure of spring-loaded injection valves in indirect-injection engines could be varied within reasonable limits without producing a significant change in the concentrations of toxic constituents.

In two indirect-injection engines, leaking injection valves caused only a slight increase in the concentrations of carbon monoxide and aldehydes. In one instance, only one injection valve was leaking, while in the other all four valves were leaking. This condition would increase the hazard from diesel engines in working mines, and conditions that might cause such leakage should be avoided. Among other precautions only clean fuel should be provided; and the fuel system, particularly the filters, should be well maintained.

Only limited experience is available that indicates similar effects from injector condition in direct-injection combustion systems. Injectors for these systems usually have multiported tips that direct the distribution of fuel in the combustion chamber. A stoppage or excessive wear in one or more of these ports would cause a change in fuel distribution and probably an undesirable change in the composition of exhaust gas.

In maintenance operations imperfect injectors should be replaced only with perfect ones of the same design. One instance has been observed where a change in injector-nozzle design caused a substantial increase in the concentration of oxides of nitrogen in the exhaust, although the power performance was not affected. This change in the exhaust gas necessitated an increase in the ventilation rate needed for mine applications. This experience emphasizes the importance of engine tests before diesel equipment is used underground, as well as the danger of permitting changes in the design of engine components without additional tests.

Some interesting practical results have been reported in England, where the performance of diesel locomotives in coal mines was observed carefully for about two years. At "full" load, pulling a train upgrade, the carbon monoxide in the exhaust increased with time or mileage in service and eventually exceeded the statutory limit of 0.2 per cent. In one instance the concentration of carbon monoxide after 10,000 miles of travel had increased to about 0.4 per cent. No similar increase was observed for "racing" or "idling" when considerable excess air is present during combustion. A major overhaul invariably restored the original desirable performance under "full" load. Other results showed no increased hazard from oxides of nitrogen under these conditions.

PROBLEMS IN FIELD TESTING

Results also were reported on the performance of new and used engines in laboratory tests. Used engines produced more carbon monoxide but less oxides of nitrogen.

Many states have control regulations requiring that diesel equipment be adjusted suitably to avoid high concentrations of carbon monoxide in the exhaust before it is placed in service underground. Specific directions for these tests are seldom, if ever, included in the regulations, but the implication is frequent that they may be made in the field. Hence, some consideration of problems in field testing may be pertinent to this discussion.

Diesel engines in good mechanical condition usually generate excessive carbon monoxide only at high loads when the maximum fuel injection rate is used. Such conditions may occur during rapid, prolonged acceleration, as on a long upgrade. To be most informative, samples should be taken during constant conditions, which are difficult to maintain with the equipment in motion. Furthermore, sampling of moving equipment may be dangerous. However, if the exhaust shows black smoke under such conditions, it is an almost certain indication that the engine is adjusted improperly for mine service.

When engines transmit power through a torque converter, the equivalent of full-load combustion performance can be obtained by running the engine at full throttle with the output shaft of the torque converter locked. Although the engine is operating at an intermediate speed, the composition of exhaust gas is nearly the same as at full load and speed though the volume of exhaust is considerably less. Again, a smoky exhaust indicates improper fuel adjustment for underground service. During such tests the diesel equipment must be anchored so that it cannot run away, and the operating time must be short to avoid excessive overheating of the oil in the torque converter. The sampling procedures must be well-planned and executed quickly.

Interpretation of analytical results is not always easy, either. Samples have been received at the Bureau marked "full" load, but the analysis shows three per cent carbon dioxide and about 200 p.p.m. oxides of nitrogen. Obviously the engine probably was operating at full throttle, no load, and the results suggest that very little carbon monoxide should be expected. Such a sample gives no information about conditions that may be critical with respect to either carbon monoxide or oxides of nitrogen. For example, the maximum concentration of oxides of nitrogen in the exhaust of indirect-injection diesel engines is usually observed at an intermediate load at any speed. Such a load cannot be predicted precisely or attained easily in field tests.

Such practical difficulties are the reasons why the Bureau recommends that only approved diesel-powered equipment be used in metal mines and tunnels. Engine tests during approval investigations examine performance throughout the possible operating range. Safe ventilation is then calculated from results at the most hazardous operating condition. Equally reliable results cannot be developed from field tests.

Considerable care must be exercised in evaluating field performance through the use of portable instruments. For example, the Bureau of Standards carbon monoxide detector is used frequently to indicate carbon monoxide. The indicator tube shows a green or blue-green color related to the concentration of carbon monoxide, provided interfering gases are absent. Unsaturated-hydrocarbon gases may intensify the color, but oxides of nitrogen bleach it. Qualitative tests of undiluted exhaust gas may show no color, even though carbon monoxide is present, because of the strong bleaching action of oxides of nitrogen.

Such an obviously incorrect result can be improved by first passing the sample through a filter containing specially treated charcoal. Later a few tests were made on diluted diesel exhaust gas with the filter in place. Results showing seemingly reliable and uniform coloring of the indicator were interspersed with other determinations showing intense local coloration on the inlet end. Obviously such results must be interpreted with considerable care. Furthermore, the sampling period with this instrument is about 45 seconds, so that some judgment must be used to decide whether uniform conditions prevailed at the location for sampling.

Care must be taken also to select reliable locations for sampling in evaluating practical mine atmospheres. Samples showing little or no contamination must be interpreted with caution, as such results may be inconsistent with the ventilation rate. Such results suggest that some nearby area is excessively contaminated. Sometimes the analytical results and other observations may suggest that contamination came from blasting gases rather than diesel exhaust gas as these gases are frequently similar in composition.

ADVANTAGES OF APPROVAL

Approval investigations are undertaken only after formal application for the investigation by the manufacturer of diesel equipment. The application must be accompanied by the fees for the work to be done. These fees are placed in an escrow account until the work is completed. A subassembly, including the engine and conditioner, must be submitted to the Bureau laboratory near Pittsburgh for complete tests. Later a complete machine must be available for final inspection and tests of the exhaust-gas dilution system.

Upon satisfactory completion of all tests and inspections, the machine must be completely identified by drawings, bills of materials, and specifications for the Bureau's records. Only then does the Bureau issue approval papers to the applicant and announce that approval has been granted. Approval entitles the manufacturer to identify the equipment with an approval plate signifying that is is constructed in accord with the records filed at the Bureau. This plate shows the model number of the machine, its serial number, the approval number, and the minimum ventilation rate for safe operation of the equipment in underground mines.

All records and test results of the Bureau are confidential, and such information is appropriately safeguarded against disclosure. Detailed results of satisfactory tests are available only to the Bureau's engineers and not released to the applicant or any others. Unsatisfactory results are disclosed to the applicant as a guide in correcting defects. Approvals of diesel equipment are issued only by the Branch of Electrical-Mechanical Testing at Pittsburgh.

Several advantages of approved diesel-powered equipment in underground metal mines and tunnels are:

1. The exhaust-gas composition is suitable for the use of the diesel-powered machine underground when the engine is in proper mechanical condition and adjusted to the maximum rate specified in the approval papers.

2. The conditioner has been tested in a subassembly with the engine and will cool the exhaust gas satisfactorily for an eight hour shift without replenishment of the water supply.

3. Exhaust gas is discharged into the mine atmosphere through a dilution system that greatly reduces the possibility of local areas where dangerous concentrations of harmful gases may exist.

4. The ventilation rate has been determined from engine performance tests and is ample to dilute and remove the exhaust gas from the mine and to maintain a safe concentration of oxygen in the mine atmosphere under any approved condition of engine operation.

5. The caution statement provides information for satisfactory adjustment of the maximum fuel rate of the engine for safe operation at any altitude, with the approved ventilation rate as well as recommendations for satisfactory maintenance and suitable repairs.

6. Fuel-metering and governor adjustments are sealed, so that tampering by unauthorized personnel can be readily detected.

7. A fuel-shutoff valve is provided for emergency use.

8. The electrical system has been inspected for safe construction and operation.

9. A fire extinguisher is available for prompt use in an emergency.

10. The manufacturer understands his responsibility to construct approved equipment in accord with record drawings and specifications and maintains inspection records to show that this responsibility has been recognized and applied.

The provisions of Schedule 24 are not intended as a static and questionable limitation on the use of diesel-powered equipment in underground metal mines and tunnels. Instead, these requirements should be accepted as effective aids and guides in the safe use of such equipment. Furthermore, the history of the Bureau's administration of similar schedules for other specialized mining equipment should make it evident that all schedules are guides in underground safety that recognize the dynamic forces in the American mining industry.

CONCLUSIONS

Diesel-powered equipment can be operated safely in underground metal mines and tunnels only when adequate, positive ventilation is supplied to dilute and remove the exhaust gas from the mine and to maintain a safe concentration of oxygen in the mine atmosphere. The concentration of toxic and objectionable constituents in diesel exhaust gas is related chiefly to the fuel : air ratio at which the engine is operated. The maximum fuel-injection rate must be controlled and restricted to avoid the production of excessive quantities of carbon monoxide. Such an adjustment does not restrict unduly the maximum power output of the diesel engine but allows its use underground with a relatively reasonable ventilation rate. In approval investigations, engine tests are made to determine the exhaust-gas characteristics and to obtain performance data from which a safe ventilation rate can be calculated. A safe ventilation rate cannot be predicted with assurance from any general empirical relationship, chiefly because the generation of oxides of nitrogen appears to be an individual characteristic of diesel engines.

Odor and eye and nasal irritation of diesel exhaust gas appear to be caused chiefly by aldehydes. They reduced to a safe concentration in the mine atmosphere when adequate ventilation is provided for other constituents of diesel exhaust gas.

Toxicity and irritation from sulfur oxides in diesel exhaust gas are controlled by restricting the sulfur content of the fuel to a maximum of 0.5 per cent.

Conditioners are used on diesel equipment to cool the hot exhaust gas. Cooling is accomplished usually by adiabatic saturation with water as the hot gas is bubbled through water. This action will dissolve some of the aldehydes in exhaust gas but has no important effect on other constituents or on the volume of air required for safe ventilation. Effective sustained removal of aldehydes can be obtained when water in exhaust-gas conditioners is replaced by a sodium sulfite solution inhibited against oxidation with hydroquinone.

Otherwise no practical solutions are known to be highly effective in removing other toxic or objectionable constituents of exhaust gas. So far no exhaust-gas conditioning device has been developed that by its action on exhaust gas will allow an important reduction in volume of air needed for safe ventilation of diesel equipment in underground metal mines or tunnels.

A well-designed exhaust-gas dilution system reduces substantially the dangers from local areas highly contaminated with exhaust gas, as well as the increased hazards that may develop when exhaust gas is recirculated in the intake system of a diesel engine. Rapid dilution of exhaust gas also decreases possible hazards from formation of nitrogen dioxide in the mine atmosphere.

Approved diesel-powered machines are tested to determine exhaust-gas characteristics throughout their load range and are equipped with a satisfactory exhaust-gas conditioner and dilution system. The ventilation rate specified in the approval papers is safe for any condition of operation, provided only that the maximum fuel-injection rate is adjusted according to the caution statement for the altitude at which the diesel machine is being operated.

An approval plate on a diesel-powered machine shows that it has been constructed in accordance with record drawings and specifications on file at the Bureau of Mines by a manufacturer who must maintain inspection records to show that his responsibility for constructing an approved machine has been recognized and applied.

INCENTIVE AWARDS FOR GOOD SAFETY RECORDS IN THE MINING INDUSTRY

by JOHN McKENNA SMITH
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This paper deals with the application of safety incentives at Asbestos Corporation Limited in Thetford Mines, Quebec. Awards for safety achievments have been used by this company for the past six years. This period compared to an equivalent period before the award program shows the accident experience has improved appreciably.

To attribute the improved experience solely to safety incentives would be incorrect because supervisory training and revised and improved methods have helped our accident prevention program. Nevertheless, no single feature has been more instrumental in making our workers safety conscious than safety incentives.

Asbestos Corporation Limited is engaged in the mining and milling of asbestos ores in the Thetford Mines—Black Lake district of Quebec. Some 2,000 men are employed, operating three plants with a large expansion program in progress at one of them. Each plant consists of a mine, a mill, maintenance shops and facilities for the storage and shipping of bagged asbestos.

INCENTIVE PLAN

Six years ago the safety department of Asbestos Corporation Limited examined several plans to improve the safety record of the company. If accident prevention could be constantly before the worker, the accident frequency and severity would decrease. This would lower the compensation rate, since this company operates on a merit rating basis within the rate structure set by the Quebec Workmen's Compensation Commission for the Quebec Asbestos Mining Association.

A safety incentive plan was proposed to management based on the following principles:

1. The goals for safety awards should be realistic and possible to attain by any group which would pay particular attention to accident prevention.
2. The employees should know their standing during the time the plan is in operation.
3. The awards or incentives should be distributed to as many employees as possible.
4. One group of employees should not be penalized for the poor performance of another group.
5. Tangible prizes are better than monetary awards.
6. The safety incentive plan must be understood by all employees.

Management accepted a safety incentive plan based on these principles, and it began on November 1st, 1951. It is still in operation.

I will elaborate on each principle and show how these principles were applied by our company. The success of the plan is due to strict adherence to the basic principles.

GOALS EASY TO ATTAIN

Before proposing any safety incentive plan, it is advisable to review the past experience of the company and of other organizations in the same industry. This review or survey will guide in setting objectives for safety awards.

It would indeed be unrealistic to base objectives on a yearly frequency of five lost time accidents per million man hours of exposure when your best previous frequency has been 20 and that of the industry 12. In other words examine your records and set your objectives so they may be reached by extra effort in the field of accident prevention. Do not expect miracles and do not set the objectives so high the employees will feel they cannot attain these objectives.

At Asbestos Corporation Limited, our survey of past experience and local conditions indicated that consecutive man-shifts worked without a lost time accident would be the best basis on which to make awards. This basis had several advantages, among which were:

a. Within our reporting or labor accounting set-up, this figure could be easily reported by the timekeeping departments daily.
b. If a lost time accident occurs on any day during the month, it is not necessary to wait until a new period before another no-accident record can start.

The objectives were set so that once the first was reached, the group continued to amass consecutive shifts since the last lost time accident. When the second or third objectives are reached, awards of greater value are distributed.

To be more specific, groups or plant divisions are awarded safety incentives after 10,000, 25,000 and 50,000 shifts without a lost time accident. The value of the award at 25,000 shifts is approximately two and one-half times the value at 10,000 shifts although only 15,000 consecutive shifts have been added to the total.

EMPLOYEES KNOW WHERE THEY STAND

The employees should know their relation to the objective when the plan is in operation.

This principle is extremely important in any work where an objective is being attained. Everyone is familiar with the thermometer chart used in charitable campaigns and war bond drives. For the safety incentive plan at Asbestos Corporation Limited, bulletin boards at the plant entrances or in the punch clock rooms, showed the number of consecutive man-shifts worked since the last lost time accident for each group operating as a unit. These boards are kept up-to-date daily by the timekeeping department at the plant.

MANY AWARD WINNERS

The awards or incentives should be distributed to as many employees as possible.

Several plans operate with the supervisory employees rewarded for safety records established by their workers. Other plans allow so many awards per department or per 100 employees. We distribute awards to each employee of the department or plant division eligible under the plan. The cost and selection of awards will be explained later in this paper.

By every employee receiving an award we are eliminating two employee oppositions to an incentive plan:

a. They feel they work to establish the safety record and then the supervisor receives the reward.
b. Many feel if their names were placed in a box and one name drawn for a safety award, their name would certainly not be drawn. In other words, they are just not lucky in lotteries.

All production and maintenance employees, the plant supervisory and clerical staff, and watchmen are eligible for safety awards. Head office staff, laboratory employees and a group at our non-operating properties are not included in the plan.

One group of employees should not be penalized for the poor performance of another group.

When setting up a safety incentive plan based on group incentives, have groups or units of employees who do the same work. The groups should not be too large. Too many employees might be penalized for the poor safety performance of a small proportion of the group. Since this is a group effort, it requires good teamwork and it is amazing to see how older employees advise new men on unsafe manner.

The breakdown of each plant for the safety incentive plan followed the main working divisions: i.e., mine, mill, shops or maintenance, and general or yard labor. Each group is a unit which operates independently in the plan. If a lost time accident occurs in the mill, it does not affect the records of other groups.

The groups are not equal in size but by setting the objectives on the basis of consecutive man-shifts worked since the last lost time accident, the exposure to injury is equal for all groups.

The objectives are the same for all groups. There were several objections to this; many employees maintained their work was more hazardous and should therefore receive a handicap. Our experience however, has shown that the equal objectives for all groups were justified. This is a point to study carefully before an incentive plan is put into operation.

It is preferable to distribute useful items as safety awards than to give the equivalent in cash. Many companies distribute individual pins, or departmental trophies. This certainly advertises the accident prevention program but a pocket knife, wallet or some small tool is a constant reminder of accident prevention. The distribution of useful items has been quite popular among our employees.

The safety incentive plan must be understood by all employees. This basic principle applies to any incentive plan initiated and operated by a business organization. When the safety incentive plan began, notices were posted on all company bulletin boards explaining its operation. Meetings with supervisors illustrated in more detail just how the plan would work. When new employees are hired, the plan is explained in the pre-employment interview.

To recapitulate briefly the safety incentive plan of Asbestos Corporation Limited: Each operating plant is subdivided into four sections which operate independently in establishing safety records of consecutive man-shifts worked without a lost time accident. When one of the following objectives is reached, 10,000, 25,000, or 50,000 and so on in 25,000-shift increments, each employee is entitled to a safety award if he has worked at least 75 per cent of the time in that section during the period the record or objective was being established. If a lost time accident occurs in a section, the cumulated man-shifts drop to zero and a fresh start is made.

SELECTING AWARDS FOR SAFETY

The selection of suitable awards is important. When employees are eligible for awards, they are entitled to the choice of one of five or six items.

The system used by Asbestos Corporation Limited entails more work and possibly has some disadvantages but it is more acceptable to our employees. If we decided everyone was to receive a flashlight or a pen knife there would be many complaints about how many our men already had; therefore, it is wise to allow a choice of awards.

The decision of the five or six items is made along the following principle: two personal items, i.e., pocket knife, flashlight, lighter; two items for the home, i.e., Pyrex ware, table lighters, mixing bowls; two tools, i.e., hand axe, pliers, tapes.

To illustrate the range of awards distributed over the past five and a half years, the following list for each series of awards has been compiled:

First Award (10,000 shifts)

Mixing bowls, flashlights, table lighters, playing cards, ash trays, pipes, thermos bottles, wescot wrenches, combination squares, hammers, tinners' snips, hand axes, wrench sets, ball point pens and razors.

Second Award (25,000 shifts)

Steak knives, Silex coffee makers, billfolds, vises, can openers, casting rods, pipe wrenches, pocket watches, a cash allowance on a pair of safety shoes and First Aid kits.

Third Award (50,000 shifts)

This is reached on an average of once a year by one of the sections within the company. The awards consist of: safety footwear, flash camera, carving set, socket wrench set, aluminum chairs and in some cases, combinations of two 25,000 shift awards.

Fourth Award (75,000 shifts)

This mark has been reached once by one section. At the request of the majority of the employees in this section and with the approval of management, instead of increasing the value of the individual awards as we do for the first three objectives, each employee received an award in the 25,000 shift range and a drawing was made for two television sets, installed in the employees' homes complete with outdoor antenna.

Needless to say this created considerable interest in accident prevention throughout the company. The president, the general manager and other top company officials, were present for the drawing. The event was covered by the local press and some local correspondents for the Metropolitan dailies. When another group reaches the 75,000 shift mark a drawing for an expensive award will be made only if it is the expressed wish of the majority of employees of the section.

Anyone in accident prevention knows it is difficult to attribute improvement in safety experience to any one item. Asbestos Corporation Limited has been constantly changing and improving working methods, and has had an active supervisory training program during the past five years. I shall indicate the improvement in the safety experience since the inception of the safety incentive plan and point out some features which might be directly attributable to accident prevention awards.

Table I is a breakdown of our accident experience from 1947 through 1956. This period was chosen because it illustrates a period of five years, 1947 through 1951, prior to the introduction of the safety incentive plan and a five year period, 1952-56, that the plan has been in operation.

Tables II and III are a compilation and average of these two five-year periods.

These records indicate an improvement since the inception of the safety incentive plan. When the compensation cost plus the incentive cost for the 1952-56 period is compared to the compensation cost alone for the 1947-51 period, we find a yearly average saving of over $30,000, and this in a period when the compensation benefits as well as the wages were increasing.

A downward trend has started in the accident frequency, severity and costs when the incentive plan was introduced. However, it is quite definite that the introduction of safety awards accelerated the improvement in accident prevention.

One prominent feature after the initiation of safety incentives with the sharp reduction in lost time accidents involving one to three days lost time. When the employees realized that this was a "team" or group contest, everyone co-operated in not losing time for minor injuries, a practice prevalent in previous years.

The company encouraged employees to return to work by allowing them to relocate to a less arduous task for a short period of time if the work would have to be done during the course of operations.

The application of safety incentives at Asbestos Corporation Limited in Thetford Mines has achieved the results desired since the plan was formulate and introduced, i.e., an improvement in our safety record and a decrease in compensation costs.

Safety incentives when properly applied will produce the following results:

a. The workers will become more safety conscious.
b. The compensation costs will decrease.
c. Accident frequency and severity will improve.
d. Workers will accept the safety program more readily when they will realize that management is willing to compensate them for safety achievements.

TABLE I
ANALYSIS OF ACCIDENT EXPERIENCE, COMPENSATION AND SAFETY INCENTIVE COSTS, 1947-1956

Year	Lost Time Acc.	No Lost Time Accidents	Days Lost	Hours of Exposure	Frequency	Severity	Compensation Cost	Incentive Cost
1947	392	196	8,834	4,441,228	88.0	1988	$121,017	
1948	188	302	10,127	4,429,187	84.1	2150	22,615	
1949	207	158	12,322	3,742,108	82.8	4850	60,081	
1950	132	209	15,026	4,482,137	29.5	3409	102,686	
1951	94	215	1,802	4,361,790	20.8	367	22,914	
1952	54	139	8,482	4,142,227	13.1	2055	22,172	$ 2,855
1953	40	305	7,743	4,062,886	18.5	1906	20,219	6,613
1954	39	305	7,721	4,177,223	8.9	1865	20,988	9,738
1955	32	267	1,543	4,287,010	11.5	363	21,362	7,878
1956	36	332	1,188	4,230,542	8.8	272	20,172	7,384

TABLE II
COMPARISON OF ACCIDENT EXPERIENCE, COMPENSATION AND SAFETY INCENTIVE COSTS, 1947-1951, 1952-1956

Period	Lost Time Acc.	No Lost Time Accidents	Days Lost	Hours of Exposure	Frequency	Severity	Compensation Cost	Incentive Cost
1947-51	715	1,044	47,820	21,075,472	33.9	2270	$228,296	
1952-56	295	1,152	26,725	21,040,846	11.2	1265	146,818	$40,722

TABLE III
COMPARISON OF AVERAGE YEARLY ACCIDENT EXPERIENCE, COMPENSATION AND SAFETY INCENTIVE COSTS, 1947-1951, 1952-1956

Period	Lost Time Acc.	No Lost Time Accidents	Days Lost	Hours of Exposure	Frequency	Severity	Compensation Cost	Incentive Cost
1947-51	143	209	9,564	4,215,094	33.9	2270	$ 57,059	
1952-56	47	231	6,345	4,212,969	11.2	1265	29,364	$ 8,147

The shops depend largely on artificial light for illumination. Windows are glass block installed as a long strip about 12' above the floor. Most other windows in the plant are thermo pane glass, eliminating the need for installing storm windows and giving frost free service in winter.

Floor panel heating is used only in the heavy repair section of the general shops. Men are frequently working on floor gliders in this area; in addition such floor heat tends to remove snow and frozen mud from the bottom of vehicles. It has been our experience that panel heat is undesirable in areas where men are required to work standing in one spot for any length of time; foot disorders generally result from such work conditions.

An enclosed steam cleaning room is serviced by a turn table and track. The track extends through the room and a short distance outdoors enabling steam cleaning to be done in the open in the summer time. The room itself has a separate exhaust unit and adequate drainage facilities in the floor. This installation permits rapid steam cleaning of heavy equipment prior to being worked upon by the repair crew.

In the welding shop a 10' curtain wall protects the machine shop from welding flash yet permits the ten ton overhead crane to serve the welding shop area. Moveable screens are used wherever needed.

A full basement below the wing housing the miners' change rooms is used for storage. Narrow gauge track with turn tables and spurs serve a large portion of the storage area; an elevator connects the basement with the shop. Motor truck service to the basement is made available by a ramp to the outside surface. A tunnel connects basement and shaft. This enclosed and convenient storage area is invaluable as it totally eliminates handling ice covered items that would otherwise be stored outdoors.

The plant boiler room is adjacent to the south end of the above mentioned basement. Loaded coal cars are spotted in an enclosed thaw shed at ground level above the coal bins. Coal is gravity emptied from railroad cars into the bin and is moved by a bin-fed stoker into the boilers. Ashes are removed by mechanical screw and elevator into a bin on the roof for disposal into trucks. This heating plant is practically automatic except for an occasional inspection and periodical removal of clinkers from the boilers. Boiler room attendants are not used.

All oil and grease are stored separately in a storage room located at the end of a wide driveway adjacent to the shop building. This location provides easy access for removal of supplies for shop or underground use. Blacksmith coal is also stored in a small bin in this driveway. The balance of the available space along the south wall of the driveway is used for steel storage.

ENGINE HOUSE

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Ammonium nitrate fertilizer is manufactured, transported, stored and used in tremendous quantities. While this inorganic nitrate has widespread commercial use, it can hardly be said it has general use as a blasting agent when compared to all other explosives. It is, however, used quite extensively in strip or open-pit mining in coal, ore and quarries and in other surface blasting as a field compounded blasting agent in place of such conventional explosives as dynamite or black powder.

The common name for ammonium nitrate NH_4 (No. 3) is norway saltpeter, 1.725 times heavier than water, melting point 337.1°F (169.6°C), boiling point decomposes at 410°F (210°C), is classed as oxidizing material. It does not qualify as a high explosive but could be a dangerous substance and requires an understanding of the hazards peculiar to nitrates and the control measures which should be applied.

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1. Bags should be stored not less than 30 inches from walls of storage building, in piles not more than 12 feet in width, with at least 30 inch aisleways. At least three feet clearance should be maintained from top of bags to eaves of roof or supporting and spreader beams overhead.

2. Roofs and floors above masonry or concrete walls should be of light weight construction, not concrete or masonry.

3. Explosives should not be kept in storage area.

4. Storage areas should be maintained in good housekeeping order.

5. Ammonium nitrate fertilizer should not be stored over or under organic materials, flammable liquids, corrosive acids, strong oxidizing agents, finely divided metals, sulphur or other readily combustible materials. Storage should be located at least 30 feet from such materials.

6. A clearance of at least three feet should be maintained between storage and sources of heat, or ignition such as steam or hot water pipes, radiators, heating devices and electric wiring.

7. Bags should be stored on concrete floors or on wooden pallets resting on any type of clean floor. Drains or similar openings into which molten nitrate can run during a fire should be closed or plugged.

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9. Smoking, open lights or flames should be prohibited in or near storage area.

The inorganic nitrates evolve oxygen as a result of decomposition upon heating or as a result of direct chemical action, thereby increasing the intensity of fires and thus supplying oxygen to increase rate of combustion of burning material. Ammonium nitrate is particularly hygroscopic and is readily soluble in water, thus accounting for another serious fire hazard since containers are usually paper or burlap bags and may be saturated with nitrate solutions. When containers become dry, they are impregnated with nitrates and therefore are highly flammable.

Most field compounded blasting agents can be purchased ready-made, or may be mixed by the user in the vicinity of blasting operations. Due to the cost item, the job-site formulation predominates. Some operations have erected a field compounding plant, while others mix the blasting agents directly at the drill hole. The first mentioned are usually practical and economical only when large quantities are regularly used in one area. There are, however, some users of large quantities who claim that mixing at the drill hole has proven entirely satisfactory as to results obtained.

There appears to be no universal standard relative to the amount of combustible material added to the ammonium nitrate fertilizer. It has been observed that where fuel oil is the mixing agent, the amount varies from three quarts to one and one-half gallons per 100 pounds. Other mixes vary in percentage as to weight. Each operation must experiment to some extent, depending upon the depth of drill holes, nature of the over-burden and the desired fragmentation.

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The shops depend largely on artificial light for illumination. Windows are glass block installed as a long strip about 12' above the floor. Most other windows in the plant are thermo pane glass, eliminating the need for installing storm windows and giving frost free service in winter.

Floor panel heating is used only in the heavy repair section of the general shops. Men are frequently working on floor gliders in this area; in addition such floor heat tends to remove snow and frozen mud from the bottom of vehicles. It has been our experience that panel heat is undesirable in areas where men are required to work standing in one spot for any length of time; foot disorders generally result from such work conditions.

An enclosed steam cleaning room is serviced by a turn table and track. The track extends through the room and a short distance outdoors enabling steam cleaning to be done in the open in the summer time. The room itself has a separate exhaust unit and adequate drainage facilities in the floor. This installation permits rapid steam cleaning of heavy equipment prior to being worked upon by the repair crew.

In the welding shop a 10' curtain wall protects the machine shop from welding flash yet permits the ten ton overhead crane to serve the welding shop area. Moveable screens are used wherever needed.

A full basement below the wing housing the miners' change rooms is used for storage. Narrow gauge track with turn tables and spurs serve a large portion of the storage area; an elevator connects the basement with the shop. Motor truck service to the basement is made available by a ramp to the outside surface. A tunnel connects basement and shaft. This enclosed and convenient storage area is invaluable as it totally eliminates handling ice covered items that would otherwise be stored outdoors.

The plant boiler room is adjacent to the south end of the above mentioned basement. Loaded coal cars are spotted in an enclosed thaw shed at ground level above the coal bins. Coal is gravity emptied from railroad cars into the bin and is moved by a bin-fed stoker into the boilers. Ashes are removed by mechanical screw and elevator into a bin on the roof for disposal into trucks. This heating plant is practically automatic except for an occasional inspection and periodical removal of clinkers from the boilers. Boiler room attendants are not used.

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ports combustion and enables fires to burn independent of any air supply. Under certain conditions it may explode at temperatures over 300°F. Any fire should be controlled in incipient stage with large volume of water. In fire fighting, caution must be exercised to prevent spreading boiling oil compounds where these additives are incorporated in the mix.

COMPOUNDING AT DRILL HOLE

Mixing directly at, or near the collar of the drill hole could result in conditions that might endanger life and property. This operation is being done by many operators and they apparently feel it is a safe method. It should be remembered, however, that when the detonating charge or primer has been placed and the compound is being poured in a confined area, the same precautions should be taken as involved conventional explosives.

Methods of loading the blast holes are varied in many instances. In dry holes the ammonium nitrate may be poured and the mixing agent subsequently added to flow or trickle through the column. In some cases the nitrate and mixing agent are fed simultaneously. Depth and diameter of drill holes vary according to type of strata and amount to be moved. Detonation has usually been accomplished by dynamite, electric caps and primacord, although there are other means used.

To prevent any accidental detonation, electric blasting caps should not be transported in same vehicle with other explosives.

Blasting agents, dynamite and blasting caps at the job site should be stored in magazines as prescribed by the fire prevention code of the national board of fire underwriters. They should be unheated and with no lighting. If artificial light is required, an approved flashlight is permissible. Magazines should be kept locked against unauthorized entry. Field compounded blasting agents should be handled only by experienced personnel and with the same plosives.

IMPROVEMENTS TO UNDERGROUND HAULAGE SYSTEM AT TCI'S ORE AND COAL MINES

by J. D. F. EVANS

mining engineer, Ore Mines & Quarries, Tennessee Coal & Iron Division, U. S. Steel corp., Fairfield, Ala.

Do you want to reduce your haulage accidents by 66 per cent? Do you want to increase your haulage capacity by 59 per cent? The Tennessee Coal & Iron Division of United States Steel Corporation did this in approximately seven years. The decrease in accidents and increase in capacity can be attributed to only one factor, improved haulage systems.

Today's production requires an efficient, economical and safely operated underground transportation system. We are constantly seeking ways to improve underground transportation in the coal and ore mines. Haulage capacity limited our individual ore mines to 1,100 tons per eight-hour shift in 1949; today, the same mines produce 1,400 tons per shift and the haulage capacity is 25 per cent more.

Such improvements are not just stumbled upon. They are based on engineering studies and a planned program for eliminating the faults.

At TCI this evalution began with studies which revealed faults such as improperly spaced passing points, improperly located derails, ineffective manually operated block signals and constant stopping and starting trips to throw hand switches. One of the most important conclusions was that the rails were too light. Alignment and grade could be improved by proper study and

engineering in new track installations. Similarly, it was difficult to maintain good track because of the magnitude of the haulage system.

The first step to overcome these difficulties was writing standard specifications on construction and maintenance of underground mine track. The specifications are revised periodically as changes in practice occur. This book is distributed to those concerned. All construction and maintenance complies with these specifications. Particular emphasis is placed on clearance, grading, tamping, drainage, alignment, gauge and elevation on curves. A project engineer is assigned to develop and maintain standard track practice specifications.

An efficient, economical track haulage system is dependent upon trained personnel, suitable locomotives and mine cars, adequate power supply, an efficient signaling and dispatching system, and good track. TCI has attempted to integrate these factors to achieve the maximum return from the system in safety and in reducing operating costs.

SUCCESSFUL TRACK SYSTEM

The foundation of a successful track haulage system is, of course, good track. Heavy rails laid on treated ties with a good subgrade, substantial ballast and welded rail joints make good track. Cross ties are of mixed hardwoods, properly seasoned and pressure treated with creosote.

Total trackage in the operating mines is 147 miles. The average haul distance for ore is 1.7 miles, the longest haul being 2.3 miles. The average haul for coal is 3.2 miles and the longest haul is more than five miles. Track grades are limited to plus or minus six per cent.

Formerly, haulageway center lines were set by grade alone. Today, they are located by the position of the block of ore plus or minus six per cent allowable grades together with the economics of grading top or bottom.

Before standardization of haulage systems, all track construction work was performed by hand. Coarse ballast and fill consists of loose broken ore or rock. This material was hand loaded on material cars and distributed by hand.

Today, mechanized equipment has eliminated the costly hand methods. Mechanical loaders and underground bulldozers, powered by electricity or diesel engines, load and distribute coarse sub-grade material. Bulldozers perform rough grading by leveling the loose ballast to sub-grade elevations.

Slag or ballast cars of various designs are used for track construction. These cars have been fabricated in the local maintenance shops. The cars have drop-bottoms and adjustable feed openings which eliminate loading, unloading and distributing ballast. Ballast is dumped from the delivery truck into the cars. Cars are hauled over newly constructed track with the bottom set to distribute the material in the amounts required.

Available to each track laying crew is a specially constructed work car which carries a 105 c.f.m. air compressor. Tools on the car are spike hammers, picks, shovels, spud wrenches and pneumatically powered spike drivers, tie tampers and impact wrenches. Approximately 200 feet of new track are installed at a time and joined by splice bars. The track laying crew is followed by a welding crew, after the track is in service. The welders remove and salvage the splice bars, one joint at a time, and weld the joints.

The haulage studies found that the standard 60-pound ASCE 6040 rail section could not withstand locomotives and tram cars loads. Derailment often destroyed the conventional splice bars and bonds joining these sections, reducing the efficiency of the electrical return through the rail. Derailments and reralling operations distorted track alignment and led to more derailments.

TCI USES WELDED TRACK

The generally accepted opinion was that the rolling stock would be replaced with heavier equipment as it wore out. This led to the adoption of the 90-pound ARA-A 9020 rail section for mainline track. The faults of the bonding practice led to preliminary discussions of welding track. At TCI rails are used as the electrical ground return. Welded track provides a continuous metallic cross-section for current flow far superior to bonded track. In turn, more current is available for the locomotives and other equipment and thus saves power.

Welded rails also provide a continuous surface enabling traffic to operate at a faster and safer speed. No traction loss at joints results in less sand consumption, longer rail life and a reduction in locomotive tire replacements.

A trial installation of welded track was made to overcome electrical power loss from broken or loose bonds and to alleviate the costly, inadequate maintenance of splice bar joints. This installation indicated an initial savings of 75 per cent and joint maintenance cost was reduced by 75 per cent. Five years ago, welding rail joints were made standard in the ore mines and 32,500 feet of main line track were welded. The coal mines began welding rail joints about a year ago and 18,000 feet of track have been completed. (This is completed track, not single rail distance.)

Welded track is a permanent installation and planned only for main line haulage. Welding on new haulage, extensions and active haulages was accomplished without interrupting production.

The 60-pound secondary haulage track is temporary and joined by splice bars and bonds. The bonding material used is scrap 6/0 trolley wire or scrap shuttle-car cable bronze-welded to the track by a fusion welding cartridge and mold. The method of igniting the cartridge is simple and eliminates transporting and using bulky oxygen-acetylene welding apparatus.

Using super-elevation on curves in haulageway construction decreases maintenance cost and lessens interruptions caused by derailments. Proper super-elevations are outlined in the track specifications. TCI uses no super-elevation less than one-half inch nor more than five inches. These data are computed for different locomotive speeds and radii in our operations. In conjunction with super-elevation on curves, track gauge is widened to specifications. This practice prevents binding of wheels, overturning and wearing of the rail and spreading the track.

For standardization, all turnouts from the mainline haulage are driven on the minimum radius negotiable by the locomotives. By following a standardized pattern, any turnout may be salvaged and re-used at any other location. Complete turnouts are purchased from an outside supplier. No turnouts, except standard turnouts, are used thus eliminating delays due to derailments on improperly designed turnouts.

Included in the turnout are the switch points, straight and curved closure rails, frog, guard rail assembly, a standard switch throw stand complete with linkage, and switch plates. At turnouts, ties to extend under both tracks are ordered in sets simultaneously with the turnouts.

STEEL TIES INCREASE HEADROOM

In the coal mines, steel ties are used on secondary haulage track where vertical clearances are critical. They provide approximately four inches more headroom than wooden ties. Track gauge is fixed permanently fixed by riveted or bolted steel clips which maintain an accurate, constant gauge. Alignment is accomplished and maintained by roof bolts set into the footwall at intervals. Steel ties reduce installation and maintenance costs, and offer light weight, fixed gauge, no tie plates, less ballast, require fewer ties and are all re-usable.

Water on haulages is very detrimental to track stability. A rotary drill improves drainage in the coal mines. Eight-inch diameter holes are drilled through pillars along haulageways to drainwater by gravity. Pumping has been eliminated in several cases by strategically located drill holes.

Electric current is delivered to operating machinery by feeder cable and trolley wire suspended from insulated pipe hangers. To provide a larger contact surface between trolley slide and wire, the 6/0 grooved wire is gradually replacing figure eight wire.

The feeder cable is suspended from the roof or back on insulated 1¼ inch pipe supports. The trolley is suspended from the feeder cable at the mid-points of the pipe supports. This provides a cushioned trolley with reduced wear on slides.

At man and material loading points, trolley wire is shielded using a collapsible rubberized trolley shielding. At points where vertical clearance is less than six feet, shielding is also required.

At present, TCI mines use 117 locomotives, equipped with air brakes, dynamic brakes, manually operated brakes, air-operated trolley stands and air-feed sanders. The newest are powered by four motors of either 90 or 120 horsepower each. This

locomotive has an end, armored cockpit for the two-man motor crew. All locomotives carry rerailers.

All mine locomotives have radio-telephones, known as trolley phones, powered by trolley voltage and trolley wire to carry the signal. Radio-telephone instruments are also in the dispatcher's station, for communications between the dispatcher and motorman.

Rubber cushioned draft gear has been under test for some time. Test results indicate this type gear, where practicable, will be advantageous.

A total of 3,530 steel mine cars are used by TCI. The newer cars are the eight-wheel, double truck, design equipped with automatic rotary couplings. These cars replaced four-wheel, all steel cars with link and pin couplings. The new car bodies are constructed of Man-ten and Cor-ten steel with a fillet at the bottom and side joints which makes the cars self-cleaning. These materials were chosen for their abrasion and corrosion resisting qualities.

Extensive tests on rebuilt car wheels were concluded recently. The tests indicate a saving of 70 per cent a year in the cost of car wheels by rebuilding worn wheels.

Mine jeeps are provided for supervisors and engineering personnel. They transport personnel from point to point over long haulage distances and haul maintenance tools and parts to broken down equipment. The haulage schedule is not interrupted and no motorman is required for their operation. Jeeps have trolley phones and are guided by the dispatcher and block signals.

Material and equipment is hauled underground on low flat cars and eight-wheeled double trucked material cars. Cars marked indicating the mining section to which they will be hauled, and material for one section is loaded on the same cars. By following this system, secondary handling of material is reduced to a minimum.

AUTOMATIC SIGNALS REDUCE HAZARDS

To increase haulage efficiency and reduce hazards of underground haulageways, all mainline haulage units operate over track completely controlled by automatic block signal systems. These signals allow only one locomotive in any one block.

Motormen operate their trips by the signal indications without dismounting or stopping unless the track ahead is occupied. There is less delay, less starting and stopping, and safer operation than with any other transportation control. In mechanized mines, automatic block signals are the only efficient means to keep mechanical loaders supplied with empty cars.

The mainline is divided into sections called blocks. On entering a block, the trolley slide on the locomotive contacts a relay switch which operates the block signals. The entering locomotive on an unoccupied block immediately receives a green light, while red lights are simultaneously set at all other entrances. These indicators remain set until the locomotive leaves the block where the same type of trolley slide contactor device darkens the lights.

If two or more locomotives approach a block from different points, only one receives a green light and the others a red light. The trolley contactors are direction sensitive and operate only for the intended direction of trip movement.

At passing points, the loaded trips take the mainline and empties take the siding. The switch alignment at the passing points is so arranged that no switch throwing is required. This is accomplished through the use of spring split-switches. The switch alignment can be changed if necessary by using a manual switch throw.

Passing points are located, following haulage time studies, so that haulage times from point to point are nearly equal. Automatic block signals, controlling the entrances of locomotives to blocks, enable locomotives to operate at the maximum safe speed, almost without stopping, with no danger of collision.

When feasible, passing points on the main haulages are equipped with automatic electric switches. The devices for actuating the switches are the same as the contactors on the block signals.

In conjunction with the automatic block signal system and automatic switches, TCI has installed automatic time controlled derails. Company safety rules require the installation of derails at specified intervals on all grades and other locations.

For protection from runaway cars and locomotives, the derail is open at all times

except while a train is passing. The derail opens and closes automatically by contact devices on the trolley wire. A speed control feature forces locomotives to travel at a safe speed toward the derail point. The locomotive's speed approaching the derail is timed between two trolley contactors approximately 100 feet apart.

If the locomotive's speed is greater than the pre-determined safe speed, the derail remains open an the locomotive and cars are derailed. A push button is provided opposite the derail for test purposes and for the motorman's use in the event of a trolley contactor failure.

At TCI "Safety First" is not just a motto; it is a way of life. Realizing that the underground haulage system is the life stream of a mine, we strive for the latest developments in control and safety devices and methods into our haulageways. For a safe, economical and efficient haulage system, adequate engineering studies followed by the formulation of specifications are required. Once the specifications become standard and are rigidly followed, improvements in cost, safety and productive capacity should become apparent.

TCI through the use of welded rails, automatic block signals, switches and derails, mechanized construction methods and improved rolling stock, reduced haulage accidents 66 per cent. At the same time, productive capacity increased 35 per cent with a 25 per cent haulage potential in reserve. In addition, the costs of hauling ore and coal have been substantially reduced.

What We Are Doing to Prevent
FALLS-OF-GROUND ACCIDENTS

by **PHILIP GRAVES**
safety engineer, Homestake Mining Co., Lead, S. D.

What we are doing at Homestake to prevent falls-of-ground accidents is both a separate and integral part of our overall safety program. Certain phases of our safety program deal specifically with falls-of-ground accident prevention; other phases prevent accidents from falls of ground indirectly.

To present adequately our present activities to prevent falls-of-ground and other accidents, we must review previous mining practices and the changing conditions which increased the need for a dynamic, effective safety program.

The government shut down gold mines in October 1942. For twelve years prior we had a stable crew of men as reflected in our accident rate. The overall frequency ran between 30 and 40, with 11 fatalities from falls of ground in the 12-year period.

When the mine reopened in 1945, we were shorthanded. By 1947 we had a full crew, but it was highly unstable. Ther were too many Johnny-Come-Lately-and-Leave-Quickly characters who had about as much serious intent of becoming miners as the average two-year-old. This hectic period accomplished one thing: it pointed out the need for a forceful safety program concentrated on the individual worker.

The two years following proved the point, for our frequency after World War II reached a high of 99 in 1949 with three fatalities from falls-of-ground that year. There were ten fatalities from falls-of-ground in the years from 1947 to 1954.

We made several changes in mining which helped prevent falls-of-ground accidents. Before 1952, about 67 per cent of our mined ore came from the open shrinkage stopes, and 33 per cent from timber stopes. The shrinkage stopes started at the bottom of the ore and worked upward to about 30 feet above the next level.

Before any stopes were started, development crosscuts were driven through the ore body every 100 feet, and from these crosscuts "raises" were driven in the ore from one level to the level above. The shrinkage stopes were laid out across the ore body and were usually 60 feet wide (30 feet each way from the crosscut). This left a 40-foot pillar between stopes which was taken up with timber after the shrinkage stopes were mined, ore extracted, and the stopes filled with waste and sand. A stope 60 feet wide extends from the hanging wall to the footwall of the ore body and sometimes reaches over 250 feet in length and 150 feet in height.

"BELLIES" GREAT HAZARDS

In this type of mining it was sometimes necessary to leave "bellies" over the extraction raises so that the back would not get too far from the rock pile to be mined. This condition presented a potential hazard and many falls-of-ground accidents occurred when these "bellies" would loosen and fall.

After the mining was completed in these stopes, barmen would "ride" the pile of broken rock down as it was pulled out. Their job was to bar the pile and dress down the sides, taking down the loose rock so that all the ore could be removed safely from the stope. This operation usually took several months, and ground movement would sometimes loosen rock in the exposed walls causing some to fall and developing a hazard to workers in the stope.

After the stopes were mined out, before mining could begin in the pillars, pillar crosscuts were driven through the center of the pillar on the sill, then raises through the pillar from one level to the next, and subsill drifts through the ore halfway between levels.

The upper part of these pillars was taken out first. Mining started on the subsill, 75 feet below, and the pillars were taken up in sections.

Ore from the first floor had to be shoveled. After the first floor of timber was in, chutes were installed and the rest of the ore was drawn through the chutes into cars, dumped into a raise and pulled out on the level below.

After the third floor was mined out and timbered, an observation line was laced off on the second floor and from there extended a manway partly open on one side for inspection purposes. The mining floor and the working floor below were kept lagged over. The openings in the floors below were checker-boarded to turn rock through the chute. The pillars were nine floors of timber. After the first section was taken up, the pillar was left with only one solid wall. After a section was mined and cleaned nine floors high, the entire section was filled with sand tailings.

Sometimes in the larger pillars three sections would work at the same time. Under these conditions, quite frequently a block of rock too large for the timber to hold would loosen and come down, caving several floors of timber with it.

About one-half of our falls-of-ground fatalities in the 1930 to 1954 period occurred in timber stopes, and about one-half in shrinkage stopes.

In Homestake's new improved method of open cut-and-fill mining, mining begins from a raise at the bottom of the ore. All ore is mined from hanging wall to footwall, lying east and west, and from 100 feet to 300 feet in north-south direction.

The first lift is mined to about 18 feet high. After the broken rock is in the raise, an 11-foot timber bin line and manway is placed over the raise and laced with tongue-and-groove slabs. With this type of mining no pillars are left, eliminating pillar crosscuts and raises and most subsill drifts. The stope is filled with sand to the top of the manway and plank floor laid leaving seven feet between the floor and the back.

WALLS CAN'T LOOSEN

This same cycle is continued on up through the ore. With this method few bellies are left and the walls are never exposed more than 18 feet high and never long enough to allow the walls or back to loosen. Only a few days elapse between the broken ore slushed from the stope to the stope backfilled with sand. Any loose rock on the back or walls is rock-bolted as the stope is cleaned out.

The timber cut-and-fill stopes are taken up similarly to the old timber stopes except that each floor is filled as it is finished. The rock is all slushed into an ore pass called a bin line or chimney instead of turning the rock through the sets. Some

of these stopes are taken all the way from the hanging wall to the footwall and from waste to waste on each end while others are limited to 50 feet in length. By not breaking through the arch between the hanging and footwall, the danger of a cave-in is eliminated when the back is properly cribbed to the timber.

The five-year average of falls-of-ground accidents from 1949 through 1953 was 17 per cent with seven fatalities for the entire period. The overall frequency had dropped from 99 in 1949 to 56 in 1953. In 1956 our overall frequency dropped to 28. There were *11 falls-of-ground* accidents in 1954, seven in 1955, and four last year with only one fatality for the three-year period.

Rock-bolting throughout the mine is important in reducing falls-of-ground accidents. Rock bolts were used extensively in the development drifts on the lower levels where the weak rock can buckle and fail. Heavy mesh screen is rock-bolted to the drift walls and back in some places.

Use of rock bolts in our shaft sinking and stripping operations has enabled Homestake to complete approximately 2,600 feet of shaft in the past three years without a lost-time injury from falls of ground. In the same period we have driven five 900-*foot raises, two 700-foot raises,* and several 300-foot raises without a lost-time injury due to falls of ground.

By these changes in methods, Homestake has provided its miners with conditions as free as possible from working hazards. However, mechanical changes can avail little if each individual worker is not constantly alert to safety. This has been, still is, and will remain the eternal challenge and nemesis of every safety engineer.

HOMESTAKE FOLLOWS N.S.C. CAMPAIGN

In 1953, Homestake participated in the National Safety Council's campaign to reduce the number of falls-of-ground accidents. That year there were seven accidents, one fatal. This was half our average for the previous three years. In December of 1953 the safety department started taking every new man, hired for underground work, for a half-shift mine trip no later than two weeks after employment. The trips are conducted by me, or the chief assistant in the department. The number in the group is kept small, and the attention personal.

On these trips, we stress the importance of doing every phase of work in the safe way. We point out potential hazards, and tell each man how to avoid injury. Special emphasis is placed on keeping a working place always barred down.

The trip and conversation cover all areas and situations applicable to the new man. The coverage is thorough and unhurried, and the new man has ample opportunity to observe and question.

When the new man has worked long enough to be a miner, the head of the mine crew gives the newly approved miner further specific instructions for protecting himself.

Some convincing statistics from research started this program. Employees' records showed that nearly one-half our accidents occurred during the first two years of employment. Examining the files of all mine employees in 1955, the records showed the first year of employment accounted for 23.3 per cent of accidents and the second year an even 23 per cent. Obviously then, the two most accident-likely years are the first two years on the job.

For this reason a 15-minute sound picture of the Homestake Mine showed a new employee touring with the safety department man. Several minutes of this film are on barring down and the consequences of leaving loose rock, along with other examples of work that are safe or hazardous, depending on the individual working.

The film is shown to all underground men and groups of new men after two months employment. The waiting period has a twofold purpose. A man is naturally cautious and careful when brand new. After this initial period of caution he can become potentially dangerous to himself and his fellow workers. Bringing the safety film to him at the beginning of a period of overconfidence again stresses the need for constant safety. Also after two months, things in the film will be meaningful, which wouldn't be earlier.

To keep the miner safe, part of our program aims at his immediate superior, the "boss" of the beat. It is his job to see that

all working places are properly barred down, and working conditions always at their best. A monthly bonus is paid the shift bosses completing a month's accident-free work.

To make accurate comparisons, the safety department maintains files of accident figures on the 24 underground bosses' beats. Statistics show which crews are improving, static, or more accident prone. From these reports the mine superintendent can single out bosses with increasing accidents and encourage them to work harder with their men to avoid accidents.

At least three times a year safety department men talk to each crew. This 15-minute talk stresses the importance of barring down, and covers other safety measures.

Members of the safety department take unscheduled trips through the mine. This gives us firsthand knowledge of conditions, and we can offer concrete suggestions to improve specific areas. It also keeps the men aware of the safety department and on their toes to maintain safe working conditions.

Additional monthly inspection trips are made by four members of the Mine Workmen's safety committee. These men are recommended by the foremen and appointed by the mine superintendent to serve one year. In this way each man makes every mine beat once a year. After the inspection trips, the committee meets with the safety department to discuss their findings. Recommendations for improvements are sent to the mine superintendent. These men also report unsafe practices or conditions they observe during the month.

In addition to the Workmen's committee, there is also a central committee of the general manager as chairman, the safety engineer, and department heads. This group meets monthly to discuss suggestions and improve safety practices.

SAFETY PAYS OFF—IN CASH

Homestake has several incentive awards for the individual miner. One is a monthly safety suggestion program which offers cash prizes for the three best safety suggestions. First prize is $25.00, second $15.00, and third $7.50. Any other suggestion adopted during the month, but not rated with the top three, is worth $5.00 to the author.

A bonus system started in 1954 presents $10.00 to every underground employee working 275 shifts or over in a year without a lost-time injury. On his fifth accident-free year, he receives $20.00. If accident-free for an additional four years, he receives the $10.00 yearly bonus and on the tenth year another $20.00 bonus. The cycle then repeats through the succeeding five-year periods.

Since 1939 the Homestake Mining Company awards watch fobs for outstanding individual safety records. A gold watch fob is presented for 15 consecutive accident-free years, a silver fob for 10 consecutive years, and a bronze fob for five consecutive years.

Since 1939, there have been awarded 215 gold watch fobs, 521 silver fobs and 726 bronze fobs. Several men had the five and ten-year awards and wanted the third to complete the set. Other reasons for wanting fobs were varied, but the men wanted the practice continued even though watch fobs are outdated today.

In 1955 the company started giving a Hamilton Guardsman I wrist watch to each underground employee with 20 consecutive accident-free years. These watches are presented annually at a company dinner for the recipients and their wives. The ceremony is informal, but impressive and friendly. In addition to giving the individual a well-deserved award, the watches prove to others that working safely for years is not only possible, but also profitable.

In summary then, what we are doing at Homestake to prevent falls-of-ground and other accidents are these things:

First: We maintain the safest possible working conditions through new and improved mining methods.

Second: We give each new man the knowledge needed to work safely with a comprehensive printed rule book and a conducted tour of an actual working area.

Third: We have responsible supervision for the worker through a qualified shift boss constantly vigilant in keeping working conditions safe.

Fourth: We offer incentive awards to both workers and supervisors so that safety will be recognized, honored, and further encouraged.

Fifth: We promote safety constantly through talks, banners, mine trips and other types of reminders from the safety department.

Sixth: We are searching always and all ways for better means to keep "Safety First" uppermost in the mind of the individual worker, for he must be fully convinced that "Accidents Don't Just Happen".

THE SAFETY PROGRAM OF BETHLEHEM STEEL COMPANY

by CHARLES R. NEIL

management's representative & safety engineer, Bethlehem Comwall corp., Bethlehem, Pa.

The Bethlehem program is grounded on fundamentals and is essentially very simple. For almost 40 years the keystone is that safety is not a separate or diverse activity; it is production *with* safety. As our President, Mr. A. B. Homer, has said: "Safety is an integral part of the production process."

The manager of compensation and safety, reporting to the vice president in charge of industrial and public relations, administers the safety program of the company, with a staff of safety engineers. He also administers the company's workmen's compensation and liability coverages. He is informed on the operations and functions in a consulting and administrative capacity, developing operational safety organizations, procedures in accident prevention and exchanging safety information. Through safety agencies, he is informed on pertinent developments in the field of safety.

Our management has established that the individual operations—the plants, the shipyards and the mines—are responsible for product quality, maintenance of production capacities and activities to eliminate accidents.

INDUSTRIAL RELATIONS STAFF

The safety engineer at each operation reports to the local staff member in charge of industrial relations, who has full-time assistants. At Bethlehem the safety engineer at the operational level is not "in charge of safety"; rather, he is a consultant and advisor to people in charge of the operations. He plans and directs safety activities in concert with all phases of operations. When a facility is constructed, altered or reviewed, the safety engineer participates. This insures safety of operation —engineered safety.

By comparison, our safety departments are not large in relation to the work force. For example, at one steel plant employing 20,000 persons, the safety engineer has a staff of seven, including clerical assistants. However, more than 50 departmental safety inspectors are assigned by and report to operating supervision to assist operating personnel.

BETHLEHEM ACTIVE IN SAFETY GROUPS

Bethlehem's program, while designed for and directed to its operations, participates in safety organizations to exchange information with other companies in the steel, shipbuilding, steel fabricating and mining industries.

We are a participating member of the National Safety Council and of local safety councils. We are members of the Seven Steel Company Safety Exchange, comprised of the seven largest American steel companies; of the Atlantic Shipyard Safety Exchange, comprised of ship repair and shipbuilding companies operating on the east coast of the United States; and of the Coal Mines Safety Exchange, comprised of representative mining companies in the areas where we have such facilities. These exchanges are voluntary, informal groups organized to exchange information, statistics or mutual problems and to hold meetings covering prepared agenda.

Representatives of the Bethlehem general office and of our operations attend the National Safety Congress. Before the Congress, we have a one-day meeting of all Bethlehem representatives, normally about 50. Our agenda last year was typical:

1. Announcements
2. Using monthly safety topic
3. Discussion—Safety Interchange Bulletin (Form 18095)
4. Interpretations of recent rulings on unusual accident cases by A. S. A. Z16.1 code committee
5. The safety program and injuries to third parties
6. New ideas that helped 1956 safety program
7. Discussion of cause code of injuries
8. Questions submitted by operations for discussion

The latter item is not intended to solve safety problems requiring immediate attention—such problems are resolved as they arise. It is, rather, an exchange of ideas and elicits comment on questions from all operations.

GOOD HOUSEKEEPING LOWERS COSTS

In addition, we have periodic meetings with safety engineers from our steel plants, shipyards and mines, at a selected operation and usually covering two days. The first day is a physical inspection of the facility and individual comments on safety practices and items observed. The second is devoted to a prepared agenda covering currently pertinent subjects.

Many approaches are used for accident control—for example, good industrial housekeeping. Mr. E. G. Grace, Chairman, has stated: "Good industrial housekeeping has been a fundamental policy of Bethlehem from the start, making for more efficient production, a better product and lower cost operation . . . a smoothly running plant means more production, greater security of employment . . . Bethlehem's good housekeeping practices reflect the cooperative effort of the employees as a whole."

Good housekeeping in a steel plant, shipyard or mine is as important as in the home, and results in pleasant, healthful working conditions—efficient and safe.

Safety and the individual are firmly intertwined. Safety advances human relations consistent with technological progress and because it enlightens the self-interest of men and management, we consider it our first responsibility. When you specify working conditions, employees' safety and health take paramount priority. Our job is to give each man conditions we ourselves should like. This is not only a human obligation, it is also self-preservation. It's a prime factor to bring into our working forces desirable and competent young men, and to compete for them with other industries.

At Bethlehem, we emphasize the way an individual performs his job; hazards encountered on the job, and how we can best accomplish this job efficiently and without accident. We term such studies Job Safety Analyses. Each is a studied, recorded analysis of how the job is done, prepared by the supervisor with the workers for the direct purpose of preventing accidents. As each hazard is recognized, a decision is made whether to change the job process or protective equipment, or a combination of both to eliminate or guard against the hazard. These completed studies are discussed with the men on the job so each step-by-step phase is understood.

The studies follow a standard pattern which includes: (1) principal steps of operation (list each step in the order it normally occurs); (2) hazards (list the hazards found at each step of operation); and (3) safety controls (list steps to eliminate the indicated hazards or the necessary safety precautions taken).

PRACTICAL SAFETY SUGGESTIONS FROM ANALYSIS

A job safety analysis not only results in a safer operation but facilitates production. For example: *Job* No. 1: Man working inside a large ingot mold casting is seated in a bosun-chair suspended from overhead crane; *Hazard:* Possibility of crane being bumped, shoving man in chair against side of mold; *Correction:* Fabricate working platform, set it inside mold, provide access to platform, properly identify job at hand and semi-isolate mold; *Result:* Hazard eliminated, job worked smoother and over-

head crane released for other shop movements.

Job No. 2: Clean slag from mixer ladle hole requiring six to eight men one day a week; *Hazard:* Pick-and-shovel job, close quarters, flying objects and metal splashes; *Correction:* Set U-shaped scrap bars in pit to catch slag, hook onto bars with overhead crane once each week to remove residue; *Result:* Elimination of work exposure and men released for other assignments.

Such studies are disseminated through personal safety contacts, on-the-job planning meetings and daily observation of work habits.

Frequent departmental inspections, proper maintenance of equipment, use of personal protective equipment, industrial hygiene surveys, including studies of air contaminants, welfare room facilities, medical treatment and allied functions, are the procedure at Bethlehem, and contribute to accident elimination.

ACCIDENT CONTROL—A JOINT JOB

Through the years, a joint safety responsibility of management and employees has developed. Accident prevention is the responsibility of everyone, although it is primarily a *management* responsibility. In our steel division, employees are active through safety committees both permanent and rotating. Meetings take place during regular working hours on company time. Departmental committees meet and review the experiences, offer and discuss, recommendations to eliminate hazards, report on inspections of their departments and review progress in eliminating unsafe acts or practices.

The membership of the general plant committees include representatives of each departmental committees. In their meetings the broader aspects of safety work are discussed, with plant, inter-plant and intercompany experience as the theme. Recommendations of the departmental committees are discussed. Representatives of the general manager's staff attend these meetings. The general managers meet with their department heads to discuss accident-prevention matters. In the Bethlehem program, production meetings are also safety meetings.

The foremen are the management people in closest contact with actual physical production, and, therefore, are responsible for the safety education of their employees and the development and enforcement of safe practices.

PUBLICATIONS PUSH FOR SAFETY

Each year before December, all operations are advised of the monthly "safety contact topic" for the ensuing year. This topic is featured in the lead article of our monthly Safety Bulletin which goes to all supervision. The bulletin, in addition to the feature article, contains information and articles to assist supervision in conducting the safety program and educating the employees.

To assist foremen in their personal contacts, "Contact Topic Cards" are available on a weekly basis. Such cards contain a brief outline of the current safety topic and make "talking" to employees easier. However, a foreman is not limited to these topics but is encouraged and expected to discuss the job at hand.

Another educational factor is our Safety Interchange Bulletin which describes safety devices developed at one operation but applying to others. The interchange bulletin customarily displays pictures of the device and detailed drawings and narrative description.

While every effort to prevent injury is made by providing properly designed and adequately guarded facilities and well-lighted work areas, personal protective equipment plays a major role—hard hats, safety glasses and protective clothing. We also advocate wearing safety shoes and proper apparel. Our primary effort is to make the place and the machine as safe as possible through mechanical engineering, and then protect the men from hazards which cannot be eliminated.

Our personal protective equipment program is of long standing, and experience through the years confirm its value. One of our operations has not had a disabling eye injury for 20 years—more than 64,900,000 man-hours.

In our experience first-aid training is essential. An employee so trained can give proper, immediate assistance to an injury whether at work, home or on the highway. Moreover, the employee trained in first-aid is a safer employee on his own job.

Safety codes play a major role in our program. A code, prepared after studying the operating phase is a guide showing how an operation may be safely performed. A positive approach is most effective, that is, we teach what to *do* rather than what *not* to do.

BE POSITIVE, NOT NEGATIVE

The economic factor of safety is compelling but we firmly believe a safe operation is a profitable operation, both to employees and to the company. The employer's cost is not the only benefits contemplated by the Workmen's Compensation Act. It is the loss of a valued employee, the cost of training a replacement, plus the production loss resulting from the accident.

What is the cost of no-lost-time cases requiring medical care? How many do we have in a given period and how much time is spent in treatment? What about production loss while an employee is at the dispensary? In an accident involving damage to facilities, what is the cost of repair or replacement, the cost of down-time and loss of production? Cost, properly used, is a valuable sales feature.

Our accident experience is measured by frequency and severity as defined by the American Standards Association in its Code Z16.1-1954. Frequency is the number of disabling injuries per 1,000,000 employee hours of exposure; severity is the total days charged per 1,000,000 employee hours of exposure.

Our concept of production with safety began in 1916. In 40 years, our accident frequency rate was reduced by 90 per cent. Our corporation-wide frequency rate for the year 1956 was 4.16, or a little over four disabling injuries per 1,000,000 man-hours worked. In four of our integrated steel plants, the frequency ranged from .56 to .78, or less than one disabling injury per 1,000,000 man-hours worked—a rather striking experience in what has been said to be a very hazardous industry.

It is not by coincidence that a Bethlehem operation has won the National Safety Council's metals section contest among large steel plants for the past 15 consecutive years. In 1956 our operations received more than 30 awards from the National Safety Council for safety performance. In addition, our operations received awards from the United States Bureau of Mines.

A consistent safety accomplishment must be built on a firm foundation, properly designed and kept up to date to cope with ever increasing production objectives. In a large measure, safety programs throughout Bethlehem meet specific problems at a given operation, but they are uniform in thought and direction.

Our management has long been convinced that production with safety is paramount—because it has to do with men and their individual significance—because it reflects the responsibility of leadership—because it fulfills one of our primary human obligations—because safety and efficiency are actually one and the same—and because of its growing significance to the total national economy.

SAFETY PROGRAM FOR THE BUTTE DISTRICT OPERATIONS OF THE ANACONDA COMPANY

by HERBERT A. WENDEL

chairman, Bureau of Safety, The Anaconda Co., Butte, Mont.

The Butte District operations are an integral part of The Anaconda Company's Western Operations. The Company operates 13 underground mines and two open pit properties, plus complete shop and service department facilities. The number of active mines depends on economic conditions, and less than half the mines are currently active.

Except for two block caving mines, all underground operations use selective mining methods. A considerable amount of hydraulically placed mill tailing is used as stope filling, and will become standard practice in the future. Rock bolting techniques are used, especially on new sill development work and in horizontal breast cut and fill stopes.

The principal products produced from the Butte mines are copper, zinc, and manganese ores, which contain smaller amounts of silver, lead, gold and accessory metals. During normal operation 5,000 to 6,000 men are employed on the Butte hill.

SAFETY PROGRAMS SINCE 1914

Safety programs for Butte operations are developed, promoted, and supervised by the Bureau of Safety, established in 1914. Information on successful safety projects is sent to the management of all Anaconda Company operations for consideration and possible use. Monthly injury reports are sent from all Anaconda Company and subsidiary operations to the Bureau of Safety, where quarterly and annual reports are compiled to determine lost-time-injury-rates.

Each year the operation with the greatest reduction below its previous 5-year lost-time-injury-rate receives the Kelley trophy for the year. Safety departments are maintained at every Anaconda Company's world wide activities.

The Bureau of Safety's staff consists of the chairman and a clerk. The Butte District organization includes a chief safety engineer, five to eight safety engineers, an artist and a part time artist and clerk. Each safety engineer supervises one large mine and smaller operations. The duties of the safety engineer include:

1. Supervises mine or plant safety programs.
2. Trains workers and supervisors.
3. Inspects working places and operations, reporting natural hazards, safety rule violations, faulty behavior, fire hazards, poor housekeeping, defective equipment or materials, unsafe mining or work practices and conditions, ventilation and industrial hygiene environments, lack of or defective protective clothing, equipment or devices, and recommends corrective procedures.
4. Follows through to see all hazards are corrected, within a three-day period.
5. Investigates and reports on all injuries.
6. Conducts weekly supervisors' safety meetings.
7. Takes new employees on a tour of surface facilities and explains the general safety factors involved.
8. Secures safety pledges from all men and distributes rule books or job safety instruction sheets.
9. Assists mine management officials in conducting employee safety meetings with Union committees.
10. Is alert to improve efficiency, safety methods and practices.
11. Sees all men are equipped with proper safety clothing and protective equipment.
12. Looks after first aid supplies, facilities, equipment, training, and treatment of injured.
13. Is available for calls at all hours for any emergency, such as serious accidental injuries, disasters, or mine fires.
14. Supervises display and distribution of safety posters, warning signs, reminder cards, news bulletins, and safety literature.

Under the Bureau of Safety, Butte District operations have achieved a gradual decline in frequency and severity rates of lost-time injuries. But the total injury rate, including accidents without a loss of time, has not reduced as much as the lost time injury rates. In fact, several years when the lost-time rate declined, the total injury rate increased.

Therefore, we are confronted with a serious problem: How can we lower the total accident rate? It must be done since even the slightest injury could result in a lost time injury, depending on factors such as age, environment, physical or mental conditions, marital status, financial position, and temperament.

Many different solutions have been tried in the past including:

1. Incentives such as pictures and cigars for the safest crew each month; chances for prizes of cash or savings bonds; National Safety Council badges, theater tickets.
2. Periodic "Going on shifts" safety talks.
3. Posting "No Accident" records for supervisors' crews.
4. Use of safety flags.
5. Bonus for supervisors.
6. Safety suggestion boxes.
7. Reminder cards at working places.
8. Safety pledges.

Each project reduced the lost-time-injury-rate but again, the effect on the total accident frequency was not up to expectations.

After a thorough analysis and study, we decided to promote a new approach to safety, based on a progressive, intensified, concerted training program. It would be a long-range project, including training sessions in preliminary safety education before the new employee is hired, and continuing progressively throughout employment. While on-the-job-safety is particularly emphasized, off-the-job-safety is also stressed. The plan embodies a program of safety education for the worker, and similar training projects for supervisors. This is essential because the supervisor is responsible for the task of selling safety to his crew, and influencing their attitudes and behavior through daily personal contact. Constant awareness of safety can become "a way of life" instead of a duty. This is the aim of present and future safety programs of the Anaconda Company for its Butte operations.

Advanced and diversified mining operations and methods increased the need for more adequate safety controls. Recently some newly inaugurated programs alleviated the major obstacles in inducing safety consciousness.

We are developing and instituting a safety training program. The projects are not new or original; many safety organizations have used similar plans. But we intend to try each point, then alter and adapt to the best performance. Finally, the separate objectives will be coordinated into a procedure flexible to changes in mining progress. The ultimate goal is accelerated action on accident prevention through safety training and education.

The large labor turnover in Butte is due to: migratory and transient workers, labor shortages in summer and early fall from miners taking temporary outdoor jobs, and fluctuating economic conditions which affect production requirements. Because of these factors during a normal year about 2,000 new men are employed and less than half remain more than one year. Our accident records show more than one-half of all lost-time injuries happen to employees with less than a five year service record.

SAFETY ORIENTATION

If we can impress the new employee, before he is hired, that the Anaconda Company is interested in his welfare and safety, he will be more attentive and responsive. Anaconda believes well-informed employees make better and safer workers.

The project consists of a lecture utilizing diagrams, posters, signs, pictures, and displays of safety clothing, required protective equipment, and safety devices. Slide projector illustrations are being developed.

After passing a physical examination, prospective employees are required to attend the Orientation and Safety Indoctrination course conducted by a safety engineer before rustling cards are issued. We present much information to help the new employee get a proper and safe start on the job, and to acquaint him with our accident prevention policies.

Information presented includes:

1. Company policies in regard to welfare and safety.
2. Size, scope, and purpose of the Anaconda Company's world wide activities.
3. Description and magnitude of local operations.
4. Wages, differentials, work week, hours, overtime pay.
5. Functions and duties of the employment office.
6. Operation of the personnel department and how it affects employees.
7. Procedure to secure job.
8. A guided, informative tour of the surface plant, conducted by a safety engineer or foreman.
9. Safety pledges.
10. Employee benefits including: group insurance, hospital medical plans, paid vacations and holidays, employees' club, pension plan, opportunities for advance-

ment, purchase of Savings Bonds on payroll deduction plan.

11. Brief description of various local mining operations and methods.
12. Résumé of general hazards of the job and ways to prevent accidents.
13. First aid facilities, equipment and training programs.
14. Proper procedure in event of accidental injury.
15. Communications program.
16. Benefits from making a permanent home in Butte.

SAFETY TRAINING FOR PROSPECTIVE SUPERVISORS

This is a proposed activity for use during full production when management staffs have a shortage of experienced supervisors. A prospective supervisor attends special courses in safety training so that when he takes on supervisory duties, he will know his responsibility in his crew's safety and welfare.

SAFETY TRAINING FOR SUPERVISORS

Each year the Mining Research Department conducts a three-day training course for all Butte supervisors. At these sessions new and review information is presented on all phases of the mining operation. A two-hour safety class is sponsored and conducted by the Bureau of Safety.

Pertinent new safety promotions are presented and discussed along with a thorough review of principles and accomplishments, using visual aids produced for slide or Vu-Graph projection.

ADDITIONAL TRAINING FOR SUPERVISORS

Safety performance records are compiled for all supervisors to determine the nature and classification of injuries. The safety engineers report periodically on the supervisor's safety attitude and the amount of training imparted to his men.

From these records and reports we determine safety performance deficiences of a supervisor, particularly those whose accidental injury rates are unsatisfactory. Then special safety conferences and reviews are conducted to improve attitudes and performances.

Letters are sent periodically to all supervisors by the chairman, presenting safety news, congratulations for records or accomplishments, information on new ideas, or requests for more effort in accident prevention.

The supervisor is naturally responsible for most employee training. In a mining operation, the average shiftboss should see every crew member three or four times a shift. Here is the best opportunity for safety indoctrination.

A competent, conscientious supervisor, alert and safety-minded, can exert a tremendous influence in promoting and inculcating safety consciousness in his crew. The safety engineers constantly stress this phase of shiftboss training.

Much psychological training is accomplished by presenting on posters particular behavior problems which contribute to poor safety performance. The effective poster must appeal to the observer by showing working environment, and aiming at the intelligence level of the average employee.

The carton poster offers the greatest attraction to the average Butte worker. We exhibit new or different posters weekly, some on surface bulletin boards, others at strategic locations underground.

To obtain consistent safety behavior and habits, the employee must be reminded constantly about hazards and how to guard against them. To do this, we post a series of safety practice reminder cards for all employees according to specialized occupations. These cards appear at conspicuous places around the work site.

SAFETY IN COMMUNICATIONS PROGRAMS

A communications program presents another vital tool to promote safety and accident prevention. The Butte district communications program consists of the News boards and periodic management letters to employees. Safety grams on the news boards are ideal for safety announcements, accomplishments, and congratulations.

Editing and publishing a monthly safety magazine for employees is a communications project. *The Headframe*, first published in June 1957, provides safety news and information for all members of an employee's family in the home. Subjects deal with safety on the job, at home and at play. The object is to extend the psychological training approach to the entire family and induce a "safe way of life" in all its actions.

Presenting workers a safety rule book or instruction sheet has only a momentary, psychological effect. But if the supervisor reads a safety pledge, explains it and the employee's responsibility to himself and his fellow workers on safety and then the man signs a pledge—this creates a more lasting impression.

Consequently signed pledges are required for the hazardous occupations, such as miners, motor crews, chute tappers and open pit miners.

SAFETY TALKS

Short safety talks are used by safety organizations. But these, like other accident prevention campaign activities, must be changed periodically to maintain interest and produce beneficial results. Due to lack of interest or tangible proof of merit this was discontinued, on the Butte hill, a number of years ago.

Occasional short "Going on Shift" safety presentations and demonstrations assist the training program. A series of Vu-Graph projections, depicting actual accidental injury cases and object lessons on safety, is being processed to emphasize the value of "thinking before doing," on all actions.

The Bureau of Safety is revising and promoting a number of accident prevention campaigns instituted years ago:

1. Annual first aid and helmet training—new and review courses.
2. First aid team contest each year.
3. Publicity and awards for outstanding safety accomplishments and life saving deeds.
4. Development and use of specialized safety rule books.
5. Research and engineering is safety promotions, projects, methods, equipment, devices and ideas.
6. Better industrial and public relations by extending cooperation and assistance on safety programs to: government and state agencies; law enforcement offices, schools, scouting activities, civic projects, service clubs and labor unions.

An amicable relationship between management and labor was achieved largely *through recognition* and utilization of union safety committees. At all mines and plants regular weekly safety meetings are held, when the mine superintendent or foreman and the safety engineer, meet with appointed safety committee members of the local miner's union. At these sessions the union safety committee presents hazards which are discussed by management's representatives and decisions are rendered. Corrective measures are reported by the safety engineer. The end result is better understanding and cooperation between labor and management.

Any safety endeavor to be successful must be: conscientious and exhaustive, flexible enough to meet changing conditions, developed through trial and error, and based on practical common-sense principles. Reducing suffering, hardship and sorrow from injury to our fellow man offers the greatest challenge and reward of any undertaking in industry today.

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Volume 20

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MOTOR TRANSPORTATION INDUSTRY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE COMMERCIAL VEHICLE SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Commercial Vehicle Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Commercial Vehicle Section carries on in behalf of its members, and for the benefit of accident prevention work in the motor transportation industry generally. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day fleet safety programs.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

ANNUAL REPORT

by K. N. BEADLE, CHAIRMAN
director of safety, Pacific Intermountain Express, Oakland, Calif.

Safety has grown in importance and influence since the first Commercial Vehicle meeting 35 years ago. Although it is impossible to say what the fleet accident picture would be today if the safety movement had never started, we could project the early recorded fleet experience and calculate a probable picture of our traffic safety if it had continued at the rate that existed over 25 years ago. According to the National Fleet Safety Contest the accident frequency rate was double what it is today when the contest began in 1932.

If we projected that early experience to the present number of professional drivers —11,000,000 for all types of vehicles—we would find that the 76,000 accidents reported by contestants during the past National Fleet Safety Contest would have resulted in an astounding figure of 3,500,000 accidents involving professional drivers. These, of course, are accidents of all types from fender dents to complete losses.

If accidents occurred at the same rate as they did 25 years ago the figure last year would have been seven million accidents. Drivers today average more than 66,000 miles between accidents as compared to 33,000 in those early days of the contest.

RESULTS PROVE PROGRESS

Many of us may feel that safety progress is slow, that results are intangible and that our efforts are not appreciated. Yet, the above experience and many more evidences of progress are apparent when we check the records.

To cite a few examples, there are in excess of 2,000 fleets currently enrolled in the National Fleet Safety Contest. This is 10 times as many as 26 years ago. There are 10 times as many drivers enrolled in the contest and they operate 25 times the mileage as was reported by their earliest predecessors.

Just during the last decade seven times as many drivers received the Council's Safe Driver Award. Four times as many drivers are now enrolled in the program. The national average of awards earned has improved from one out of three drivers to one out of two drivers during the last decade. In 1957, the Council will issue about 150,000 awards—as many as were earned during the first eleven years of the program.

EXPANDING RAPIDLY

Use of Motor Transportation safety materials has doubled in the last five years. The Motor Transportation Division represents the fastest growing section in the Council. The Commercial Vehicle Section, the largest section in numbers of affiliations continues to out distance all other sections in new affiliations.

Motor Transportation Services now extend to police departments, state highway patrols, school bus transportation systems, the United States Post Office Department and other governmental agencies as well as fleets of passenger car drivers in sales and supervisory positions.

From a salesman's coupe to a mammoth truck trailer combination, persons who earn their living by driving are setting a pattern of safe operation unequalled in our country's traffic records.

By their example, they have proven that motor vehicle accidents can be prevented. The ingredients for this accident prevention formula have been studied in detail and are presented in the manuscripts which follow. These ingredients are the positive elements of driver selection, training and supervision. ▲

ACCENTUATE THE POSITIVE

by LORNE F. PURVES
fleet superintendent, The Toronto Star, Ltd., Toronto, Ontario, Canada
program chairman, Commercial Vehicle Section, N.S.C.

Safety is not just a traffic light flashing its amber caution beam down the highway, or the roadside sign indicating the dangerous curve or bad hill ahead, or is it a hard hat worn by an oil refinery worker. Safety is a state of mind, a "positive" state of mind. Without that "positive" state of mind, all the safety equipment, all the traffic controls and legislation can be without purpose.

This business of "positive thinking" was brought to my attention some years ago while having dinner in a restaurant. It was before the days of air conditioning and the restaurant was extremely warm. Customers were asking for extra ice water almost as fast as the girls could bring it. One tall, blonde, southern girl seemed to have twice as many people to serve as most of the other girls. She was extremely efficient and thoroughly courteous, running back and forth with water jugs, extra pats of butter and iced drinks of various kinds.

There was a woman sitting close to us who seemed to be unnecessarily demanding and bothered her incessantly. When it came time for the girl to serve our table, I could not help but remark her pleasant attitude, and I asked her how she maintained such an excellent measure of tolerance and cheerfulness when people were making so many unreasonable demands. Her reply was very significant. She said, "It sure is tough at times but, believe me, it pays big dividends."

EXPECT THE BEST

The Reverend Norman Vincent Peale in his great book, "The Power of Positive Thinking," mentions the magic of believing, and that when you set your sights low and expect the worst, you get the worst—whereas, when you expect the best results and work positively to that end, you will get the best possible results.

We all have good examples of that negative type of thinking with the men in our own staff. You know the type—the driver who is beset by imaginary fears. Before he even starts out of the terminal yard with his rig, he wonders if the police will be weighing on the road today—will the fog be bad in the valley—will the traffic be heavy on that long hill into Centerville—will he be able to arrive at the terminal on time?

We call them "worry warts" and you know them well. They do a good job most of the time, but when the chips are down, things are tight and the traffic heavy on the highway because of the football game, or plugged with snow, you and I know which driver is going to blow his stack and possibly give up on the shoulder of the road somewhere until he settles down. Is it the driver who always measures his problems carefully and positively, and says, "Sure boss, I think we can do it," or is it going to be the "worry wart" who frustrates himself mentally and physically with negative, mental processes, which magnify and distort everyday problems out of proportion?

HELP WORRY WARTS

William James, the famous psychologist said, "Your belief at the beginning of any doubtful undertaking is the one thing that insures the successful outcome of your venture."

As supervisors and safety directors in our respective companies, I feel we can spend a little more time with these "worry warts" and try to improve their job. It is the success of those with whom we work that indicates our ability and our success, and the measurement of our ability and our success is what puts the groceries on the shelf at home in small packages or big packages.

Frequently the problem kid in our organization is, in a roundabout way, trying to keep in the spotlight and make us know indirectly that he is around. He is also telling us something that he doesn't know—that he needs us and our understanding. Some of them need a lot of understanding.

If you have a rugged individualist on your staff, do not cuss him for the problems he is causing you, much as you would like to,

because it would probably take more out of your old tummy than it would to dent the armour he has built up around himself over the years. Approach him in a friendly fashion, using his first name not his last, and give him the impression you are genuinely interested in getting his viewpoint on those habits and negative attitudes that give us the impression he is unco-operative.

To handle people—you have to be a good listener—and it doesn't have to be a task! A "positive" mental attitude attracts the "positive" attitude in people just as a magnet attracts steel.

If you can get him psychologically "unlocked," you may be able to solve his problems. Possibly, if you approached him with the same "positive" attitude that you would use to lower your golf score, the results would be just as gratifying.

We often allow the negative attitude of a few individuals to obscure the higher-than-average standard maintained by the majority of our personnel. We, as important parts of administration and supervision, should practice the policy of "positive" thinking and "positive" procedures as frequently as possible and in a manner most beneficial to these few. They are the ones that need our help the most.

Governments and firms spend millions in public relations. How much do we spend, not in money, but in time? It's worth thinking about!▲

BE POSITIVE IN DRIVER TESTING

by A. L. HAUCK

director of safety & public relations, Transportation Underwriters, Inc., Indianapolis, Ind.

I speak not as an industrial psychologist but as a layman discussing our attitude toward driver testing. I have spent many months talking to safety directors, supervisors and many administrative people sincerely interested in safety discussing current practices in testing.

There were many pros and cons as to its value. One fact did come out: those who did use testing were strong in their beliefs of the benefits derived. Most were using tests for training or indoctrination purposes.

Testing, according to Webster's New Collegiate Dictionary, Copyright 1953, used in the educational sense says "Any series of questions or exercises or other means of measuring the skill, knowledge, intelligence, capacity, or aptitudes of an individual or group."

The interpretation of that definition has varied among the people I have talked to. It has varied from "taking a small sample and from the test of the sample predict the whole" to "an exact measurement of the whole by analyzing the sample."

Tests for driver selection include:—

1. Road test in traffic.
2. Yard or skill tests.
3. Psychophysical tests.
4. Knowledge tests.
5. Vision tests.
6. Psychological tests.

Disregarding entirely the discussion of who believes and who does not, I would like to talk about some of the positive attitudes I have seen in psychophysical testing. You know the depth perception, reaction, peripheral or tunnel vision. The greatest success encountered was in the attitude of the safety director or supervisor giving the psychophysical test.

I asked as of its value as to screening and physical check as to reaction. The answers were of this pattern:

Value?—"Do you realize that for each test given I have the undivided attention of our prospective driver and with each test I tell him of its relation to actual driving and how important it will be to his success as a safe driver." With reaction we study the evils of tailgating.

I may never again have his undivided attention but for that time I do. This is not a contest between the applicant and the testor, but a case where the applicant is encouraged to do his best. "This is positive thinking. These safety people knew what they wanted to get across and did it."

USE POSITIVE THINKING

The next point is the positive thinking in vision tests. The successful and enthusiastic people held forth the idea that the vision test was given to assist the prospective employee and in many cases the vision tests were given regular employees in all departments. The results of the test indicated that he or she should or should not see their oculist or optometrist. Here is an example of this idea.

In Louisville, Kentucky, my home town, we had planned vision tests for all employees. The "scoop" got around as it normally does that the safety department was checking eyes. The maintenance manager came to the safety office and informed us the mechanics were discussing the point of whether to submit to the examination and informed him that nothing in their contract said they had to take the test and some said furthermore we were not doctors.

Both points were absolutely true. To combat this attitude we posted a small notice on the garage bulletin board to the effect that as an employee they too were entitled to receive the free vision test which would indicate if there was a need for further eye examination and to please see the garage foreman to arrange an appointment to avoid the crowd.

Before we were through they coined an expression for us "You can't set points if you can't see points." Positive thinking.

I am sure many of you have conducted road tests in traffic or yard or skill tests. Again while giving and immediately after, the student gives you his undivided attention. Sometimes the errors point towards what should be stressed in further training. These items are placed in our hands for action.

Knowledge tests afford us the same opportunity of assisting our people. With the proper attitude on our part it tells us what should be stressed in training and retraining programs.

Of these tests or testing devices some may ask—"Where do I find them?" or "Who could help me?" Without fear of plugging but with pride—your National Safety Council can help you.

These tests are meant for practical supervisors. Training and knowledge are necessary, of course, but the training and knowledge needed is readily acquired.

On the last point I tread lightly and with just a little advice. I refer to psychological tests—intelligence, personality, etc. If you contemplate this type consult an industrial psychologist or with state universities. They are a great help in putting each one of us on the right track. Consult them, they are a world of help in this field.

Testing has as many facets as the most beautiful diamond, but the brilliance of any one only reflects your attitude or thinking. If testing is but a sample, the prospective employee is also getting a sample of what the company thinks and does. Can he judge the whole company accurately from the sample you gave him?▲

BE POSITIVE IN USING INCENTIVES

by JOHN H. WASPI
director, Safety & Driver Personnel, Allied Van Lines, Inc., Broadview, Ill.

The title of this talk "Be Positive in Using Incentives" may cause some people to wonder exactly what do we mean by that subject. According to Mr. Webster, *incentive* is that which incites or has a tendency to incite, to determination or actions; motives; spur, as money and pride are incentives to action.

In other words, when you give someone an incentive, you give them a reason to act as you want them to. Mr. Webster used the word *spur*. This does not mean that you put spurs on your safety director, although spurs might help under certain circumstances.

What do we mean by positive? There are many ways to explain positive, however, in this case I refer to a plus not a minus. In other words, we add, we do not take away. That gets back to the word *incentive*. By giving, you incite someone to act as you wish.

Now what types of incentives are there? Money can be used as an incentive to an employee. The payment is an incentive for them to do their work. Certainly they would not do the work without the money. Money can also be an incentive by giving an employee additional money to perfrom an exceptionally good job.

BOOST THE EGO

There is also "ego." By publicizing the good work of an employee to his fellow employees, you boost his ego and make him proud of himself. Merchandise awards are also incentives designed to bring in the family of the employee. In many cases, the merchandise prize is the best incentive to offer, since the employee who brings home a merchandise prize also benefits his family and at the same time, boosts his ego because his family appreciates what he has done.

Now that we have gone into "positive" and "incentive," let us determine when we should use them. Since we are primarily concerned with drivers and safety, we shall put the *positive* incentive plan for drivers into effect. The most common argument against incentive plans is "why should we give a driver an incentive to do a good job when we are already paying him enough to do a good job." This is a very good argument until you reach a certain point. Our job is to know when we reach that certain point.

Certainly management is not going to give you authority to set up an incentive plan until you hove proven to them that you have done everything that you can to reduce your accident rate through the normal and more economical means. You reach the need for an incentive plan when all else has failed. What type of an incentive plan should you put into effect in your own fleet?

Chances are that you already have some sort of an incentive plan in effect. Every time you issue a safe driver award, you issue an incentive. This is the ego type of incentive. You give the driver a badge telling him that he has operated his vehicle over a period of time without having a preventable accident. You may have a driver of the month program or a driver of the year program in which you honor a specific driver for doing something better than the other drivers. Such a program is a positive incentive on the ego of the drivers.

Now comes the decision. Shall we go into a cash or merchandise plan? If you asked your drivers, they would probably say, "let's have cash." There is a good argument against cash awards. Cash is easily spent and we know that a good percentage of the drivers would spend it on themselves and it will never reach home. Cash in many respects, will do you no good, since it becomes an addition to his salary. He begins to expect it and takes it for granted. Then too, it does not get into the house where the wife and family can take advantage of it. The cash award therefore is not desired in most cases, so let us look at the merchandise award.

The common practice here is to award the driver prize points that are redeemable in merchandise. These prize points are earned by the driver for operating a given number of miles without an accident. He can also be given prize points for operating over a period of time or a specific number of miles without being arrested for violating speed limits or other traffic violations. He can be given prize points for the number of years he has been in service in addition to his accident record or arrest record.

If you have a road patrol system, then he can be given prize points for each satisfactory report he receives. Please note here that we do not take points away from a driver for having a violation charged against his record or an accident charged against his record. It is not recommended that you issue points to a driver and then take them away from him when he has an accident or when he is arrested or when he has an unsatisfactory report of some type or another. That is being negative.

Let us assume that you have set up a merchandise award plan based on the positive issuance of prize points. What is going to be the basis of this program? What will its rules be? It is recommended that you set up your program in such a way that all awards are based upon improvement, either improvement in the driver's record or improvement in the company's record.

POINTS FOR NO ACCIDENTS

Since your company is paying your salary, your first interest should be improving the company record. One thing that you want to improve for your company is your accident rate. Therefore, you can set up your incentive plan based upon accident rate improvement or the reduction of accidents. Prize points can be issued to drivers who have no accidents during a given month. Suppose that you had 10 accidents during July last year and five accidents this year. This is a reduction of five accidents assuming that mileage remained the same or increased.

You can figure the average cost of an accident, multiply it by five, and you have the approximate amount of money saved for the company. Naturally, you do not want to give all of this as incentive prize points to the drivers who had no accidents. Certainly it is worth 50 per cent of the money saved for the company. This amount can be given to the drivers in incentive prize points.

In such a plan, you want to inform your drivers of the company's past record. Keep them aware on a weekly basis of how they are doing in reducing the accident record for that month over the same month for the preceding year. You will note that this is almost a no cost plan since you are saving money for the company over previous experience. You pay out nothing until you have saved for the company.

PROMOTE COMPANY RECORD

At the same time that you issue prize points for reduction of accidents, you want to award those drivers who continually do a good job in accident prevention. You give the men only 50 per cent of what is saved for the company. This leaves you a little room for a bonus. You can give the drivers who go an entire year without an accident, a bonus for their good performance. The amount of bonus may be determined by the company.

The bonus arrangement is a method of taking care of the good driver regardless of what the bad drivers do to your accident record. In other words, it gives the good man an incentive to continue to be a good man even though other drivers have cut him out of participating in the monthly awards due to increased accident ratio for that particular month.

When setting up a merchandise award plan, you must carry your message to the driver's family. This is often done by presenting the prize catalogue to the family as a group. The driver's wife and children immediately become interested in obtaining the many merchandise prizes shown in the catalogue.

FAMILIES HELP PROGRAM

Families then have a tendency to get on the bread winner's back and encourage him to drive safely and perform in such a manner as to earn merchandise awards for them. Experience indicates that as soon as the prize catalogue reaches the home, that it becomes marked showing the awards that will be ordered first.

This should be followed up by constantly reminding the family of the merchandise award plan and that all they have to do to win, is to encourage the bread winner, the driver, to drive safely and follow company rules and good safety practices. You have

in effect, added another safety supervisor to your staff. The wife and the children have a lot at stake, not only the merchandise awards but the life of the husband and father.

This is a positive incentive plan. It can and will work. These ideas and methods are not necessarily the ones that you will want in your own fleet. The idea is to think positive and set up a plan that will improve your safety record and at the same time, improve your drivers.

BE POSITIVE IN USING SAFE DRIVER AWARDS

by JOHN L. HUGHES

director of safety, Southern California Freight Lines, Los Angeles

One of man's most powerful motivations is the desire for recognition. We want everyone to know we excel in our field and this desire frequently forces us to exert a real effort to excel.

As children in school we took great pride in seeing our paper exhibited as an example of neatness, ability or proficiency. When one paper was exhibited we increased our efforts because having once tasted the sweetness of recognition we were determined to taste it again.

As we advanced in years, another motivation began to affect us. This was the desire to belong or be a part of some group or effort. If we were athletically inclined we tried to make the team, or perhaps we joined a debating or theatrical society.

The recognition motivation was temporarily replaced by a strong determination to support the common effort. Soon we realized that we could best help the group by developing ourselves and again the recognition motivation assumed its proper place in our advance to maturity.

EVERYONE DESIRES RECOGNITION

To satisfy both motivations our school made use of an age old idea. Bestowed on us was a device, an insignia or a letter which proclaimed that here is a person who has achieved the right to belong by his ability, skill, knowledge and perseverance. Throughout history men wore signs or devices, perhaps unaware of the underlying urge for recognition.

On leaving school and entering the business world we found the same motivations charting our courses. Perhaps they had now assumed different degrees of relative importance, but we still had them and one of the most important was the desire for recognition.

In our complex modern civilization we find a need for the rapid, safe and efficient transportation of persons and goods. The mule trains and stage coaches of yesterday have given place to rails, planes, trucks and busses. The trucks and busses use the same streets and highways as the public and must cooperate with the public to get the maximum safe and efficient use of these facilities.

AWARD SAFE DRIVERS

A wise employer of commercial vehicle drivers will call upon the basic human urges to help him develop his organization. Aside from the humanitarian consideration, it is economically unwise to have an unsafe operation. One effective means to encourage safe operation of trucks or busses is to recognize the driver who has a record of safety. This recognition will be a challenge to him to continue the safe record, and to other drivers to gain such recognition.

Some persons rely on monetary recognition of a safe driving record. I believe a sign or insignia is more effective. Money may be obtained in many ways but the sign or insignia sets the driver apart and gives him the recognition he values so highly. Such a device is the Safe Driver Award of the National Safety Council, the nation's highest award to the professional safe driver.

No award is effective unless it is bestowed with appropriate ceremony. Such ceremony re-impresses the recipient. But just as important it impresses others with the value and desirability of the award. I have known employers who mailed awards to their drivers or who passed them out like prizes out of a box of cereal. Such awards lost their meaning and value to the safe drivers and were no incentive to others.

In my experiences in the use of the National Safety Award, I found it is imperative to comply with the rules governing qualification. The award must be hard to get. That makes it more valuable. What a man fights for or works hard for, he values more. The award must be known as the sign of a man who knows how to do a good job and has done it.

Each year we have a series of Safe Driver Award dinners. These are regional dinners given at the times and places most convenient to the greatest number of award recipients. We select one of the better hotels or restaurants and choose the menu carefully to insure an attractive, interesting and satisfying meal. We avoid repetition of both menu and location so the drivers can look forward to a new experience each year.

COMMEND DRIVERS' SERVICE

With great care we avoid preaching to these men the benefits of safe driving. After all, these men know how to drive safely. They have proved it. We do, however, impress them with the value of the service they have rendered their community by the manner in which they have operated their trucks. This interpretation of their achievement is clearly illustrated by the speaker or speakers selected for the occasion. We always have as speaker someone prominent in the community. We have had a police chief, a mayor, a highway patrol commissioner, a judge and a senator. The fact that such persons will give up an evening to honor the safe drivers adds to the prestige of the driver and the award.

We publicize the award and the award dinners by newspaper and magazine articles. These articles are clipped and posted on our bulletin boards. Later they are reproduced in our company newspaper. Although this may appear to be repetitious, it is effective in keeping the occasion in our employees' mind for a long time. Sometimes we take pictures of the dinner and put these on the bulletin boards or in the company newspaper.

Our positive approach in building up the value and meaning of the Safe Driver Award has returned to us manifold the cost of the effort. The cost can not be evaluated in dollars nor can the returns. The returns in employee moral and in employee relations, although intangible, can nevertheless be recognized and cherished. Here are some examples of our drivers' feelings for the award which have been engendered by the sincere esteem our management has for it.

PRIDE IN DRIVER AWARD

One of our drivers had become ill and I visited him in his home. He expressed apprehension that his absence might prevent him from earning another Safe Driver Award. I assured him that it would just delay it a bit. A short time later I visited him in the hospital and this time his major worry was that he would miss his three year dinner.

It was apparent that he had little time left him and yet he had time to dwell upon this phase of his obligation to his fellow citizen—the obligation to drive safely. At the funeral the minister related this man's ideals and his pride in having won a National Safety Council Safe Driver Award. One of his last requests was that the award lapel pin be on his coat as he was returned to the earth.

The minister said that long after the physical part of this man was gone there would remain an indestructible monument—his service to his fellow man. This man's effort to drive his truck safely was encouraged and nourished by his knowledge that his achievement would be recognized.

Once while visiting the home of one of our drivers, I saw the 15 Year Expert Driver Certificate on the wall right behind the TV set in the living room. I suspect the TV lamp was placed exactly so it would illuminate the certificate. The driver told me he expected to replace the 15 year certificate with the 20 year certificate immediately after our next Safe Driver Award dinner.

When men take these things home with them and give them a place of such prominence, you know that pride in accomplishment and pride in recognition are supported by an intention to keep up the good effort.

The other powerful motivation is the urge to belong. This urge made its appearance among our drivers in an interesting manner. As it was directly associated with the Safe Driver Award, it is a reaction which will be duplicated whenever management has the same positive esteem for the award. Our president had just bestowed the last award and after a sincere message of thanks, returned the meeting to me for adjournment.

Before I had time to act, a driver stood up and asked for a few minutes. He stated that a number of them had been thinking about the fact that they had something of value in common—the Safe Driver Award, and that they felt that their combined know-how and combined efforts would be of benefit not only to our company but to the community as a whole.

EVERYONE WANTS TO BELONG

The enthusiastic response of the drivers present was matched by the enthusiasm of management and public officials present. Plans were made for organizational meetings and a new traffic safety group was born—Safe Drivers of America.

This is their resolution:

A. We, a group of Professional Commercial Vehicle Drivers, residing in California, who have proved that it is possible to drive such vehicles without accidents, observe that:

B. Whereas, our National Health and Safety depend upon the unrestricted and uninterrupted use of highways in the transportation of goods and persons, and;

C. Whereas much of these goods and many of these persons never reach their intended destinations because of traffic accidents, and;

D. Whereas these accidents take a toll of American life and wealth greater than that taken by war, and;

E. Whereas almost all of these accidents result from the personal failure of one or more drivers, and;

F. Whereas many of these failures stem from improper attitude, from lack of skill, or from ignorance, now therefore,

G. BE IT RESOLVED that, we shall create an organization of drivers of proved skill and ability to drive defensively and so to avoid traffic accidents.

To that end we pledge ourselves: 1. To continue to set a good example. 2. To discourage unsafe acts by other motorists. 3. To join with other Safe Drivers of America in the community for the prevention of automotive accidents.

I believe the individual and group reactions to the National Safety Council Safe Driver Award clearly illustrate what can be expected if we try to develop the position of the award in our safety program.

If we neglect the award, it is just another gadget. If we give it its proper place and make it a positive factor, it can be made to be our most important and effective tool.

THE POSITIVE APPROACH TO DRIVER PHYSICAL REQUIREMENTS

PHYSICAL FACTORS

by DR. EUGENE P. OWEN
president, Northwest Association of Occupational Physicians, Portland, Ore.

Prevention of motor vehicle accidents is a universal concern, accidents in general representing the major public health problem in the nation.

The public should be conditioned to accept more stringent qualifications for driving vehicles, such as those now accepted for flying planes or carrying a gun. Finding poor drivers and removing them from the highways is a major need.

In January 1956 the nation was shocked; headlines flared. A Santa Fe passenger train, on a curve, had left the track at 70 mph. The tragic results were 30 dead and 117 severely injured. The Interstate Commerce Commission reported the engineer was 61 years old and in the opinion of the examining physician, had suffered an epileptic seizure and was not conscious of his actions at the time.

In Johnstown, Pennsylvania in 1953, a truck and trailer loaded with steel bars collided head-on with a passenger bus that was just discharging its passengers. The truck was on the wrong side of the highway. The findings were that the truck driver was a diabetic and in insulin shock at the time of the accident.

PHYSICAL HAZARDS

These are just two of a number of serious accidents that have occurred in the transportation field and have resulted from a physical condition affecting the driver. They have this in common: an individual was relied upon to control a moving vehicle, but because of a physical condition he was rendered unfit for the task, thus the vehicle, weighing many tons, was released from conscious control and of course was capable of great destruction.

I am in no way criticizing the industry. I know the progressive steps that have been made in accident prevention. At Consolidated Freightways in 1948, the accident rate was 1.49 per 100,000 miles; in 1956 it was .51 per 100,000 miles. This has meant saving in life, a saving of many painful hours of suffering, also many dollars. In 1948 the cost at this company was one cent per mile and in 1956 it had dropped to .03 cent per mile.

I also realize that companies have devoted a greater part of their research to develop mechanical safety devices. By that I mean the size of wheels, the skidability of tires, and the braking surface of the brake-drums. All of these, of course, have been great accident reducing factors. But quoting Ernest Cox of the Interstate Commerce Commission:

"In truck accidents during the past year only about 14 per cent were due to mechanical failures and about 86 per cent to human failures."

NO SUBSTITUTE FOR DRIVERS

Our economy is geared to trucks. They are our life blood. They move over congested roads at high rates of speed, carrying 20,000 to 40,000 pounds of cargo day and night, in all kinds of weather. The operation of these vehicles requires a more alert and physically qualified man back of the wheel than in any other type of transportation. The railroad has a dead-man switch, and is operating upon a restricted right-of-way. The airplane pilot has dual controls with a co-pilot.

But the truck driver is alone, all by himself. He must then be in top physical condition at all times. In addition he has a great economic value to his employer. The cost of selecting and training of a driver is estimated at $4,925.00 at Consolidated Freightways.

In an attempt to control the drivers in interstate commerce, the Commission has formulated minimum regulations, they are

1. There must be no loss of foot, leg, hand or arm.
2. No mental, nervous, organic or functional disease can interfere with safe driving.
3. No loss of fingers, impairment of the foot, leg, fingers, hand or arm or other structural defects or limitations can interfere with safe driving.
4. There must be a visual acuity of at least 20/40 (Snellen) in each eye, either without glasses or corrected with glasses; the form field of vision in a horizontal meridian shall be not less than a total of 140 degrees; there shall be an ability to distinguish red, green and yellow colors.
5. The hearing shall not be less than 10-20 in the better ear without hearing aid.
6. There shall be no addiction to the use of narcotics or habit forming drugs, or the excessive use of alcoholic beverages.

Dr. Payne is to discuss the visual factors and Dr. Turrel the emotional or psychological factors. I will concentrate on the regulation: no mental, nervous, organic or functional disease that may affect safe driving. These are the physical factors affecting safe driving.

DANGEROUS PHYSICAL CONDITIONS

Now what are some of these? One of the most vital is vascular and by vascular I mean heart or circulatory diseases. Can or should a man be issued a certificate to drive who has had a heart attack or a coronary occlusion? These are often immediately fatal and if not, the occurrence of the next occlusion cannot be predicted. The United States Air Force, commercial and passenger airlines ground permanently all pilots who have had an occlusion.

At the Consolidated Freightways there has never been an accident due to a coronary occlusion. There have been some heart attacks but fortunately the driver realized he was ill and had pulled off the highway before death occurred. The margin of safety, however, far too close and in my opinion a certificate should never be issued to an individual with a history of a previous attack.

There are many other types of heart conditions that are dangerous because they will cause a sudden loss of consciousness; but if an adequate physical examination is done, they most certainly would be recognized for their danger.

BEWARE HIGH BLOOD PRESSURE

Another vascular condition is high blood pressure which may precipitate a stroke. Prior to the time a stroke occurs there have been many small hemorrhages in the brain. This has been demonstrated at autopsy, when many scars have been found in the brain tissue. I am wondering if some of the accidents reported in which a driver states that he blacked out could not have been due to one of these tiny hemorrhages that caused a momentary loss of consciousness, which, in turn, has been due to high blood pressure.

We realize that truck driving is a sedentary job and that obesity in truck drivers is perhaps higher than in other types of workers. Obesity often is accompained by an increase in blood pressure. This, then frequently leads to premature disability of the driver.

Now, believe it or not, the Interstate Commerce Commission regulations concerning blood pressure states merely "An individual having a blood pressure over 150 mm of mercury, systolic, shall have a urine test."

Another large group of diseases that are potentially dangerous are neurological conditions. Our interest in this group is because these conditions may produce abnormal muscular reaction.

About two months ago a driver, four miles from his terminal, and just at the beginning of his run, crashed into a bridge abutment. Apparently there were no known causes of the accident. The driver could not explain what had happened. However, electroencephalographic tracings showed an abnormal tracing consistent with epilepsy. Therefore, it is most likely this driver must have been having an epileptic seizure at the time of the accident.

The sclerosing diseases affecting the brain and spinal cord are almost uniformly disabling. Some of these are, Lou Gehrig's disease, multiple sclerosis and Parkinson's disease. These diseases are easily diagnosable and should be easily detected on examination. Because they may cause a lack of coordination, slowing of reflex action, momentary blindness and sudden loss of consciousness, anyone with one of these diseases should not be issued a certificate to drive.

Another group are the metabolic conditions, such as diabetes and its disturbances. In the Johnstown, Pennsylvania accident the taking of insulin by a diabetic precipitated a loss of consciousness. But a diabetic without insulin is apt to have major problems. Diabetics soon lose depth perception and will go into a coma if their diabetis is not controlled.

As Dr. Melvin Newquist, medical director, Texas Company, in a recent article concerning drivers, said: "At first it would seem desirable for the physician to individualize each case of the diabetic driver; this however, is not advisable inasmuch as the physician, the diabetic, or the employer, does not always have control of conditions which would safeguard the diabetic driver against either drowsiness or coma, or insulin shock. Long hours, irregular meals, emergencies, or breakdowns, wherein food or insulin may not be obtained, are some of the complicating factors beyond control of the certifying physician."

DANGEROUS DRUG EFFECTS

Another group of conditions that should be discussed are those due to drugs. The sleep-resisting drugs called amphetamines are by far the most dangerous. They have a two-fold use, that of keeping one awake and to dull the appetite. Their use by truck drivers is common. These drugs often produce hallucination, visions of on-coming vehicles, animals in the road, strange objects or peculiar twists in the highway. Accidents from the use of these drugs are assuming serious proportions.

Tranquilizing drugs! Two hundred million dollars worth were sold during the last year. They are sleep producers. The sheriff of Imperial County, California, cited the fact that seven fatal accidents during 1956 could be traced to these two types of drugs.

Other physiological conditions are malignancies, anemias, and the leukemias. A case in point: Driver C had had most of his stomach removed because of cancer. Six months later he was recertified to drive. One night on the highway between Portland and Spokane, Washington, his rig was seen weaving from one side of the highway to the other. A driver supervisor who fortunately happened to be following him was able to stop the rig.

The driver was in a partial coma. The coma was due to complete debility from the lack of proper digestive function and the assimilation of food. Of course this driver is now on another type of job, but it does illustrate that more thorough and detailed study should be given to these men prior to the time a certificate is issued.

AMPUTEES—BAD RISK

With relation to amputations, there should be no necessity to discuss these conditions as it is evident that one with an amputated extremity should not be issued a driver's certificate. At a meeting in Portland, Oregon of an amputation clinic a rehabilitated amputee, his leg having been removed at the hip, was on his first job since his injury, and to my amazement his job was to "drive a ten-ton truck." This had been arranged for him by the rehabilitation department of the State Industrial Accident Commission.

The best example of the loss of function of an extremity or a portion thereof is the end result of poliomyelitis. Many of these persons have a real impairment and in most cases should not be allowed to drive.

In an attempt to track down the causes of driver accidents we at the Consolidated Freightways have compiled the results of the last 155 accidents; 27 per cent of these accidents were caused by the less-than-five-year driver. The larger percentage of accidents in all ages occurred in the first four hours of driving, regardless of the time of day or of traffic hazards. We are in the process now of reviewing the medical histories of these drivers, and one of the salient facts worth mentioning is a possible relationship to diet.

I am sure that this type of careful scrutiny of accidents by the Medical Department has been a primary factor in savings .07 cent per mile at Consolidated Freightways.

Here are some positive approaches you should take to see that drivers are in the best physical condition at all times and that the physical factors affecting safe driving are safeguarded.

ORGANIZE MEDICAL PROGRAM

● Some medical program should be started by your company. Many companies are now large enough to have full time medical directors, heading a medical section. Through this department pre-employment physical examinations should be evaluated to determine whether the drivers are meeting adequate standards for safe driving.

Re-examination records should be kept and evaluated over the years, as we now know that many drivers are getting into the upper-age level in which degenerative processes may rapidly develop. These re-examinations should be thoroughly scanned for disease trends and corrective measures instituted.

Again quoting Ernest Cox, "No one would inspect a vehicle for the sole purpose of determining whether or not it was roadworthy and upon the first unfavorable finding, junk the entire rig. Rather, such an inspection is expected to detect unusual wear, defects, and cracks in their early stages, so that corrective measures may be taken."

Just recently the safety director of a major motor carrier of the mid-west presented himself for examination to 11 local physicians who were retained by his company for driver examinations. He was sadly disappointed by the results of five of his examinations. As he said: "Particularly were the physicians uniformed as to I.C.C. regulations and were not aware of their vital importance in this commercial field." A medical department should assist in the selection and education of physicians doing these examinations.

DOCTOR ON BOARDS

● On every accident board there should be a well-trained physician, and a thorough study should be made of the driver who has had the accident to determine the possibility of human failure. A case in illustration. About two years ago one of our drivers applied for a transfer from Portland, and he was assigned to a run out of Chicago. In two months he was back on the coast, and presented himself at my office complaining of severe stomach distress.

Adequate examination disclosed no disease. A few days later he rolled a truck and trailer on a curve. At the accident hearing he maintained he had blanked out. The real cause of this human failure was a psychotic wife, who threatened to kill herself and their baby. The answer in this case was simple, and we placed the wife under psychiatric care. Happily the matter was straightened out and he is now an adequate driver.

The Interstate Commerce Commission requires that a driver shall be examined once every 36 months, but many conditions may develop the day following an examination.

RE-EXAMINE DRIVERS

● I suggest that all drivers should be re-examined after any illness requiring ten days away from duty, or following any major accident. The results of this examination should be kept in his medical file, not the personnel file, by your medical section, and from these files adequate statistical information can be developed of the relationship of disease to accidents.

The Industrial Medical Association and the Industrial Council of the American Medical Association have an active committee now at work on driver requirements and it has been surprising how little information has been obtained from companies concerning the effects of disease and accidents. Their report will be released in the near future.

The I.C.C. is attempting to enforce its driver regulations but because companies have failed to evaluate accident records in the light of human failure, they have little or no basis upon which to suggest that additional recommendations be included in their driver requirements.

Until physicians have more detailed positive regulations, in which disqualifying defects and diseases are listed, the Commission's regulations will be subject to individual interpretations, and because of these interpretations, we are very likely to have drivers on our highways with physical impairments that are apt to cause accidents.▲

VISUAL FACTORS

by DR. BRITTAIN F. PAYNE
clinical professor of Ophthalmology, New York University Post-Graduate Medical School, New York City

Poor eyesight may be the basic cause of the awful carnage from automobile accidents occurring every day in our country. Far too many automobile drivers with defective vision are endangering the lives of others and themselves on the roads at the present time. Many drivers see well enough, but they fail to use judgement or act in accordance with what they perceive. This is a psycho-physical problem and not related to eyesight.

It matters not, whether one is an experienced commercial driver in a deluxe bus or an old-individualist farmer with a model "T" car, visual requirements should be definite and fixed. At present, there is a tendency to require better vision in commercial drivers. The day will come when driver requirements will be the same for the individual as for the commercial drivers. The people will demand this equalization to spare the lives of their families and themselves. It is just as important for the average driver to have good vision as the special operator of highly specialized machines.

CONGRESS BILL

Automobile fatalities have created such a problem that Senate Majority leader, Lyndon Johnson of Texas, introduced a bill in Congress to investigate and report on necessary measures for correction. The bill, S.1292, which would establish an Automobile and Highway Safety Division within the Department of Health, Education, and Welfare is as follows:

"(1) collect from public and private sources information on the causes of automobile accidents and possible preventative measures to eliminate such accidents and to reduce the seriousness of injuries caused by such accidents (including the design of automobiles and highways) and support and aid research to determine such information.

(2) evaluate and disseminate such information in such manner as may best promote safety on the highways and the reduction of the automobile accident death toll; and

(3) prepare and establish, on the basis of such information and in cooperation with other Federal agencies, with state and local governments, and with industries involved, programs to promote safety on the highways and to reduce the automobile accident death toll."

This measure was referred to the Committee on Labor and Public Welfare, without action being taken. Such an investigation would undoubtedly call for a visual evaluation of operators of motor vehicles. Perhaps some correlation of vision and accidents could be determined. At the present time, there are no adequate figures but Dr. DuPont Guerry III, a medical authority, has stated that between three and five per cent of the accidents are caused by faulty vision. He further reports that visual acuity requirements range from 20/70 to 20/30 in 46 states and no tests are required in two states.

My thoughts on the importance of vision in driving were stated most ably by Mr. S. E. Nelson, Supt. of Safety, Burlington Truck Lines, Galesburg, Ill., in his excellent argument "Against Road Patrolling" at the 44th Annual Safety Congress, October 1956, in Chicago. His statement in the 1952 Transactions, Vol. 18, p. 12 were as follows:

PORTABLE CLINIC TESTS VISION

"We are currently engaged in a program of testing drivers in our fleet on a portable clinic, which tests color vision, visual acuity, depth perception, field of vision and reaction time. During the first week of this testing we found a driver who had not had a physical since July 11, 1955, and, therefore, was not due for another one under I.C.C. rules until July of 1958. This man's eyes had failed during the past few months to the extent that he could not see well enough to drive safely. When we con-

fronted him with the results of our tests, he readily admitted that he could not get around to spending the amount of money required for a pair of glasses. He agreed to have his eyes tested by a doctor and received a new pair of glasses.

"Today that man is a safe and happier employee, and no doubt is probably grateful for the testing job that we did. I might add that we could have followed this man on the highway for miles and probably wouldn't have the faintest idea that his vision was poor. Yet, he could have been involved in an accident because of his failure to see a hazard or danger. My point is this: The money spent in testing this man was a better investment than the same amount of money spent to buy an observation report of his activities."

Mr. Nelson's experience with this employee is fairly common with those of us who examine eyes day after day.

Unfortunately, the vision of some operators cannot be improved by glasses alone.

Recently, a trusted personal chauffeur of an official of a great corporation was sent to me for relief of failing eyesight. The examination showed beginning blindness from extensive retinal hemorrhages. Further tests showed that he had unsuspected diabetes mellitus and his sight was so affected that it could not be restored. The employer had not insisted on a pre-employment examination of his personal driver, when his company insisted on annual medical examinations of all employees, including the official himself.

RECOMMENDS 20/30 VISION

The ability to see is recognized as the most important factor in driving an automobile of any type. Responsible bus line and trucking firms insist on strict visual requirements. Dr. Hedwig Kuhn, a recognized authority on vision in industry said that some firms follow Air Force regulations for pilots closely when selecting driving personnel for commercial purposes. Such requirements exceed those suggested by the XIII International Congress of Ophthalmology and the recommendation made at a meeting sponsored by the American Medical Association at New York University Medical College, May 23, 1956.

Although I participated in this meeting with Doctors Kuhn, Berens and others and was in agreement with the suggested recommendation of correctable vision in each eye of 20/30, (if glasses required for 20/30 they should be unbreakable or an extra pair should be available) it is my feeling now that better correctable vision of 20/20 for each eye should be required. Just what disposition is to be made of vision in relation to motion and moving objects will have to be evaluated in the laboratory and on the highways themselves.

The above is concerned with vision for distance. The ability to shift the focus from the road to the instrument panel is the effort of accommodation. It is taken for granted that human engineering has taken care of the visibility of the instrument panel. Older farsighted operators frequently used weak bifocal lenses to see the speedometer, oil gauge, and other instruments. Although, not continuously required for drivers licenses, it should be noted on employment and reexaminations. Some embarrassment might follow if the driver could not see the indicator for "engine heating." Eye glasses might help the lack of accommodation.

DOUBLE VISION DANGEROUS

"Seeing double" or diplopia is a serious condition which may cause an automobile crash, head-on collision and side-swiping. Double vision indicates lack of muscular coordination, either from fatigue, injury or disease, and should disqualify a person from any type of driving. A test for double vision should be included in the examination.

A satisfactory test for depth perception, or the ability to locate still and moving objects in space, in daylight and partial darkness should be devised and used. It might be well to investigate road hypnosis and the effect of twilight on this faculty or vice versa. Misjudging distance in passing may be the direct result of poor depth perception. A test for stereoscopic vision will give some information at least.

Color vision or the ability to recognize colored traffic lights, in dazzling sun, fog and at night is necessary. At least one out of every 10 males and one out of 1,000 females have some deficiency in color appreciation. A simple lantern-type test for red, yellow and green would be satisfactory for practical testing. My own experience with 25 per cent color deficiency while driving into the sun makes it almost impossible

to tell when the lights turn green. A heavy fog confuses my color appreciation quite seriously. Therefore, total "colorblindness," whether congenital or acquired from tobacco and alcohol or disease, should be a disqualifying factor.

Dark adaptation and recovery of vision from glaring headlights are important factors in safe driving. The tests are rather complicated, but give considerable information of value. Ingestion of vitamin A will help dark adaptation which tends to diminish with age and is definitely lowered by alcohol, tobacco, and carbon monoxide fumes.

REQUIRE 140 DEGREE SIDE VISION

Peripheral vision or side vision is a necessary faculty in safe driving. Such diseases as pigmentation or separation of the retina, increased pressure within the eyeball, scarring and hemorrhages will cause serious loss of side vision. If the driver is progressing through a narrow tunnel of vision, it is impossible to see many objects overtaking him or approaching from either side. A crash may result because the affected driver may not see the object in time.

The normal field of vision for the two eyes in the horizontal plane is at least 180 degrees and less than 140 degrees should disqualify for driving. When the eyes are tested separately the horizontal extent of the field should not be less than 70 degrees and if any meridian shows contraction to 20 degrees the applicant should be disqualified. He should be limited to daylight driving because he is actually driving through a narrow tunnel of sight.

Dr. Harold Brandaleone, Medical Director of the Third Avenue Transit System and the United Parcel Service of New York City, uses a profile classification system similar to that of the United States Air Force. Class 1 represents the highest and class 4 the lowest division in this evaluation. The use of narcotics, sedatives, antihistamines, dexedrine and other stimulants in excess as well as chronic use of alcohol will place the applicant in the fourth group. The visual standards are similar to the above discussion.

The recommendations of the Committee on Visual Standards from the meeting on Medical Aspects of Motor Vehicle Accident Prevention at the New York University-Bellevue Medical Center 23 May 1956 are worthwhile. Although minimal in many aspects, adoption of these recommendations may save many lives on our highways. They are as follows:

"We recommend that the usual three main categories of public transportation, interstate commerce, and private care operators be changed so as to combine public transportation and interstate commerce personnel into one group.

"I. The following are our recommendation for the minimal visual standards for the first group (public transportation and commercial operators):

A. A correctable visual acuity to 20/30 Snellen in each eye. If corrective glasses are required for obtaining visual acuity of 20/30, unbreakable glasses or an extra pair of glasses should be mandatory.

B. Form fields of 70 degrees in the horizontal meridian with each eye and 140 degrees in the horizontal meridian with both eyes.

C. No requirements for color vision indicated. However, it is recommended that the shape, size, position, and color of traffic lights be standardized.

D. No requirement for stereopsis (depth perception) indicated or recommended.

E. No test for light sense recommended but the presence of night blindness should be excluded by direct question.

F. Mandatory yearly examinations under the supervision of a qualified eye examiner.

FOR NON-COMMERCIAL DRIVERS

II. The following are recommended as the minimal requirements for private car operators:

A. A correctable visual acuity to 20/40 Snellen in one (the better) eye.

B. Form field of 70 degrees in the horizontal meridian in each eye or 140 degrees in the horizontal meridian in one eye.

C. Re-examination of eyes every three years.

III. The following recommendations are considered pertinent to the board role of vision in safe motor vehicle operation:

A. There is need for greater recogni-

tion and correction of present inequalities in related state laws.

B. Further consideration must be given to such mechanical factors as the following:

1. Vehicle design (windshield bars, wipers, blind spots, etc.).
2. Lowered visibility in use of tinted windshield and/or use of tinted glasses for night driving.
3. Reflections inside the car (chrome, etc.).
4. Rear window and mirrors.
5. Visibility of moving objects on road or roadside.

C. Consideration should be given to the advisability of requiring parties involved in a serious accident to undergo more extensive medical (including visual) and mental examinations under duly qualified examiners to evaluate their fitness to continue to drive.

D. No specific recommendations are made at the present time in regard to color vision, stereopsis, and light-sense because of the lack of uniformly acceptable tests.

E. Consideration should be given to further research concerning the relation between the causes of accidents and depth perception (stereoscopic vision), muscle balance, and particularly visual and mental reaction time.

F. It is recommended that every commissioner of motor vehicles have available qualified eye consultants for consideration of all visual problems, including limited license and hardship cases.

G. It is recommended that the licenses of all individuals receiving aid for the blind be revoked.

Great emphasis must be placed on further evaluation of total environmental factors in accidents and on scientific determination of the perception and proficiency of drivers."

My personal feeling is that far too many automobile drivers with defective vision, are endangering the lives of others and themselves on the roads and highways today. Persons with one eye or defective vision in one eye should be given limited driving licenses.

Drivers with poor color appreciation should be examined carefully and if they are unable to distinguish red and green lights their licenses should be limited to daylight driving only. If the fields of vision are diminished to less than 20 degrees in any meridian, the applicant should be limited to daylight driving.

Applicants with poor depth perception, the inability to locate objects in space, should receive special attention and perhaps be disqualified for night driving.

EMOTIONAL FACTORS

by DR. EUGENE S. TURRELL

director, Psychiatric Div., Denver General Hospital, Denver, Colo.

Injuries and deaths due to accidents constitute one of the major health problems of this country. As in the case of any health hazard, a knowledge of etiology is of paramount importance in developing adequate preventive and treatment measures.

The task of investigating a phenomenon as inherently complex and as multi-determined as motor vehicle accidents demands a many-sided approach. Among the types of accident research currently in progress, they are:

1. Studies of factors of automotive design and safety features
2. Investigations of the relation of highway design and traffic characteristics to accident frequency
3. Research on safety regulations and law enforcement
4. Studies of the relation of physical health and physiological functioning to accident susceptibility

Added to these, are studies of emotional factors in relation to accident frequency and

investigation of the effects of psychotherapy on driver behavior. Though this paper will focus on emotional factors, it must be emphasized that these influences operate within the previously noted framework of multiple causality.

EMOTIONAL CAUSES OF ACCIDENTS

Interest in emotional factors in accidents gained its impetus when Marbe, in 1926, proved statistically that the person who has one accident is more likely to have another than the person who never had one. In 1934, Alexander Adler suggested that an unknown factor in human personality was responsible for repetition of injuries in these persons prone to accidents.

Additional work of Dunbar, Menninger, Tilman, McFarland, and others further demonstrated this relationship between personality factors and accidents. However, what might be considered a single influence in causality, turns out to have multiple facets. In other words, there is not a single, isolated emotional influence related to accidents but rather a multiple of interrelated emotional factors—thus further complicating our already complex system of multiple causality.

Perhaps I could illustrate this by brief case histories:

● One young man in his early twenties had five accidents during a three-year period. During this time, his father had been ill and our patient had to do all of father's work around the farm. The patient had resented this, and the five accidents had all occurred while driving the father's car, with damage only to the car.

● Another patient had an accident, when he ignored a stop sign and a truck ran into the right side of his car. His wife was sitting on the right side holding their baby. Fortunately, no one was injured. However, a careful history revealed that this accident had occurred following an argument between the patient and his wife—an argument which the patient felt that he had lost.

● Another patient had six accidents in a two-year period. In all of these, the patient had been run into and complained that he was not at fault. He made it appear as though he had been victimized in each circumstance and was thus able to seek sympathy in his role as the victim. However, the number of accidents of this nature would indicate that he had had something to do with setting the stage. Further evaluation revealed underlying suicidal drives.

Though the settings were superficially different in each of these cases, each involved hostile and aggressive impulses. The difference appears in the handling of these impulses. In other cases, sexual impulses or guilt reactions to sexual impulses may be involved. Menninger, in his book "Man Against Himself," classifies the accident motives as follows:

1. As a means of atonement of guilt
2. As a permission for further indulgence
3. As a result of rage

But this leads us a little nearer the solution of the accident problem, since much of human behavior is motivated by sexual and aggressive impulses.

ACCIDENTS REVEAL HOSTILITY

During our studies at the University of Colorado, we had the impression that a measure of hostile, angry feelings would give some indication of accident susceptibility. Such feelings generally arise from frustration of normal aggressive drives and, psychodynamically, are found to stem from early frustrations. We used the Rorschach test as an indicator of these impulses, or derivatives of impulses, and intensively studied a group of accident and non-accident subjects.

These tests were then interpreted by skilled psychologists who did not know into which group each of the subjects belonged. The subjects were divided into two groups on the basis of the degree of exhibition of such impulses, with the startling result that each group was composed of half accident and half non-accident subjects. We could not have come closer to a chance phenomenon had we tried.

HANDLING AGGRESSION

On the basis of this study, we concluded that accident potential is not related to the degree to which individuals have such impulses, but rather to the methods by which they handle or cope with these impulses. Incomplete results on further analysis of our data continues to support this conclusion. The question then becomes: having experi-

enced such feelings or impulses, how does the individual control his behavior?

This view agrees with other findings of our study—that accident and non-accident drivers are best differentiated by a particular test, the Allport-Vernon scale of values.

This is a test which rates individuals as to how well they agree or disagree with different value systems. Those dealing with aesthetic, theoretical, and religious concerns proved highly discriminatory on both the original and cross validation samples in our study. The remaining scales (economic, political and social) did not.

The non-accident subjects were more oriented toward religious values and less toward aesthetic and theoretical values than the high accident subjects. The mean scores of a middle accident group fell in a middle range between the high and non-accident subjects.

DRIVING REFLECTS LIVING

Such a differentiation would further indicate the importance of controls over impulses, since value systems are probably a reflection of behavior in response to varying impulses. These findings are in agreement with Tilman's studies and his classic statement that "a man drives as he lives."

Dunbar in her studies of accident proneness also emphasizes the behavioral aspects of the accident subjects. She describes the accident-susceptible person as a decisive, psuedo-impulsive person with unresolved conflicts with authority; and makes the interesting observation that accident proneness seems to occur when delinquent behavior is no longer a successful mechanism for handling such conflicts.

Each of these studies would indicate, then, that social adaptation and value systems of the individual will give some clues about his safety as a driver. If these findings are valid, we are then confronted with the question: What components of social adaptation and of value systems will best discriminate between the accident susceptible and the non-accident driver?

Our findings with the Allport-Vernon scale of values need to be validated on a larger sample and it is hoped that commercial firms might use this test and compare the results with the accident records of their drivers. In addition, both Tillman's and Dunbar's studies give some clues concerning features of the social adaptation which might be utilized and compared with accident records of the drivers.

A history of conflict with authority and delinquent or psychopathic behavior, especially if these behavior patterns have changed, may be good indicators of accident susceptibility. It should be emphasized, however, that the use of such indicators should be approached as research studies, since the validity of these observations requires further confirmation.

In the practical problem of selection of commercial drivers, there is an additional complicating factor—the motivation for this particular type of employment. The motivation should also be evaluated to determine whether or not this contributes to or subtracts from the personality features associated with accident susceptibility.

At this point, I should like to digress for a moment and discuss the relationship of psychoses and neuroses to accident susceptibility. I have never seen any valid studies which would indicate that neurotic or psychotic patients are more prone to accidents than other groups.

In addition, my own clinical experience would indicate that patients with certain types of illnesses, who come to the attention of psychiatrists, may have less than average susceptibility to accidents. Therefore, I would caution against considering a person accident prone because of manifest psychiatric symptomatology.

INTELLIGENCE INFLUENCES

The level of intelligence is another factor frequently implicated in accident behavior. Though I do not have specific references, there are indications that, in routine jobs of driving, highly intelligent individuals have more accidents. It has been implied that the discrepancy between intellectual capabilities and the demands of the job leads to boredom which in turn leads to accidents.

However, it is equally valid to assume that such accidents are the result of frustrated ambitions, which could reasonably have been achieved, had such highly intelligent individuals been able to properly channelize their aggressive drives.

It seems reasonable to assume that, at the other end of the scale, low intelligence would interfere with ability to master the complexities of driving and would therefore be associated with increased frequency of accidents. This is undoubtedly a factor at some level of intellectual deficiency but further data is needed to determine the level at which this becomes a factor.

To this point, our discussion may have led to the impression that personality problems are static and are amenable to single analysis from which we can predict driving behavior. This may be the case in a small group of frequent repeaters, but it is far from the fact in the majority of individuals who have accidents. As in the case of the young man who had five accidents with his father's car, he ceased to have accidents when his father got well and he, the subject of our study, was no longer required to carry on all of father's duties.

CAN PREDICT POTENTIALS

Probably most accidents are experienced by individuals during periods of stress with accident susceptibility subsiding as the stress is alleviated. However, basic value systems and behavioral mechanisms for handling such conflicts may be subjected to evaluation: thus indicating the potentiality of accidents if the individual does meet particular stressful situations.

Now, assume for a moment that we could be completely successful in the selection of drivers who would not have accidents. Dunbar reports on one commercial firm who transferred susceptible accident drivers to other jobs within the company, only to find that they continued their accident behavior by having other types of industrial accidents.

If all industries could select accident-free personnel, manpower resources would not be adequate from which to choose. Therefore, in addition to evaluation procedures, we will need to develop preventive measures to help certain individuals overcome their accident susceptibility. We need further research in education, counseling, incentives, and psychotherapy as useful measures in the field of accident prevention.

HELP SUSCEPTIBLE WORKERS

It might also be of value to explore the possibility of substitute aggressions. The noted physiologist, Dr. Walter B. Cannon, pointed out that the physiological mechanisms for our aggressive behavior stem from the time that man lived a more primitive existence and needed such defenses. Though modern society does not require such primitive aggressions, the mechanisms still exist and still react.

Dr. Cannon proposed a program of substitutes, such as competitive sports, as a means of discharge of these aggressions. I recognize that many industries have programs of sports and recreation but do not know that such programs involve a large percentage of employees, nor that the effects of such programs upon accident rates have been evaluated.

I should like to emphasize the need for additional research regarding factors in causality as well as in prevention of accidents. Much of this can be done with properly controlled studies in the field of commercial driving and I would encourage the increased development of such programs of investigation.

PANEL FORUM ON POSITIVE DRIVER TESTING

by A. E. NICHOLS
safety director, Consolidated Freightways, Inc., Portland, Ore.

Medical Panel: DR. EUGENE P. OWEN, DR. BRITTAIN F. PAYNE, DR. EUGENE S. TURRELL

Group Interviewers: DR. HAROLD BRANDALEONE, medical director, United Parcel Service; assistant clinical professor of medicine, New York University, College of Medicine, New York city; E. G. COX, chief, section of Motor Carrier Safety, Bureau of Motors Carriers, Interstate Commerce Commission, Washington, D. C.; J. P. HIGHTOWER, director, transportation and safety, The Greyhound corp., Chicago, Ill.

Nichols: Starting with the interviewers at my left. Mr. Cox, do you have a question?

Cox: Dr. Payne, you advanced the theory that far too many automobile drivers are driving with defective vision and are endangering their lives as well as the lives of other users of the road. Do you know this to be so or do you assume it?

Payne: I assume it.

Cox: How are we ever going to approach the problem if we are going to have to rest at this point without ever running down a positive finding in the situation and is such an eventuality possible in your judgment?

Payne: Yes, I think it's possible. All you have to do is to refer to the eye examination record. If these requirements are stated and duly recorded they may be associated with the accident. If a driver should see double, as he might through the curved windshield or if his vision is such that his eyes do not focus properly and he sees double it is reasonable to assume that that accident was caused by trouble with his vision. Frankly, I do not know, it's up to the safety engineers to figure out how they would associate this visual difficulty with the accident. Things happen so rapidly, with the emphasis on speed and power that you hardly have time to associate one cause with another, but it is only reasonable to suspect that some accidents do occur from blackouts or from poor vision.

Brandaleone: Mr. Chairman, I would like to explain that the problem of motor vehicle accidents requires an educational program not only for the public but for physicians. National medical committees are trying to educate the physician about his important role in motor vehicle accident prevention. There is a committee on standards for motor vehicle drivers of the Industrial Medical Association and a committee on medical aspects of motor vehicle injuries and deaths of the American Medical Association.

EDUCATING PHYSICIANS

There is also a Committee of Congress that is investigating motor vehicle accidents. The committees are working almost full time to establish medical criteria that can be presented to the physician and everyone else interested in this problem. These criteria will assist in determining who should be granted a license to drive.

The industrial physician can supervise the drivers under his jurisdiction and observe and study them. The Committee of the Industrial Medical Association is trying to collect data, through questionnaires on the relationship of various physical or organic diseases associated with accidents. As soon as this data is collected the results will be published.

The American Medical Association Committee is working on a booklet that will be sent to physicians who will make it available to his patients. This committee is also preparing two other books. One book will contain the criteria for licensing and will be available to all police and motor vehicle licensing bureaus. The other will be written for doctors to assist them in deciding who is capable of driving. This is a tremendous project and requires a great deal of time.

The Interstate Commerce Commission requires assistance in establishing further criteria. At the present time their criteria are general. Their present standards state that if a person is not qualified to drive, he shouldn't. But they do not state specifically what that means. It is felt that more specific standards should be required.

Three papers give specific criteria for motor vehicle drivers. One paper is called "The Physical Standards for Vehicle Operators" it was published in *Industrial Medicine and Surgery*, in January, 1956. Another paper "Recommendations for Medical Standards for Motor Vehicle Drivers" was published in *Industrial Medicine and Surgery* in January, 1957, by the Committee of the Industrial Medical Association. The third paper presents results of the symposium at New York University called "The Medical Aspects of Motor Vehicle Safety" which was published in the *New York State Journal of Medicine*, December, 1956.

Basically, everyone agrees that rigid rules are necessary to stop the tremendous loss of life that occurs on the highway. At the present time the rules are not rigid enough. The Industrial Medical Association Committee is studying the results of a questionnaire to determine in industry the relationship between coronary occlusion and accidents.

HYPERTENSION HAZARDS

Someone asked about hypertension. At what level is it dangerous to drive? This depends on individual evaluation—and the answer depends on the complications of hypertension and the condition of the heart and blood vessels. I would disqualify a driver for hypertension when it reached somewhere between 180 and 190 systolic and 100 diastolic. Some doctors may have different ideas. They may be more lenient or more rigid.

Dr. Owen mentioned something about drivers being obese and having more coronary disease. Recently I had the privilege of spending two days with Dr. Leslie Norman in New York. He is the medical director of the London Transport. He has 40,000 drivers under his jurisdiction. He studied bus drivers and found that there was a much higher percentage of drivers as compared to conductors who were overweight and had coronary disease.

I believe we are all aware of the importance of neurological problems. Persons with convulsive disorders should not be allowed to drive.

We will allow a driver in our company to drive if he has diabetes but does not take insulin, provided he checks with us frequently. However, there is always a possibility that he may be taking insulin without our knowledge. If the person is taking insulin we do not want him to drive under any circumstances. There is a new drug in the treatment of diabetes, orinase, a tablet, which is taken by mouth. This drug is effective in mild older diabetics. Persons taking orinase do not develop the same type of hypoglycemia that occurs with insulin. Recently in a discussion with a physician from the Joslin Clinic in Boston, I learned of a case where after two days of orinase medication the patient went into a coma and died. So you see, even with orinase, unconsciousness occurs in some patients.

The effect of drugs on driving is another important problem for discussion. Everyone must remember that the drugs sold at the drug stores for the common cold contain antihistamines. There is nothing that makes some people sleepier than antihistamines. There is no question that the amphetamines are stimulating and will keep people awake. Many people expect these drugs to work in spite of overwhelming fatigue and when they don't an accident occurs.

Tranquilizers are wonderful drugs but I think that everyone should try them out before they drive. Some people become very sleepy after taking some tranquilizers. Other are not affected by these drugs.

COLOR TESTING

Hightower: I have heard the repeated reference to the three colors associated with traffic signals and I would like to ask Dr. Payne whether the minimum requirement for commercial drivers is sufficient.

Payne: I'm not too sure it is sufficient. From the viewpoint of the aviation it is not.

You have to pass at least 75 per cent of the test plates for color appreciation or the equivalent thereof. I have difficulty with colors especially if it's foggy or raining or if I'm driving into the sun. With the sun striking the traffic signals one may have trouble distinguishing whether they were red, green or yellow. If the traffic movement gives no indication that the lights have changed a person might run through the lights innocently.

Nichols: Then, Dr. Payne, you would change your opinion from the symposium in New York and you think that the color *tests are very essential to driver* requirements?

Payne: I have changed my mind.

Owen: May I discuss that just a second? We find that there are more than just the traffic signals that have to be discussed in color vision. Many drivers, especially over the road drivers who travel through many cities, are liable to find signals with the red where the green belongs and vice versa. It would be impossible for him to memorize all the signals that he meets. Another thing when he is approaching curves, especially into an area where there is shade, he uses the shading and the different colors of green foliage as a tip-off such as a ditch, a ravine or to distinguish the different levels in the ground, etc. Therefore, color association at curves is important.

One thing that we find is that most people who see orange generally call it red. The railroads, as you know, have a big orange light for a caution light. We have found that accidents have occurred when the individual seeing the light thinks it's red and has stopped and the person *following him crashes into the rear end* of his vehicle. We therefore feel that color vision has been an extremely important part of driver requirements and we are not accepting drivers who are color blind.

Hightower: The Greyhound Corporation has been using the Ishara Test and your comments strengthen my own belief in its importance.

Cox: Dr. Owen, you and Dr. Brandaleone both made reference to the fact that the ICC standard, or requirements on which commercial drivers are either certified to drive or are not, use generalized terms, "likely to interfere with safe driving." Now I would like to learn from you and the other doctors here whether it is a practical thing for those regulations to be worded to define specifically conditions which would disqualify.

MAKE STANDARDS SPECIFIC

You have no idea of the controversial problems presented to us constantly because the driver's own family physician says that he's all right to drive. Maybe he has diabetes but he's under good control or he has *epilepsy* but it is petit-mal. Besides that he hasn't had a seizure for two years. If we are to reduce to a government regulation (unless there is some special waiver arrangement such as the Civil Aeronautics uses) the regulations could, and should, be worded to exclude conditions such as diabetes, epilepsy and so on?

Owen: This is one of the most important things we want to do today and that is putting the positives and the specifics in this regulation. Let me illustrate that I review all of the physical examinations of drivers for Consolidated Freightways such as placement and annual physical tests.

I find that a certain per cent of those drivers should not be issued certificates by the physicians, even our own physicians. We find that a greater percentage of non-qualified drivers come to me with a certificate from their own physician.

As an illustration, we have the famous Green case in which the man has diabetes and is taking insulin and has certificates issued by five physicians. He is on 40 units of insulin a day. If we place ourselves in the position of this man's family physician this driver must have a means of livelihood. The physician knows the family and their dependency upon him to earn a living. He has a job to take care of that family and he is going to see that the man maintains his job. Of course, he's going to certify that driver regardless of whether he's a diabetic, or not.

In fact, there is a lack of appreciation of the situation among many doctors. We have one man that has a Jacksonian epilepsy following an injury and goes into a seizure at times. The head of the neurological department of *our own* medical school wrote a letter to this driver's union and said certainly he's able to drive a truck. We must have this whole problem spelled out in ABC's. A diabetic taking insulin shall not drive! An epileptic whether he be on control or not, shall not drive! Everything else must be spelled out so that we do not have these individual interpretations and the arbitrations that go with them following that particular type of a thing.

Brandaleone: I would like to emphasize the remarks of Dr. Owen. We, who see these things know and understand the seriousness of the whole situation. We must realize that the private physician is in a difficult position. He must protect his patient and help him as much as possible. There are some physicians who perform 60 I.C.C. examinations in an hour. He just has time to fill out the forms and does not do the examination at all. We have compared our own reports with such examinations and frequently find gross errors. Examinations done improperly are of no value and may permit an unqualified person to drive.

Dr. Turrell in his remarks said it was not necessary for a neurotic or a psychotic to be more accident prone than anyone else. I don't agree with that at all. It is almost an individual problem. There may be neurotics or psychotics that may not be accident prone, but many of them may be dangerous drivers. He said earlier in his presentation that the most important aspects of the psychological problem is the hostile or sexual reactions of a person. Does not the neurotic have a distorted picture of his hostile and sexual responses?

NEUROTIC OPERATIONS

Turrell: I can only answer from the standpoint of having examined and evaluated 200 servicemen that fit into the two categories of accident and non-accident people. There were none of the accident people who had serious overt emotional illness. Primarily the neurotic problems fell into the group of people who had no accidents. With some exceptions and as I pointed out, there are certain obvious psychoses during which it may be dangerous for the person to be at large. I would assume that some accident susceptible persons come in this category and should be put into a hospital with or without his consent. Now one other interesting thing. I don't know what it means but, in a study of patients in psychiatric hospitals, there were more members of families of psychiatric patients who had been killed through accidents than there were in a similar group of control patients. But these were members of the families and not the patient.

Brandaleone: I think then that there is great need for further investigation as *you have indicated, but my own feeling* is that I would not like to have a child of mine riding on a bus that was being driven by either a compulsive neurotic or a manic depressive psychotic in a manic stage.

Owen: May I interrupt to ask a question? Is there any particular type of test that we can use that the ordinary interviewing officer can use to tell which are the safe and the non-safe compulsive neurotic or psychotic individual?

Turrell: I think that such tests can be developed. It can be done in one of two ways with a psychological test or an interview. A skilled person as a psychiatrist, physician or doctor of psychology can learn much about a person's accident susceptibility. Perhaps we should make a study in industrial driving using the Allport-Vernon Scale of Values. If results of this test continue to indicate those persons who had accidents or did not have accidents, then I think this is the type of screening we need and for which we are looking. But my own personal opinion is that there would be no correlation between the accident and non-accident groups and psychoses and neuroses. I believe that persons are often victimized because they carry a psychiatric label.

Hightower: I believe that Dr. Brandaleone must be talking about something other than intercity buses. His children would certainly be safe on that type of travel. I'm inclined to agree with Dr. Turrell. We have used a very extensive plan for the last 10 or 12 years delving into temperament and personality and frankly I don't think there is any correlation between the two, the psychotic or neurotic

person—and certainly we haven't observed it in our experience. I strongly concur with Dr. Owen in his remarks about concrete standards toward driver physicals. We go far beyond the I.C.C. requirements, as you well know, and we run into this situation you speak of frequently and it would be most helpful if we had it spelled out in black and white.

DEPTH PERCEPTION

Cox: Dr. Payne, you said that a satisfactory test for depth perception should be devised and used. You emphasized the importance of depth perception especially in the field of commercial vehicles. Do you imply that there are no such tests or equipment available now?

Payne: There are three or four tests being used at present. One is still acceptable to the Air Force which is the so-called Howard-Dohlman test. It has been used satisfactorily since World War I. It seems to me, for the purpose of driving cars, you wouldn't have to use it, the Verhoeff test or the Orthorater. You could use a simple steroscope and determine whether or not the person knows where things are located in space. There are arguments as to whether depth is determined.

The test would show whether the two eyes are used together in unity. If they are, the chances are that fusion is fairly good, and third dimension is present. You can do this with an inexpensive steroscope which costs about $3.00, with one simple slide, containing an F on one side and an L on the other. You look through that steroscope with both eyes and if the F and L come together and form an E you have fusion. However, if you see the F and L as separate images more elaborate tests will be needed.

Cox: This also concerns the I.C.C. safety requirements which now require a driver to have at least 20-40 Snellen rating in each eye. People who are critical of that standard have told me that drivers who can satisfy the requirements of 20-40, still may not have adequate vision for commercial driving. Let me put it another way. I've been informed by persons who have had experience in the field, that the standard will let some people drive who have much less satisfactory vision than other people who will be kept out because they cannot measure up to 20-40 in each eye separately. Will you comment on that please, Dr. Payne?

Payne: It my feeling that the driver should have better than 20-40 vision. He should have single vision with two eyes with depth perception. The eye standards should be outlined arbitrarily, perhaps somewhat less than those that are used in the Air Force. If the applicant didn't come up to requirements he should be disqualified.

Owen: I will agree with you on that. The thing that I wanted to bring out is about fusion and phoria. I don't believe that 20-20 or 20-40 will tell us whether both eyes are looking in the same direction as Dr. Payne has said. The American Optical company's Keystone Telebinocular or the Bausch and Lomb's Orthorater give us a pretty good testing mechanism and I think that an individual should be rejected who has elements of phoria quicker than a person who hasn't the aquity test of 20-40 because he is apt to see double. I think he should be rejected.

Nichols: Then, doctors, you agree that eye examinations should be spelled out more definitely in the regulations?

Owen and Payne: Agreed.

USE OF PSYCH TESTS

Brandaleone: I would like to emphasize the things that have been said about the use of psychological tests and of the interview. We published a paper a few years ago showing the results of three psychological tests. The people who took these tests and passed them had a better accident record than a control group who did not take them. These results were obtained in a small group. It was not conclusive evidence nor did we feel that the tests that we used were the ideal ones. I hope that Dr. Turrell might give us the opportunity to study the Allport-Vernon test that he has been using. I think that we could use it in some of our groups.

I think that there is one thing that has not been brought out, of interest to nonphysicians. A person may have perfectly normal vision, but he may have weak eye muscles and not be able to converge to get fusion of both eyes. I think that the I.C.C. visual standards should be made

very rigid and include rigid criteria for fused vision. I think we should all do everything we can to assist the I.C.C. in establishing more rigid physical requirements.

Owen: The thing that I would like to see us do is to bring out some specific things. Might I suggest that all six of us go on record stating that I.C.C. should have these specific recommendations so that the National Safety Council can work on some specifics.

Turrell: I would like to second that. However, I think that rules and regulations from the standpoint of specific requirements for driving sometimes are inclined to go too far. Especially, since public or non-commercial driving and licensing may follow the recommendations of a group like this. I should like to put in a plea for the study of the engineering features which would help out so that one wouldn't have to have 20-20 vision in order to drive a car. There are a lot of people who depend upon an automobile for a living.

Driving down wide boulevards with stop signs on each side and one every block that are not synchronized, you don't quite know which one you're looking at. Furthermore, this is complicated by advertising signs in various colors of red, white, green and blue. It makes it difficult to pick out the stop signs. I would think that pressure from groups like this should call for designing certain sections of towns and highways to help the person who perhaps does not have 20-20 vision to negotiate them safely.

I think we also have to approach the psychological problems from the standpoint of therapeutic intervention. I would like to ask Dr. Owen to comment on this in terms of some therapeutic approaches to particular stressful situations.

THERAPEUTIC INTERVIEWS

Owen: The thing that we have found is that many of these men who are compulsive drivers or who have a problem at home disturbing them have to get it out of their system. If you can have an impartial medical discussion with impartial physicians and you can make them realize that you are not going to take back to their boss what they tell you they can get the particular irritation out of their system. I'm sure that by this method we are actually preventing accidents. If we encourage the people to come to us rather than having to pay for it they will come to us and let their hair down. We believe it will save a lot of money for your company.

Hightower: My question is directed to both Drs. Owen and Payne and I believe will be of interest to the audience. With the growing popularity of contact lenses do either or both of you feel that the wearing of contact lens by commercial vehicle drivers, when that lens has corrected his vision to meet our requirements, is safe?

Payne: This would be a most dangerous situation for an individual to drive any type of vehicle. You never know when you will scratch your eye with them or the eyeball becomes swollen and irritated. Contact lenses have a reasonable use. I was one of the first ones in New York to fit contact lenses and have had a lot of experience with them and I'll tell you this, they're not safe for automobile drivers. The people who can wear them and wear them successfully are usually the type who have eyes which cannot be corrected by regular lenses. The person who wants contact lenses, ordinarily wears thick glasses, uses them a few times and discards them later. Eventually they may be developed for practical use, but they are contraindicated at present.

Hightower: My own personal reactions concur with that but, unfortunately, the doctor recommended that a driver be kept in service as the driver's vision was corrected to 20-20 and the regulatory body through the Public Health's doctors approved it.

Owen: This is just another indication that we need more evidence and spelling out of the possibility of individual interpretations.

Cox: Dr. Turrell, you heard Dr. Owen in his paper refer to the driver who had the psychotic wife. I can think of any number of tragic accidents that have been traced to people with what I would call "preoccupation." There isn't time for me to use examples but I am sure that this involves a condition which you wouldn't

normally classify as psychosis or a neurotic.

The first time I heard Dr. Brandaleone, roughtly five years ago, he referred to a driver on the Third avenue transit system who had had an excellent record. Within a short space of time the man had three accidents, all preventable. They called him in for counseling. They found that the man was recently married, his wife wanted to go to California to live and she had no use for New York. Upon counseling they sent him out there, guaranteeing him his job if it didn't work out. When they got there his wife wanted to return to New York. They came back and he's had a good record since. Now, does it take a physician to handle that type of counseling?

Turrell: I don't think it necessarily requires a physician. Each company should have enough counselors who knew the men well enough that, when they ran into problems of this nature, they would have someone to whom they could come for counseling.

HOME EMOTIONAL PROBLEMS

Brandaleone: In our own experience we have found that drivers with emotional difficulties either at home or on the job are materially benefited when they come to the physician in the company medical department. The well trained doctor must give a patient a great deal of time and complete confidence must be maintained, but the results are gratifying. Sometimes it means a temporary change of job. In some cases even that is not enough. For example, in one case a man was terribly worried over an ill child and his job was changed from a driver to a cleaner-shifter. Unfortunately within a few days he killed one of the men in the garage. He was just not able to think about what he was doing at all. Taking the man away from the wheel of his vehicle apparently didn't help.

In response to another comment you made, Dr. Turrell, I can understand, as a practicing physician myself, how you feel toward rigid regulations. We must realize, however, that 40,000 deaths a year is an impressive number. We may in establishing certain rigid criteria be unfair to some persons, but it is a necessary step and after a trial and error period our criteria may be more fair.

The Massachusetts Licensing Bureau grants certain epileptics and diabetics on insulin a temporary license. This method seems to work well. Every three months these persons must be examined by an objective physician, not their own, who is a qualified specialist in his field, to determine whether the driver is able to continue. This may be a solution to the problem.

Hightower: As you know, the I.C.C. requires a physical examination once every three years which is an improvement over its former rules. The question is whether or not you think that this is adequate for a commercial vehicle driver and whether or not you feel they should be examined oftener?

Owen: We are examining yearly. I'm inclined to think that in some cases we are doing it too often in the 25 to 40 year level. However, an examination is not to disqualify, but rather it is to find any defects and to correct them before we have to disqualify the driver. Now if we examine a man once every three years we are going to have disease trends already established before we get to the individual. I believe your medical department should have the right to determine when and how they want a man examined and it should never be less than two years on a commerical driver and in certain cases be as often as every six months.

Brandaleone: I so agree with Dr. Owen. In talking about cancer detection and diabetes detection these examinations are detection for everything and more preventive medicine than anything else. We feel that civilian drivers up to the age of 45 should be examined every three years and after 45 every two years and as far as industrial drivers are concerned, up to the age of 45 every two years and annually thereafter.

Nichols: I think you're right. I would like to make a comment about drivers within Consolidated Freightways, that I'm experienced with in the older or upper age levels. Incidentally the closer I got to 50 the younger 60 seems to be. These older drivers 60, 62, 63 years old, because they have been on a good medical program, are

in good condition and are our best drivers. It's keeping them on this strict medical program and taking care of them the way they should be taken care of and advising them properly, I believe, that has done much to keep these men on the job.

(At this point the moderator asked if there were questions from the floor. The following question was posed—I would like to have the doctors say a little more about the tranquilizer drugs particularly amphetamine.)

TRANQUILIZER DRUGS

Owen: The tranquilizers and antihistamines are sleep producers. I don't believe we are in a position to state that the I.C.C. should put in its regulation that these cold remedy drugs should not be used but I think that any dispatcher who knows that the driver is on a tranquilizing drug should be a little hesitant about letting that driver go out until he has thoroughly checked his reactions.

Brandaleone: Dexedrine is just the direct opposite of the antihistamines and tranquilizers. Dexedrine is a stimulant. The transquilizer and antihistamine are relaxing drugs. These two are entirely different. Benzedrine is taken to keep persons awake. They may do that for a short period of time but so frequently people take them and they expect them to work far beyond their capacities and fatigue and sleep will overcome the use of any benezedrine or similar drugs. Tranquilizers are useful drugs which may cause some people to get sleepy and others may not be affected at all. It must be remembered too that different tranquilizers react differently. The important point is that anyone who drives should not take medication which might make him sleepy.

(Another question from the audience. I would like to ask Dr. Owen. Someone mentioned the connection between obesity and heart cases. I'm wondering if you found any connection in accident proneness in any types of underweight as well as overweight or for any types of size or stature?)

Owen: We haven't made any particular study on the anthropological size of the person as it affects accident prevention. Abnormally little or abnormally big have to be questioned as to whether they actually can drive. I'm positive that some of our truck drivers that weigh 250 pounds and five foot six inches tall have difficulty reaching the levers on their control panels. We have to study them from the standpoint of whether they can or can not actually handle a machine and it is something that probably should be done.

Hightower: I've had information from doctors that drivers should not be permitted to drive the day after they have taken the Asiatic flu shot.

Owen: I don't feel that we have had quite enough experience in the giving of the Asiatic flu shot to determine whether or not it is dangerous. Within my own practice we have given about 1,000 inoculations for the Asiatic flu. I only had three people sick and they all were sick in the same family. I am sure there was a great deal of psychosis mixed up with this whole picture. The Asatic flu vaccine may make you feel a little dopey the next day. I took it myself and I felt that I could have driven all right. We use the intradermal method with two shots, rather than take a chance.

Brandaleone: That's what we are doing and I see no reason why a "flu" injection should make them sleepy. It may give them muscle aches or malaise, but nothing more.

ACCIDENTS CAN BE STOPPED AT THE HIRING LINE

(A Symposium)

SAFETY STARTS WITH YOUR EMPLOYMENT APPLICATION FORM

by D. J. MOFFIE

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A study of the development of personnel procedures over the past 50 years shows that these have progressed from the subjective to the objective. Systematic and analytic methods have replaced "intuition" and "hunches." The psychologist, the safety and personnel people have been largely responsible for this.

Notable advances have been made in the interview, tests, reference checks, accident analysis, criterion development, training, and supervision. More recently, emphasis has been placed on the application blank. Safety experts now realize that accidents are caused by many human factors, and that no one test or technique will be the panacea for selecting safe drivers.

The application blank can play a real part in effective selection. Insurance companies, through weighted application blanks, place heavy reliance on this technique. Colleges have used it in their selection of freshman students. Industries are now beginning to develop weighted application blanks as a selective tool.

This report illustrates one situation where the application blank has been studied for the selection of safe drivers. This study was conducted through the North Carolina State College Department of Psychology for the McLean Trucking company. It was part of a larger research project conducted at N. C. State College for quite a number of years, originally beginning with Carlton Alexander, then safety director for the company, now directed by Howard Walton. The study consisted of two groups—an accident free and an accident group.

The accident free group consisted of drivers who worked a minimum of 12 months, were accident free, and were charged with no more than three violations or complaints. The accident drivers worked a minimum of 12 months, had incurred two or more accidents in which the driver was responsible and may have had any number of complaints or violations. Sixty-five accident free drivers and 36 accident drivers comprised the two groups.

The types of items and their weights are ascertained by determining what personal history or biographical responses are most frequently given by desirable employees and are given less frequently by undesirable employees. A large number of statistical techniques can be used to determine whether or not these differences are significant.

Chi Square has been one, or the significance of difference between percentages may be used. In every case, however, the techniques will determine whether or not the differences between the two groups in their responses to the items are statistically significant and not due to chance.

SIGNIFICANT QUESTIONS

In this particular study, the application blanks of these accident free and accident drivers were studied in relationship to such factors as height, marital status, number of children, average age of children and level of education. The items on the application blank which were statistically significant between the two groups were as follows: Height, marital status, number of children, average age of children, association with social or civic groups, hobbies, reading materials, kind of car owned, age of car, license of individual, level of education, and average length of employment on last three jobs.

To establish the significance of an item, it had to differentiate the accident from the

accident free in terms of weight, and in normalcy of distribution. For example, the first item height, a weight of two was established for those drivers who were from five feet four inches to five feet seven inches.

A weight of one for those drivers five feet eight inches to five feet eleven inches and statistically from six feet up a weight of zero was assigned. This would mean that the safer driver based on this study ranges from five feet four inches to five feet seven inches. On marital status, a single driver received a weight of one, a married driver a weight of one.

MARITAL STATUS RATES

If a driver were divorced or separated he received a weight of zero. For number of children, no children gave a driver a weight of two, one child, a weight of one, two children, a weight of zero, three and up, a rate of one. For membership in social or civic groups he received a weight of two; owning a higher priced car received a weight of two. The age of the car, if the car were one to five years, gave a man a weight of two.

From an educational standpoint, the grades nine to ten were most indicative of accident free drivers. This educational level received a weight of two. As we increased the education level, or decreased it below nine, we find that the weight assignments are significantly less. Average length of employment of last three jobs showed somewhat of a descrepancy, nevertheless, one year or less received a weight of two; two years, one; three years, zero; four years and up, one.

The items which were found insignificant between the accident and accident free drivers were as follows: weight, bank account, previous accidents. Those which were questionable because of distribution were time at present address, arrest, duties of last job, and reason for leaving last job.

Based on these weights, the original 65 application blanks for the accident free drivers and the accident drivers were studied. Weights were assigned and the total score was computed. The larger percentage of the scores fall below the optimum cutting score for the accident group and a normal distribution is seen for the accident free group. The average weighted score for the accident group is 12.2, for the accident free group 9.1. Incidentally, these differences were significant.

Slicing the data from another standpoint indicates the percentage of accident free drivers we would have hired above the cutting score of 12 and the percentage of accident drivers who would have been rejected. If the optimum cutting score had been available and used at the time of hiring, 81 per cent of the accident group would have been rejected. Likewise, 40 per cent of the accident free would also have been rejected under these conditions.

Conversely, 60 per cent of the accident free would have been hired, but only 19 per cent of the accident drivers would have passed the initial screening device. Incidentally, this study is now going on and will be cross-validated with the additional groups at the company. Normally this would be the routine procedure in the validation of an application blank under the conditions of this study.

Our conclusions from this study show that the weighted application blank has promise of being a good selective device for drivers. But the weights and cut-off scores found in this study should be considered preliminary and characteristic of this company only. The sample of undesirable drivers should be extended to include a larger number of terminators.

An application blank must also be used in collecting standard information identifying the individual, his education, marital status, previous employment and residence. Items which are extraneous to the selection of the the individual for a particular job should be eliminated, such as one's religion or the number of previous jobs.

TAILOR MADE BLANKS

The application blank is only one of many devices that can be used. Your employment procedure should supplement the application blank with selective tests for knowledge, character, abilities, and aptitude. And many tests have been found to be worthwhile in these particular areas. Steps should be taken to tailormake the application blank to fix your own needs.

The portion of the driver application blank that should be tailormade or standardized can only be determined through statistical

study such as we have completed here. I should also like to point out that in order to conduct such studies there is need for clear cut and reliable criteria, and in many industries the criteria of an accident or an accident free driver is still one to be desired.

The bulk of evidence in the field of driver selection seems to point towards personality as the dominant factor in accident causation. This view has been supported by studies at N. Y. U., studies at the University of Colorado, in the far west in California, N. C. State College and other universities too. Since this appears to be true, the weighted application blank approach might prove a worthwhile selection procedure.▲

SAFETY GROWS WITH YOUR INTERVIEW

by WALLACE C. TAYLOR

director, Personnel & Safety, Ringsby Truck Lines, Inc., Denver, Colo.

Until comparatively recent times the Interview was the accepted entire employment program. An applicant said, "I want a job" —if you needed someone, say a truck driver at the moment, you pointed to the vehicle to be operated and said, "Get going."

We have learned though—we've learned "the hard way"—that the pre-employment interview if properly conducted, can save many headaches, and a lot of money; in fact, may help to prevent a business from going on the rocks.

Some employers rely solely on the interview—others discount it entirely. However, most do find great value in the initial contact with an applicant.

Some use a patterned interview form, such as published by White Motor company —or several publishers, which lists stock questions and even gives you clues on what kind of answers are most desirable or undesirable.

We'll discuss a man—truck or bus driver applicant:

APPROACH:

1. Hands out of pockets.
2. Walking or standing straight-leaning on wall or desk.
3. Clothes clean and neat.
4. Pleasant facial expressions. (He's a potential representative of your company.)
   He doesn't have to be handsome but better that he doesn't look too much on the rough side.
5. Self introduction or just "I want a job."
6. Handshake (firm or dead-fish). Hands and finger nails clean?
7. Look you in the eyes.
   There're all kinds of sayings and proverbs about people who won't look you in the eye.
8. Nervous-trembling speech, hands, smoking hard, chewing hard.
9. Offensive breath or body odors not good in customer contacts, working with others indoors or on a sleeper cab truck.

BEGINNING:

1. Try to put him at ease by your talking just enough about the weather or your company to acknowledge his stated desire for work and get him started talking about himself, his qualifications and ambitions.
2. Why do you think you'd like to work for this company?
   That question is a good way to test his sincerity—whether he's just "looking for a job" or has a genuine interest in your company.
3. Review the application with the applicant.
   (a) Discuss in detail his former jobs —details of the work and reasons for leaving.
   Work conditions at your company. Maybe the same as those he gave as reasons for dissatisfaction or leaving another company—"Not enough money"—"Wanted to get off sleeper rigs" or, "Wanted to take line job."
   (b) Double check age; marital status, state of current health. How long a resident? Own home, etc.
   (c) Review specifically "no accidents."
   (d) Review specifically any accidents noted and "is that all you have ever had?"
   (e) Review "Personal injuries" the same way. How caused? Does it bother him anymore? There is always danger of employment with you "aggravating the former injury"—Habitual compensation user?
   (f) Does your wife approve of your doing this type of work? is a question sometimes the acid test of whether or not he will stay long.
   (g) Education may be a factor—you may wish to get verbal details of that—but particularly note—can he write legibly.
   (h) Thorough—did he obviously read what the application asks and then answer completely.
4. Conclude the interview with a definite statement so the applicant will know "how he stands," i.e., "Sorry, we cannot use you now;" "Call me tomorrow," or "Step over here for some of our tests."▲

SAFETY IS IMPROVED BY YOUR INVESTIGATION

by JOHN A. DE PEW

director, Safety & Personnel, Dohm Transfer co., Rock Island, Ill.

I made up a questionnaire and sent it to 105 carriers throughout the country. These were sent to all types, such as, regular line haul common carrier, private carrier, automobile transporters, petroleum haulers, and bus companies. The number of drivers represented in those replying ranged from 25 to 1750.

The following is a summary of replies received representing 75 employers and 45,000 drivers:—

1. Which Department in your company does the applicant screening?
   Answer: personnel and safety 32, safety only 11, and personnel only 11.

	Yes	No	No Ans.
2. Do you require a 10 year work history?	29	45	1
3. If not 10 years, how many in years? *Answer:* Less than 10 years 56, and others varied from last 3 employers to 5 years.			
4. Do you bond all employees?	41	31	3
5. Do you check previous employers?	75	0	0
6. Is this done by Telephone? telephone 6, letter 7, both 56, on answer 6.			
7. Do you check with state motor vehicle departments?	37	38	0
8. Do you have an outside agency check made?	45	28	2
9. Is this done by a detective agency?	10	39	26
10. Is this done by a credit bureau?	34	17	24
11. Do you have a credit check made?	40	29	6
12. Do you believe such a check is necessary?	52	21	2
13. Do you fingerprint all applicants?	22	53	0
14. Do you ask for past arrest records from employee?	66	8	1

15. Do you check on this information?	54	19	2
16. If an employee has had other than traffic arrests, is he eligible for employment in your company?	13	48	14
17. Do you find the Local Police co-operative in giving out past arrest information?	48	19	6
18. Do you have a single agency or association check prospective employees for your company?	27	44	4
19. Do you use the same method in all your locations in checking on past employment and arrest records?	59	13	3
20. Do you check on previous record of moral or social misconduct?	53	17	4
21. Do you have neighborhood check made?	36	37	2
22. Do you use a driver testing clinic? If the answer is "yes" please give the name and town of the Clinic:-	21	52	1
Some answered. The Associated Highway Carriers, Kansas City, Missouri; Los Angeles Driver Testing Bureau, and the Nebraska Safety Engineering Service, Omaha are the ones that were listed in the reply to the question above.			
23. Do you have any other method of investigation not mentioned above?	17	44	14

DETECTIVE AGENCY CHECKS

Now the second part to this question, if the answer is "yes" please explain briefly:—

One carrier claimed he put their employees through a polygraph examination; others mentioned a detective agency, such as, Thompson Dectective Service, in Indianapolis; the Brown Detective Agency, in Chicago, the Civilian Fingerprint Agency, in St Louis. Atlantic Greyhound have their own driver testing clinic, and I am sure the other Carriers included in the survey have their own Clinic, but failed to mention in the particular spot in the questionnaire.

This survey in my opinion points to one of the reasons why some carriers are having difficulty with their employees.

Please bear in mind these questionnaires were mailed out to carriers who in my opinion had a better than average selection procedure. I am sure that you can realize how many undesirables must be in this industry as a whole.

INVESTIGATE EVERYONE

Let me give you an example. Shortly after starting to work for our company, I received permission from the owners to investigate all employees, and the word all included the owners and myself. This is checking back on their past police records on employees.

In one of our locations we had a man working for us more than 10 years. Prior to coming to work for us had served two year in a Federal Penitentiary for theft from Interstate Freight while working for another carrier. This man was such a good employee his terminal manager and those in our general office couldn't believe that this was possible.

He did admit the complete story to me and I told him he had nothing to worry about as far as his future was concerned so long as he remained the good employee that he had been in the recent past. Many other things came to light, some of them amusing and some of them just the opposite. Since that time we have investigated all new employees and checked back in their police records.

In addition we have the prospective sign, which we call a "Record File." We read one paragraph over carefully, and ask them to be sure they remember everything and tell us the complete story. If this person has deliberately tried to hide the facts of his past after signing such a statement there isn't any recourse but to dismiss him at once.

As soon as word gets around to the other carriers and through the industry that your company has a thorough and strict screening process so that just everybody can't get a job, you will find that many undesirables will not even apply for work and waste your time trying to get employment with your company.

We are dealing with human beings, and regardless of your screening process one may creep into your organization who later turns out to be undesirable. For example, one could turn into an agitator or suddenly become involved in accidents—both vehicular and personal injury.

The more you can learn about an employee and his past, the better your relationship will be during his employment—if he knows that you know. You can inform him the only persons in your employ are those you yourself would like to invite into your parlor. This is when I am sure you would be able to improve your safety performance by improving your investigation during the probationary period of each and every employee.

INFORMATION FROM POLICE

Some of the methods used in obtaining this information will take a little time to set up, but it can be done. Sometimes this information can be gleaned from the police department direct if you contact the Chief or his designated substitute, explain your problem and show them how you would like to have this information.

You must do most of the work getting this request to them, and then in most cases furnish a stamped addressed envelope. A number of departments in medium-sized towns at the present time are giving us this information without cost. Most states will furnish the driving history on an individual, for a fee. For example, the State of Illinois charges $1.00 per individual check. Starting January 1st, 1958 they will furnish a form for this request to be sent to them on an individual or a group of individuals.

They will return this form with the information inserted giving you the history they have on their records whatever it may be. May I suggest if you have a mail clerk in your office—have this information sent to your home. It may save a great deal of embarrassment.

The safety performance of your drivers and all your personnel can be improved by a good and thorough investigation of all your employees including the office force.▲

SAFETY IS INFLUENCED BY YOUR DECISION

by J. WYLIE LUMPKIN

manager, Safety Division, Railway Express Agency, Inc., New York city

The fourth and final step and undoubtedly the most important in the procedure of positive driver selection is that of making a "decision"—a decision to hire or not to hire.

Immediately after the three preceding steps, those of taking the application, having the interview and completing the investigation, you must decide whether or not the applicant is to be hired. Careful selection of driver personnel is important in a safety program.

The task of assembling a group of drivers to operate the equipment efficiently, courteously and without accidents, starts with the initial selection of each driver. Safety in your company is influenced by your decision and, of course, your decision is the controlling factor of stopping accidents at the hiring line.

The ability to act safely is perhaps nowhere more important than in the operation of a motor vehicle where a driver, by a single lapse of mental alertness may cause an accident resulting in great loss of human life and damage to property.

Summing up the initial three phases of the employment cycle—how do you cross reference the application, the interview and the investigation?

The completed application form contains details of past data as submitted by applicant. This is the applicant's statement of his past record and history. All information should be carefully scrutinized and discrepancies brought to light by the personal interview

or the investigation should be given due consideration before making a decision to hire.

The personal interview is perhaps the most important single employment technique in the driver selection procedure. The overall perspective gained during the interview is often the determining factor in employment. A properly conducted interview should reveal additional facts about the applicant's past employment experience, knowledge of traffic regulations, attitude, personality, appearance, family life and general background.

INTERVIEWS CAN REVEAL

Following the interview the application should be reviewed again to determine whether the information coincides with that developed during the interview. Again, any discrepancies discovered should be carefully considered before a decision is made. In fact, your decision should not be made until all references provided on the application form are carefully checked.

Sometimes you may have difficulty in obtaining reliable information from previous employers. Some hesitate to put their frank *opinions in writing. Therefore, you should* analyze the information obtained from this source and compare it with that developed in the interview—as well as that detailed in the application form—before making a decision to hire.

You may obtain additional information from the local credit bureau, police department and state highway patrol records that will be helpful to you in reaching a sound decision.

Don't rely too much on what the applicant says he knows and the experience he says he has had. Check his past record carefully.

FACTORS FOR DECISION

In determining standards of selection the personnel or employing officer should first make a careful study of what the job entails and what qualifications the driver should possess to perform the job satisfactorily.

An example of an inventory of essential qualifications is that established by the American Transit Association for prospective transit employees. This lists nine basic qualities as follows:

Moral character
Mental ability
Motor ability
Health
Motivation
Stability
Maturity
Sociability
Manner & appearance

With minor changes this inventory should be applicable to all driver jobs. Relative stress to be placed on any of these qualifications would depend on the type of motor transportation.

An experienced personnel officer will detect all obvious and many subtle reasons why some applicants should and others should not be hired. These reasons will be matters of personal judgment based on experience and education. While the most important objective of a driver selection procedure is to screen out accident-prone applicants, you should not lose sight of the fact that many traits not related to accident-proneness must also be considered during the selection process.

Certain traits are considered important in deciding upon the general suitability of applicants for driving jobs, such as age, physical fitness, driving experience, intelligence, education, attitude and financial habits. These are some of the factors that will affect your decision.

AGE, PHYSICAL FITNESS

Generally, the minimum and maximum age limits for new drivers are between 21 and 40 years of age. The ideal age is between 25 and 30. Some firms are reluctant to hire a man over 30 unless he is a sound physical specimen and measures up well to all other requirements.

Youthful drivers are inclined to have more accidents than older drivers. This is attributed to their immaturity. Men under 25 years and especially those under 21 are not considered good accident risks. Fleet operators should take special pains in analyzing the qualifications of applicants under 25 years of age and accept only those who evidence a mature, stable personality.

Generally there should be limitations on the stature of a driver. Very short drivers have difficulty in reaching and manipulating

driving controls and devices. Short drivers and the overly fat drivers are not as dexterous in turning or backing a vehicle and the added effort necessary for them to perform contributes to a general state of fatigue.

Nervousness and clumsiness in an applicant are thought to be indications and causes of accident-proneness. A record of epilepsy or dizzy spells should be sufficient cause for rejection.

Blood pressure should be within reasonable limits. Applicants with bad hearts, poor eyes, inadequate hearing, are not likely to make good drivers.

DRIVING EXPERIENCE REQUIRED

What a man has done in the past is a good indication of what he can do in the future. Type of previous driving experience is important. You should try to obtain drivers with experience in handling vehicles of the type he will drive.

Individuals who have a record of repeated accidents should not be hired. They are likely to continue having accidents at the old rate.

While it is important, skill alone does not insure safety in driving. Actual driving skill can not be successfully measured by a laboratory test. Ample time should be allowed for road tests. How an individual responds in a tight situation is far more important than speed of reaction time in application of the brake.

Two general types of road tests can be used to measure driver skills. The driving range or obstacle course test is best for training purposes, especially for beginner drivers. The range provides normal roadway features but without the hazards of public traffic.

A standard road test permits observing and rating the driver under actual driving conditions. The test is used to measure his ability to drive in traffic, determine his general attitude, and detect his unsafe driving habits.

However, even road tests have certain limitations. They do not measure the driver in complex traffic conditions or dangerous road situations. They make no allowance for the emotional state of the applicant who may be excited and may not perform in a normal manner. They test driver performance only at the time of the test, not his potential ability.

Formal education is thought to have little bearing on an applicant's potential ability as a driver. Most firms, however, have minimum educational requirements. As with intelligence, middle ranges of educational qualifications are most desirable. Highly educated employees do not always make good drivers.

On the other hand, knowledge of driving principles and practices are important to the safe operation of a motor vehicle. However, the mere knowledge of traffic rules and regulations is no guarantee that they will be faithfully observed. Observance of regulations depends primarily upon the attitudes with which they are regarded.

Proper attitudes are essential to safe driving. A driver may possess the necessary skills and knowledge for safe driving and yet be involved in accidents. If he fails to appreciate the relationship between his behavior and the safety of others, if he drives in a mental state of disregard, selfishness and indifference, he can readily become involved in situations that are dangerous.

Dissatisfied, timid, naturally troublesome or otherwise temperamentally unstable individuals usually do not make good drivers. The irresponsible type of worker who seeks a job without the desire to render his best services, should not be employed.

MARITAL STATUS-MATURITY

Some firms will not hire single men. Experience has shown that married men are more settled and dependable as drivers. Married men have responsibilities and are therefore less inclined to drift from job to job. However, domestic troubles can make the married man a bad risk.

A man's financial habits may be an important index to his suitability as a driver. A man continually in financial hot water may be accident-prone because of constant preoccupation with personal worries.

Home ownership is an important indication of stability. The applicant who has, or is, buying a home will work more regularly and with more care than one who has no investment to protect.

All the factors mentioned, as well as others, should be carefully considered before a decision to hire is made.

Do such factors as labor market, pay standards and work standards in a highly competitive market determine the type of applicant reached initially? Do such factors affect the drivers' desire to be hired or to stay on the job once he learns the ropes?

Labor turnover is an outstanding cause of inefficiency and high accident frequency and its avoidance deserves much attention.

COMPETITIVE LABOR MARKET

There are two main causes of labor turnover. One consists of personal reasons, the other is based on dissatisfaction with the job. The following are among the personal reasons and they generally are difficult to cope with: more attractive offers, job with more pay; better hours and a better future, family conditions such as sickness at home and financial difficulties and living conditions such as distance from work, transportation difficulties and inability to find living quarters are other factors.

The company or the supervisor generally can do something about the causes of turnover in the other group based on dissatisfaction with the job. Dissatisfaction with wages or some related factor, and working conditions, including condition of facilities and surroundings are causes for turnover.

The most elaborate selection procedure will still yield a poor type of employee if only applicants of a generally low caliber are attracted to apply for work and you choose the "best of the lot" even though sub-standard.

Effort should be made to attract an adequate number of well-qualified persons to apply for employment. Advertisements in local newspapers stressing the advantages of employment as a driver have attracted more desirable candidates in some areas.

How is local organized labor tied in to the hiring decision? How can such factors be used in a positive direction?

Most of the labor union agreements contain a validating rule which states that the applications of new employees shall be approved or disapproved within a certain period of time. Generally, after the validating period expires, whether it be for 30, 60 or 90 days, you will need good and sufficient cause and formal investigation to dismiss a new employee found unsatisfactory after being put on the payroll.

Employing officers should take advantage of the validating rule, if it is in their agreement, and dismiss from service within the time allowed those who do not measure up to minimum requirements. This is a very important factor in the procedure of positive driver selection.

I have covered only briefly some of the factors that should be given careful consideration by you or the employing officer before a decision is made to hire.

The importance of proper selection of driver personnel at the hiring line cannot be over-emphasized. Undesirable results are bound to follow if a good job is not done.

It doesn't take long to invest a great deal of time and money in training driver personnel and then find that some of the new men can't absorb what you are trying to teach them. It is better to avoid the expense and problem of replacement by deciding in advance what kind of a man you want—and then make the right decision before accepting an applicant.

Safety in your company is influenced by your decision—and your decision is the controlling factor of stopping accidents at the hiring line.

EFFECTIVE SUPERVISION IS POSITIVE

ORIENTATION—THE BEGINNING OF DRIVER SUPERVISION

by WILLIAM W. CARTER
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Every employee some time or other has been new in an organization. In all probability there was a period embracing a few moments or a few hours between the time we were hired and the moment of introduction to our immediate supervisor.

It is this period of time I want to discuss . . . this short lapse of time that is so important to the new employee and the company. Since my topic concerns drivers, only that classification will be referred to . . . although many comments that follow could apply to every new employee.

Orientation of a new driver is the initial adjustment or conditioning interval of supervision. As such, and comparable to other undertakings, there must be objectives and procedures for effective accomplishment.

To insure a new driver getting off to the right start (a) he must be properly conditioned toward the company, and (b) a sound basis established by the supervisor for a truly friendly relationship.

Everyone is generally ill at ease in new organizations. So it is with new drivers. They want to do a good job and need proper guidance. At no time during employment will we find the driver more receptive to courtesy and kindly treatment than his first day.

SUPERVISOR MUST GUIDE

Should the supervisor fail to help and guide him, or disregard the importance of a friendly and sympathetic welcome from his fellow drivers and others, don't be surprised or cast blame on the new driver should he go to the union steward for advice and help. He needs help, he knows he needs it and he's going to get it from someone. The good supervisor knows this and takes full advantage of this time to insure proper conditioning toward the company.

There are certain "wants" existing in the mind of every new driver that the competent supervisor is well aware of . . . "wants" that can not be minimized or ignored to secure the most from orientation. He knows the new driver wants to be recognized as a human being, wants fair treatment and a square deal, to be accepted in the company family, have a feeling that his job is secure, good working conditions, a competent boss, to know what is going on, someone to hear his grievances, complaints and suggestions, to feel useful and know the value of his work, and an opportunity to show or demonstrate his ability.

TEACH 3W'S OF ACCIDENTS

Likewise the good supervisor knows the "wants" of his company. He is aware that a profitable operation necessitates a high level of productivity from every driver. His company desires daily performance where freedom from absenteeism, accidents, injuries, labor turn-over, and incompatibility prevails. Of these loss factors, vehicular accidents and injuries usually show the longest row of red figures in the accounting books . . . and the supervisor knows it. Particular emphasis is placed on accident prevention.

Laying the ground work for accident prevention during the adjustment period calls for knowledge of the subject. The good supervisor knows, by virtue of responsibilities inherent to his position, that drivers must be taught why, where, and when accidents occur . . . and how they can be avoided. He knows drivers must be indoctrinated with the philosophy of safe driving and kept alert to the need of practical application.

He is well aware that a productive driver understands and has adopted a scientific approach to accident prevention. It is within

practically every driver's capacity to operate equipment guided by principles which confine to a minimum the possibilities of collisions, upsets, jack-knifes and other loss producing incidents. He knows also that safe driving does not require a talent comparable to the arts, science, or athletics because ordinary driving ability is sufficient. He knows accidents are not caused or prevented by any particular human characteristic, for the reason it is usually too late to avoid a collision whenever any particular characteristic becomes necessary to influence the result of such possibility. He knows lightning action is necessary only after a faulty approach to the scene. He is appraised that the talent to drive equipment is the same talent which can serve to make driving safe.

EMPHASIZE PREVENTION PRINCIPLES

It can be readily understood the good supervisor has a wealth of background information on his company, the driver, and the principles considered with accident prevention. Being so equipped is of little value unless it is properly aimed at the target with enough force to hit the bull's eye.

Form a mental picture of an office (possibly your own) with good lighting, adequate ventilation, orderly arrangement of fixtures, without outside interference. You have the new driver in your presence. Now, what are you going to do? No doubt you will put him in the right frame of mind . . . condition him so you can "get through" to him. This entails creating a desire to learn the things you want him to learn. No faster method is known to create this desire than to show him the goal to be reached and its value to him . . . to him not only as an employee but a human being.

Most drivers know what it means to be a good citizen or a good neighbor, and most assuredly recognize the meaning of a good brother or a good son. Attitude and judgment have the same relationship to the art of driving that personality and character have to the art of living . . . in both cases, these things are the end objectives or goals. Seeming rational and logical, the goal to implant then would be that of living as a good citizen, and a good neighbor.

After this goal has been firmly planted in his mind, he must still be encouraged, encouraged, and encouraged. All of this can and must be enhanced by the earnest and fervent feeling shown by the supervisor.

Orientation is an attitude-changing affair . . . a setting to "sell" the new driver on accident prevention. As in other lines of selling, some can be sold quite easily while others pose a most difficult problem. Not all drivers will admit to any deficiency behind the wheel thereby denoting an unwillingness to change their driving habits. This amounts to nothing more than an elevated level of evaluation with respect to their own driving ability.

Several years of operation without an accident, for example, accounts for a lofty sense of confidence which is usually without foundation. Admittedly, this type of individual is a "hard nut to crack," but with a goal established, accompanied by desire, plus the supervisor's enthusiasm and perseverance, he too can be sold.

"Selling" the new driver on accident prevention is equivalent to showing him where he is going to profit . . . not necessarily in dollars and cents, but by satisfying his desires and "wants."

We have been told that attitudes are "caught" and attitudes are "taught." In this particular phase of driver supervision both methods should be used. Reverse the mental picture referred to a moment ago and place yourself in the new driver's position.

The supervisor has made you feel at ease by a cordial greeting and told you he is glad to have you in the company. A friendly atmosphere has been created. He has told you he is interested in you as a person. Said with sincerity and enthusiasm, he automatically put the softening-up process "in gear." He proceeds to give you a brief description of the company's history, the extent of operations, amount and type of equipment, number of employees with emphasis on number of drivers like yourself and gross annual business.

MAKE HIM FEEL IMPORTANT

You have discovered a new friend, he's making you feel "at home" and, in so many words, has said you are a mighty important person. Yes, he's recognized you as a human being, treating you fairly, accepted you in the company family and letting you know what the score is. In this short span

of time, you have "caught" the attitude pitched your way because the supervisor has commanded your respect. The desire to go out and do a job is beginning to grow on you . . . you have become inspired to a degree, and a goal is beginning to form.

You are asked the question, "What would you do if a money bag containing $20,000 was placed on your lap and entrusted to your care?" In all probability you'd say every reasonable effort would be made to protect it. Then you are told $20,000 is the approximate amount of the money the company is entrusting to you when assigned to a tractor-trailer unit . . . saying nothing of the thousands of dollars worth of property carried as cargo.

Now you realize you are recognized as a trustworthy person . . . a person entitled to confidence. This approval, this trust, "rings a bell" with you and that desire to go out and do a good job is continuing to grow on you.

A sheet of paper is laid before you disclosing the names of drivers holding safe-driver awards, and the number of safe driving years credited to each. You are shown a record which compares driving records of top performers with drivers who haven't been able to hurdle the three-year qualifying period. You note those holding five, eight, and 10 years of safe driving have few or no traffic infraction and reprimands from management. You also notice the non-qualifiers show innumerable instances of undesirable behavior.

Your attention is directed to the fact that so-and-so terminal manager, dispatcher, safety supervisor, and executive with the company began as drivers and attained their position by operating equipment safely in conjunction with other elements of high productivity. You are also told there is a constant need for competent supervisors and the gateway to those positions is always open.

CHALLENGE THE AVERAGE

These few thoughts are turning over in your mind, when you're told it's the so-called "average" driver that has accidents . . . not the above-average performer. This seems to "ring another bell" . . . that of a challenge. You ask yourself the question "do I want to be an average driver or above-average?" The immediate impulse, obviously, is to be an above-average driver.

At this point the new driver has set his goal . . . that of an above-average performer. He wants to belong to that winning team of men who are recognized for their achievements. The supervisor's inspiration has "rubbed off" on him. He has a goal, and from this point on he needs encouragement . . . lots of encouragement to inspire doing the job he wants to do and the job management wants him to do.

Citing examples concerning trust, what it takes to belong to a winning team, the regards of top performance, and opportunities with the company all tend to create a favorable attitude. These are a few examples of "taught" attitude . . . there are many more.

It appears axiomatic that greater emphasis on orientation of new employees is a "must." Fleets without such a period in employment should initiate one, and fleets with this conditioning phase of supervision should evaluate it with the objective of improvement . . . if we are to cope effectively with the ever-present factors of economy, public relations, and overall smooth functioning of the individual truck, bus, or taxi organization.

EMPLOYEE RELATIONS

Success in our complex business and industrial world appears equivalent to successful relationship or dealing with other people. Successful prevention of vehicular accidents likewise appears closely allied to successful dealings with drivers. This should be more thoroughly understood by everyone on the management team . . . and become so imbued as to command first attention for solving fleet operations problems of any nature involving drivers.

Many of you are associated with fleets that can display evidence of outstanding accident prevention programs, which would indicate your belief in, and practice of, sound techniques of driver supervision . . . and these reliable details of procedure most assuredly are headed up by the conditioning period, the "selling" period, the attitude-changing period . . . that phase of driver supervision we call orientation.

The ensuing days, weeks, and months should find every alert supervisor seeking and probing deeper in the search for methods

conducive to accident freedom. We must first realize we are dealing with people, . . . clearly understand the wants of the individual up and above money . . . . learn more about the ways and means of changing attitude . . . and faithfully practice the golden rule from the beginning of driver supervision.

EDUCATION—THE FOUNDATION OF DRIVER SUPERVISION

by F. S. LAKE

director of safety, Interstate Motor Freight System, Inc., Grand Rapids, Mich.

In the prevention of accidents, the education of people is basic to perform their respective duties in a prescribed manner whether they are workers or supervisors. It makes no difference whether we are referring to industrial accidents and injuries, or to vehicle accidents—we still find that most of these accidents result from some form of human failure, and that failure usually resulted from job performance contrary to the proper procedure as set forth in our manuals or other instructional material.

While such an introduction may appear apart from the topic assigned to me, we still must set our sights on our ultimate goal, which is the prevention of accidents, and injuries. To obtain this goal we must tie in all factors in our program, not just part of them.

Without being considered presumptuous, I would like to present this question—"Are we not too prone to direct our efforts to the selection, training and education of the driver himself, rather than to include all of the other people in our organization who have much of the responsibility for the manner in which the driver performs his duty and the results obtained from that driver?"

If our program is so conceived, then it is my opinion that it is incomplete.

EMPHASIZE ONLY DRIVER

Many discussions relate to programs for positive driver selection, his physical, visual, and emotional factors, and the relative merits of incentives and discipline. With the exception of the latter two items, all of these deal with the new employee, and all that we have accomplished is to determine that we have potentially employed the right man for the job he is to do. But if we leave the matter at this point what assurance do we have that he will continue to function and develop as we wish or expect him to?

We need supervision to accomplish this. Incentives and discipline are two elements of our continuing program. The purpose of these is to develop our driver, encourage him to perform in the manner desired to obtain our objective or speak him if he fails to do so.

GREATER SUPERVISION PROBLEMS

This raises a second question—"Are we, as safety people, willing to allow a driver —employed on the basis of his ability, attitude, knowledge and physical factors, and instructed or trained in accident prevention —to be supervised by one who has not been similarly trained and developed?" There is a large void between the employment, indoctrination and training of a driver and the finished product of the accomplished driver.

That void must be filled by supervision—and it is supervision of the right sort which will mold the new driver from the potentially good employee we hired into the finished or accomplished driver for our fleets. Therefore is education not only the foundation of driver supervision, but also is not education of the supervisor the keystone in our accident prevention program?

To borrow again from our counterparts in the manufacturing industry—Heinrich, in his book on *Industrial Accident Prevention*, gives a basic philosophy for accident prevention in which a large portion of the responsibility for such prevention of accidents is placed on the foreman or line supervisor. It must be conceded that our problems and methods of supervision are much different than those in manufacturing industry, and if anything, our problems are greater. For example, the supervisor in a plant can observe those under his supervision when they are performing their duties and can immediately correct any faults.

We, on the other hand, cannot do so as our drivers are alone and actually on their own, performing their duties away from direct supervision. We must therefore have a supervisor who can convey his instructions to the driver so that they will be remembered during the driver's tour of duty —so that, through supervisory efforts, the desire or will to comply with those instructions is instilled in the driver. While the principle is still the same, the problems differ and we must therefore compensate for them.

In our industry we actually have two types of driver supervision—the road supervisor and the terminal supervisor. The area of control over the driver is somewhat diverse, but the ultimate purpose is identical, namely to maintain the efficiency of the operation at the highest level which, of course, includes the prevention of accidents.

HIRING A SUPERVISOR

Let us start with our supervisor in the same manner as we do with the driver—that is his employment. We must naturally set certain standards for employment, but these standards must be higher than those for a driver, because we are now selecting someone who will be a part of management. Certain of these standards are set by our operating department to meet their requirements, and we as safety people would have little actual interest in those. However there are those standards in which both operations and safety must jointly concur.

The basic qualifications of a supervisor should cover such areas as knowledge, attitude, ability and action. Certain of these must be present before employment, but like our driver, we will find it important to teach others.

Knowledge of his overall job duties would be a prerequisite. But just as he would have to be trained in the procedures and routine of his duties, so he must be taught the company policies and educated in the manner in which they are to be enforced. He must be educated in those regulations by which our industry must abide, whether they are local, state or federal, because all phases of his responsibilities are circumscribed by these regulations.

Attitude—this we might call an intangible because it is something in us that is in the process of development throughout our entire life. However, any individual who has the responsibility for directing the activities of others should have a proper supervisory attitude if he is going to meet with success.

DEVELOPING ATTITUDES

We should therefore include in our educational program methods to develop this supervisory attitude which embrace his relationship with those whom he is directing —his feeling of responsibility to management of which he is a part—to promote their interests and carry out their policies, his sense of honesty and fair play to those workers under him, and as the go-between for management and employees, his responsibility to the latter to make his orders fair and to see they are carried out. This is essential to successful supervision.

One condition frequently encountered when an individual is given a position of responsibility and the authority, is a change in his attitude and the resulting improper use of that authority. Education in the proper use of authority is one important area which will assist materially in preventing the loss of respect for the supervisor by those whom he is directing.

Ability—this also might be considered an intangible. Some people are natural leaders and have the ability to direct others easily. But many, while able to perform tasks themselves, have difficulty conveying their desires and directing others. They lack the ability to organize either their own work or the group of workers they are supervising. They are slow to make decisions. Therefore, our education of the supervisor should be directed toward overcoming such faults—to analyze a situation quickly and take the necessary steps to counteract those adverse happenings and changing conditions.

A smooth operating supervisor will have a smooth operating organization, but one

who cannot organize his efforts will only pass this lack on to the workers with inefficiency the result.

Action is the fourth area and the one which finally gets the job done. This is the application of the other three areas of knowledge, attitude and ability. Without being able to apply these three requisites he is not going to be able to accomplish his own duties and responsibilities. Knowing what is to be done—having the desire and will to do it properly and the ability to organize to get it done will result in the finished product.

I have previously referred to two separate types of supervision in our industry—the road supervisor and the terminal supervisor. What can we gain from their efforts?

The road supervisor in a measure takes over after the unit has been dispatched and he functions when the driver is actually performing his work. In different companies this supervisor might be known under various titles such as safety engineer, safety supervisor or road foreman. Regardless of his title, his duties are similar. He checks the operation of the equipment on the highway to see that drivers complete their runs according to operational schedules, that principles of good driving are adhered to, and that all safety regulations are complied with.

Since the efforts of the road supervisor actually will tie in closely with the accident prevention program, his education as a supervisor has been usually formulated and directed by safety people within the organization.

EXPANDING FIRST REQUISITES

We are therefore in an excellent position to see that those policies we have established for the employment of new drivers are followed up and will actually be the continuation of our structure to build our group of accomplished drivers from the foundation which we have already established.

The education of the road supervisor should cover his thorough knowledge of what is to be done and how to do it and how to impart that knowledge to others. One major area of his education should be his ability to stimulate others to want to do the job properly without the whip of direct supervision to see that it is done.

With this I believe that we can leave the matter of educating road supervisors. To me the matter of educating our terminal supervisors—particularly those having relations with our drivers is of primary importance. In most companies this supervisor carries the title of dispatcher, because he actually directs the activities of the drivers

It is the dispatcher who instructs the driver as to what he is to do, when he is to do it and usually how he wants it done. Perhaps the only thing that he does not do directly, insofar as his supervision of the driver is concerned, is to instruct the driver in the actual physical operation of the vehicle.

DISPATCHER'S DIRECT CONTACT

The key man in a terminal operation is the dispatcher as he controls the pickup and delivery of freight and the cost to do it. He also is responsible to dispatch the equipment properly over the road or to receive it at the destination terminal. He is the one who has the greatest contact with the driver; is the last to talk with him before his departure on his run and the first to greet him on his arrival. In fact to many a driver the dispatcher is the company and is his only contact with management.

Since the basic philosophy of accident prevention places a large portion of the responsibility for such prevention on the supervisor, we must recognize him in this capacity as a key man in our accident prevention program. If we take a positive approach to supervision in the development of our driver, we cannot lose sight of the importance of the dispatcher to us and our continuing program. Accordingly, we should be vitally interested in the education of our dispatch personnel, and any failure to do so means that we, as safety people, are overlooking a major tool in our safety activities.

Supervision is the chain between the raw material and the finished product. If we must go to great lengths to insure that the drivers we employ are properly selected, and through our continuing program are educated to conduct themselves to perform efficiently and without accidents, it follows that just as much care should be taken to insure that the supervisor who is directing the activities of the driver is as carefully chosen, and likewise he must be as carefully and completely educated in the arts of supervision.

STIMULATION—THE FRAMEWORK OF DRIVER SUPERVISION

by S. E. NELSON

superintendent of safety, Burlington Truck Lines, Galesburg, Ill.

Our company was failing to stimulate our drivers to perform along the lines we wanted them to. We wanted to get our message across to drivers. Most of our drivers have never had a serious accident. Most of them never will have. Every organization wants to find ways and means of helping these drivers avoid having that serious accident. We improve our performance by taking a look at past performances and by picking out the flaws and defects and mistakes that we've made.

We have a series of colored slides taken at the scene of some of our most serious accidents. We made a detailed study of more than 150 million mi . of highways operations and we use slides from some of the accidents that occurred during that operation.

DRIVERS VIEW SLIDES

We have started talking to our drivers along the lines of asking them to try to recognize what has taken place at the scene of a serious accident. We do not draw conclusions; we ask them to look over the slide. We give them the facts, the evidence collected at the scene and they figure it out for themselves.

One slide shows an accident that occurred on a straight highway of dry road, ideal weather conditions and in the daytime. The driver failed to recognize a hazard—a soft mound of earth graded up on both shoulders preparatory to having it rolled out and sodded. He moved along at the permissible speed, in this case at 45 mph, but did not recognize the hazard of this soft earth. He lost control and was forced to leave the highway.

We have a closeup shot that impresses our drivers. They tell us that every time they step into the cab of a tractor they are reminded that their cab can end up looking like this.

We thought that it was physically impossible for a unit that weighed 20,000 pounds and had 26,000 pounds of freight on it, a total of 46,000 pounds to be lifted completely into mid-air without a collision. We found from our investigation that this unit left the road, hit this soft sod and traveled completely in mid-air and turned over and came down on the roof of the trailer.

EXPLAIN LOSS OF BUSINESS

Another slide shows a tractor and trailer taken out of service for a long time for repairs, while another tractor and trailer and driver are at the scene of this accident who would normally be delivering freight and performing service for our customers. A wrecker, the state police and cars moving past the scene are included which adds up to poor public relations.

One shot shows an automobile that struck one of our units which was legally parked. Many of our drivers have gotten into the habit of wheeling into their favorite coffee stop and jumping out of the cab and dashing in for a cup of coffee and a little conversation with the waitress without due regard to being legally and properly parked.

In this case we were not liable. We show these slides to impress upon our drivers the importance of parking legally and safely. The man who was driving this car was drunk. He was thrown from the car and killed.

But we had to prove, of course, that we were legally parked or we would have ended up paying out thousands of dollars as a result of this death.

CUT SPEED ON CURVES

Others show units that ended up off the highway because the drivers failed to recognize the need for reducing speed on a curve . . . a tractor taken out of service, a trailer taken out of service. Our customers are not getting the goods they want in time and we lose business as a result of this.

We can point out here that if a vehicle had been coming from the other direction

we would have had a head-on collision and probably fatalities. As it was it was a non-collision, the unit overturned.

This driver failed to recognize the highway signs preceding this curve. He had gone over this route so often that he thought he knew it by heart and he tried to negotiate a 30 mph. curve at 45 mph., which under these conditions was physically impossible.

One accident was photographed to help us sell our drivers on the use of the tachographs. We have a tachograph on every highway tractor. Some drivers complain about them as many of you know. In this case the driver of this automobile was late for work. Our driver had made a complete stop at a four-way stop sign. He shifted down after stopping, started to across the intersection and was struck by this car just at the landing gear of the trailer.

TACHOGRAPHS PROTECT

There was a clear view from all directions before approaching this intersection. The first thing that the state police and the sheriff wanted to know was whether or not our driver had stopped. They assumed that he might have slid through the stop sign and therefore would have been equally liable for the resultant injury.

The driver removed the tachograph chart and gave it to the state police and sheriff. They saw then that he had definitely come to a complete stop. This one set of slides has done more than anything else to sell our drivers on the fact that the tachograph can protect them and it stimulates their acceptance of it.

Another shot helps stress the importance of getting the load safely to our customers. The drivers realize when they see this that we pay out a lot of money as a result of damage to our shipments resulting from accidents.

CAUSED POOR RELATIONS

This accident also occurred on a curve with a frozen shoulder. The driver came around the curve at too high a rate of speed. He was not hurt, but he tore down the telephone line serving the area which caused a lot of criticism. Naturally it was a reflection on him as well as the company. We again took a tractor and trailer out of service and delayed a shipment.

Most of our drivers have told us that when they look at this slide they visualize themselves sitting there between that steering wheel and the rear of the cab. There isn't enough room for anyone of them no matter what their size is.

This accident and another one illustrates two of our men would have lost their lives if they had been strapped down with safety belts. You may say that that's purely an act of God and well it may be. But the fact remains that this man was thrown from behind the steering wheel into the right front seat and as a result jumped out of that tractor and walked away.

This picture impresses the drivers with the fact that it might have been their chest behind that wheel, between it and the rear glass.

One series of pictures shows another tractor accident—the only fatality in the service of our company. The driver left the highway during a snowstorm. He failed to recognize that decrease in visibility was a driving hazard. He continued to operate at 45 mph. when he should have either stopped or reduced his speed to possibly 15 or 20 mph.

VISIBILITY HAZARDS

He left the road, travelled 309 feet in a straight line on the shoulder and we think that he was still under power when he struck the tree. He struck it with such force that the trailer came in on the cab, the engine was shoved back in the cab and he was pinned against the back. The steering wheel pinned his hands to the dash board, crushed it against his feet and pinned them to the floor boards.

The man was alive following this accident and was coherent. He was concerned about his family and rightly so because he had a wife and five little kiddies whom he just left a few hours before this and they were expecting him back the next day. Most of our drivers give this picture serious thought when we show it to them.

Another shot shows the distance the tree penetrated into the tractor. It penetrated clear up to the fire wall. Most men don't realize the amount of force and energy that they have behind them when they cruise along at 40 or 50 mph. down the highway.

Needless to say we pick the worst accidents that we possibly can find. They're the most impressive.

One accident shown does not involve our equipment. It involved an over-the-road bus. We show it because many of our drivers travel over the route where this accident occurred. This occurred at a blind rural intersection. The driver of a farm truck failed to stop for the stop sign.

The bus driver was travelling leisurely but he failed to recognize the hazard that existed in the intersection. He did not reduce his speed, he was not prepared for what happened when he hit this truck. The front motor of the bus shot back past the front axle. The driver was killed and several people injured.

We have used these slides to good advantage. There are many people who think that this is a negative rather than a positive approach. We consider it positive because we get positive results. Our men have stayed around our safety meeting for an hour or two talking about these accidents. They never did that before.

CONSIDERING VISUAL AIDS

When we prepared the visual type of accident scene presentation we asked ourselves the following questions:

—Do drivers resent this sort of presentation?

—Is this a negative rather than a positive approach to accident prevention?

—Does this give drivers an impression that will encourage them to be more cautious?

—If there are any good results, could these same results be attained in any other manner?

—Does this tend to embarrass the individual who actually had the accident?

—Can the company benefit from this sort of detailed on-the-scene investigation?

—Is it practical to spend the time and money required for this type of investigation?

—Does the fact that you are self-insured or not have any bearing on this type of investigation?

—Will a detailed investigation pay off in accident prevention and a reduction in claims?

—Are there any other reasons to justify the time and expense involved in detailed investigations?

—Does a detailed investigation ever bring out facts about the equipment that would remain unknown otherwise?

—Is this kind of investigation given any consideration by the Interstate Commerce Commission?

—Should drivers be spared the discomfort of looking upon the serious accidents their buddies have experienced?

—Does this help to convince the drivers who think that it can't happen to them that it might happen to them? Most of your drivers have never had a serious accident and most serious accidents were a first time experience for those who have had them.

—Is a visual presentation the best for maximum effects? If so, what subject matter would be more effective than past accidents?▲

HUMAN RELATIONS—THE KEY TO DRIVER SUPERVISION

by DR. GEORGE D. HEATON
Minister, Myers Park Baptist Church, Charlotte, N. C.

While human relations is the key to all supervision, human relations bears the same relationship to supervision that pathology bears to the medical profession. Until the science of pathology developed, medicine was mere sorcery and magic. But then pathology gave the medical profession something sure and positive for making diagnosis and applying therapy.

Human relations is no gimmick. Human relations is no technique. It is the pathology from which all techniques develop. When one understands the real meaning of human relations, he sees that it has a definite bearing upon everything from the moment that an employee is being interviewed as a prospective employee on through his orientation, indoctrination, training throughout all of his supervisory experiences.

Human relations is the very foundation of communication, of discipline, of handling complaints, of obtaining the participation of people. It is the pathology of supervision. If the pathology isn't right, the techniques are mere guess work.

DEVELOPING TECHNIQUES

If human relations are not right, our techniques are only, at best, haphazard. But with right human relationships, men can find where the techniques that will not only cure some of the things that disturb us, but that will prevent *these things from* ever happening. So I would present to you just a few elements in this human relations which is the key to driver supervision as though I were presenting some elements of pathology to the medical profession.

These are elements that we know are true of human beings. When you accept these basic principles, you can upon that foundation develop adequate and satisfactory techniques not only for the supervision of drivers but for the supervision of all personnel, not only to eliminate accidents, but to reduce costs and improve service.

The first basic principle of all human behavior is this: every attitude that a human being has is his learned way of meeting his needs. You will never get anywhere in the long pull of making your drivers safety conscious unless you recognize that the attitudes of human beings are *our learned* ways of meeting our needs.

CHANGING ATTITUDES

Now there are only two sets of conditions on which my attitudes will ever be changed. One is when I discover that my attitudes which I had learned in childhood and adolescence will no longer meet my needs in an adult world. The moment that I find that any attitude that I have will no longer meet my needs I will change that attitude; nobody can change it for me.

The second *set of conditions is when I* discover that I have new needs for which I do not have attitudes. I have a son who lives in California. He married a year ago and my wife and I read the letters that his wife writes to us and since he's in that Hollywood section of California, we really wondered if it's our son that she's living with. The man that she writes about is not the one we lived with. I'd get up every morning at four at home. That's when he was coming to bed.

We shared the same bath and he'd always be with me and say, "Boy, I'd never work that hard for a living." I preached to him; I lectured to him but he was allergic to hammers, saws, lawn mowers and was sensitive to anything that involved work. But now our daughter-in-law writes about a man that she's living with who's made all the living room furniture, who gets up at four o'clock every morning and goes to work.

She says he's my son. But you see he didn't have any needs that required those attitudes as long as I was feeding him. But when he got her and became a husband, he found that he had some needs for which he didn't have attitudes, therefore, he changed.

Now this is the underlined principle to change the attitudes of people, and attitudes can be changed. You have to build on a sound pathology, you can't go around with any crack patent medicine remedies. You have to understand how people do change their attitudes by the statements that have been made to you.

RESOURCE FOR THINKING

That's the first part of the pathology. The second thing is this: every human being has only one resource for thinking, just one. That resource is the accumulation of all his past memories of his experiences. There is no such thing as a bolt out of the blue. There is no such thing as an idea that's unrelated to a man's past experiences. The only way that you can think and the only way that anyone else can think is by marshalling the memories of his past experiences to bear up on a problem.

If you will understand that all human behavior in its thinking process is but the use of the memory of past experiences, then you can make sure that your people will have experiences out of which they will be able to think, and to think in a pattern of safety. But, if they are denied the experiences which can be used as memories in thinking they will be unable to think as they move along a highway.

Now, this is the pathology of supervision and the third principle is that every human being is a unique. Every human being is a unique individual. God has gone to great pains to make you and every driver different from every other human being. Out of the sexual process of reproduction in which two microscopic cells unite in one cell and then it divides and divides, billions of people have been born and no two of them ever looked identical. A very profound thing.

EVERYONE CAN CONTRIBUTE

But what is more profound is that no two human beings have ever had the same experiences; no two human beings have ever acquired the same attitudes, the same habits, the same preferences. If you forget everything else, remember, that every human being who works for your company can make a contribution to the solution of a problem which no other person in your company can make.

For his memories are different from the memories of everyone else and there isn't any problem of safety, there isn't any problem of reduction of cost, there isn't any problem for improvement of service but that this individual regardless of his academic background can make a unique contribution to the solution of that problem which no other human being can make.

This is the real dignity of man and the pathology of supervision dictates that if you want the cooperation of people, you must give meaning and purpose to what they do in work by recognizing that uniqueness in their dignity, that uniqueness whereby they can make a contribution to the solution of problems which no one else can make.

REMEMBER—EVERYONE'S UNIQUE

If you don't do it you can't pay them high enough wages, you can't give them enough fringe benefits, you can't give them enough security that they will ever be anything other than sullen and antagonist and non-cooperative. You have violated that basic element in the pathology of human relationships that God made me unique and I can do something and think thoughts which no other human being can do.

Now that which seems to destroy this pathology more than anything else, that which seems to destroy good human relationships more than anything else is that which is described in this brief passage from the Bible:

"Bend your ear to this knowledge that caution may be your safeguard and prudence may take care of you. Keep hold of caution and sound sense that they may save you from the loose woman. Her lips drop honeyed words, her talk is smoother than oil itself but the end with her is bitter as poison, sharp as a sword with double edge, her feet go down to death, her steps leads straight to the grave. The high road of life is not for her, shifting and slippery are her tracks."

Who is this loose woman? I'll give you her names for she has many aliases. She is misunderstanding, she is misjudgment, she is miscalculation, she is misinterpretation, she is misteaching, she is mistake.

Whatever her name, she's a dangerous woman.

She destroys the relationships among men that enable men in full dignity to grapple with their mutual problems and if you will but recognize the basic elements in the pathology of supervision you will be able to build your own techniques which founded upon the truths about people will enable you to accomplish what is the goal of all management-to get an important job done with the help of other people.

It's not only hard to do it without their help, often it is impossible. Good human relationships is the way that you get the help of other people to do an important job. ▲

DO WE DRIVE AS WE LIVE?

by DR. PRESTON BRADLEY

Pastor, The Peoples Church of Chicago, Chicago

When talking about safety you only have one theme and all you can possibly do is a variation upon that theme. The effectiveness of what you're saying will depend entirely upon your capacity to create the variation.

I'm chairman of the Library Commission of the City of Chicago and chairman of the Mayor's Commission on Human Relations and a member of the Illinois Prison Investigation Commission. I've given a great deal of my life to enterprises with a civic circumference. But, I get a little tired about the constant undignified references to Chicago. If they would only tell all the truth it wouldn't be so bad.

We are in an era where accidents, murders, immorality, corruption and sin are news. Goodness and truth and achievement are not yet news. They do not possess the dramatic quality of news and that happens in this matter called publicity. Let me tell you what I mean. I could lecture giving the best of my mind, the best of my thinking, the best of my energy.

I could project my ideas to the best of my limitations which are many and nobody would pay much attention. Every editor in the city of Chicago is my friend. But the probabilities are that no matter what I'd say while I have this opportunity, it won't make any headlines. Nobody will care much about it, nobody.

THIS MAKES NEWS

But, I can put my name in one inch letters on the front page before eight o'clock tonight of every newspaper published in the city of Chicago with no trouble at all. All I have to do is artfully get my fingers in your pocket and get your wallet and put it in mine and then go around and visit some more and get in and get another wallet and get four or five of your wallets and start out of here.

The house detective gets me going out the door on La Salle Street and says, "Doctor can you step into the office a minute." He finds your pocketbooks in my pocket. There isn't a newspaper in the city of Chicago that won't have a headline "Doctor Bradley Arrested As A Thief." That's news.

Until we can bring sufficient pressure on those who have the power of creating public opinion in your field and in mine and in every other area which affects the human personality this is going to be an uphill battle.

PUBLIC OPINION BRINGS ACTION

The greatest force and power in a democratic society are the newspaper, the lecturer, the educator, the person who has the responsibility of creating public opinion. For public opinion leads to action and action leads to destiny and destiny is where we are all involved.

You can have a technical appreciation and technological education of the whole problem of safety. You can exchange ideas at national Congresses; you can discuss the by paths; you can do all that. But you and I must find the way in which we can touch that intangible power in a democratic society in which every problem is involved in the creation of public opinion.

Just as the present cold war of the world —a war of missiles and satellites—is not a cold war in which the national boundary lines of unimportant nations are involved or little inarticulate people. It's not merely a cold war in which the representatives of the free world argue and meet and discuss in the United Nations. Fundamentally, it's deeper than that.

This cold war is a war for the human mind. When we come out into the area in which the most valuable thing in the world in involved—a human life—we've got to become more basic and more fundamental than I sometimes think we are. It isn't enough to have a technological understanding of the problem; it isn't enough to have a machine made with honesty and integrity in your control.

Have you ever thought that there never was a perfect machine yet that could not be destroyed and wrecked by an imperfect machinist? The integrity of the machine

today is beyond question. Never were the manufacturers more honest; never was there less cheating in the actual product of transportation.

All of the great industrial equipment of the nation in the creation of the wheel, which is the symbol of the whole problem, were never more integrated with the basic honesty than they are today. I am familiar with a great many of them, a great many of the manufacturers, a great many of the techniques that are used. As an outsider who knows nothing about the technical aspect of safety I want to suggest to you something deeper; something more fundamental.

PURE ACCIDENTS DON'T OCCUR

I don't think that there has ever been a pure accident. I am not one of those who accept the philosophy of fatalism. I am not a fatalist in my theology and I am not a fatalist in my philosophy. And I have lived a long time in the heart of a population of three and a half to five million people and I'm face to face with this problem every day.

Perhaps I should tell you I never drove an automobile. I've been guilty of many things in my life but I've never been behind the wheel of an automobile. I've had an automobile every since there have been any and I have one today. But I have never driven an automobile in my life. Right now I imagine some of you are thinking, "What in thunder does he know about safety?"

Now don't be too sure. As one who doesn't drive, my opportunity to observe my chauffeur and the other fellows on the highway is pretty acute. Don't you discount the authority of that observation.

SAFETY DEPENDS ON PERSONALITY

I think that many times we've been a little wrong in our emphasis about some aspects of safety. When you resolved it all down to its final point it is a matter of personality. It's just as simple as that! It's a matter of personality! I submit this observation to your consideration for you are most deeply concerned.

Something happens to very man who gets behind the wheel of an automobile. Something happens to him, psychologically, and 99 per cent of the accidents both fatal and of little consequence can be traced to a personality defect, a fundamental personality defect.

I have written eight books, two of them on the human personality and I think in this field I speak with some element of authority. I'm dealing all the time with the human element—the element of personality. I have never yet seen a situation which could not be traced to some defect in the personality.

That means that over the long pull with the ever increasing opportunity of speed on the highways of America, and with the application of the scientific aspect of transportation which the experts are giving to us in the creation of the great freeways of the nation, we still have much work to do in the matter of driver's personality.

Last week I was speaking in Los Angeles and a friend of mine who was interested in this very subject took me out on the highways and freeways around Los Angeles. It was a never to be forgotten experience and in a matter of just two or three hours, I saw three tragic accidents in which the lives of eight people were involved.

. . . BECAUSE OF HUMAN FAILURE

When we followed through the investigations that came later, it was not alcohol or the like, it was human failure—lack appreciation of the rights of the other driver.

Obviously, no man should ever take the responsibility of all of his faculties. And, those faculties should not either be depressed or encouraged by an artificial condition. When a brain is befogged with alcohol, even a microscopic presence of alcohol that you could hardly detect on the breath, there is a psychological reaction in the person's will and judgment.

The idea that a person has to be so drunk that he staggers or that he weaves in traffic in order to come under the classification of intoxication is ridiculous. You can't take a spoon full of alcohol in a position of responsibility like that and not have a direct affect upon your will and your judgment. I think that there is an area of education in that field that sooner or later we've got to do something about. It isn't enough to treat it as objectively as it is being treated today.

If the job is really going to be done in the presence of the trend to create more power in an engine, it will take more regulation in the state legislatures and assemblies of our country. The paradoxical situation of most state legislatures talking about 65 daylight and 60 night time and putting increased limitations on speed and in the meantime the manufacturer providing more horsepower is creating serious situations.

I'm not so sure but what it's dangerous to put into the highway an instrument in the hands of a man who depends upon something called quick pick-up knowing that under him is 200 or 300 horsepower, that he can take a chance in any spot because he knows it's there.

I don't think we're beginning early enough to teach safety. This is a power age. Every kid is smitten by the power bug. I've got a nephew that's already talking about space flight. He explained to me the other day how to make a platform in the moon where they can land. He's got it all figured out.

Of course, I don't get as excited about those things as a lot of people. This little piece of tin running around the globe in an orbit doesn't bother me. I don't know why anybody bothers the poor old moon or Mars or any of the rest of it. I think we ought to be doing something about this earth first.

TRAIN PEOPLE EARLY

If we could have saved this money, half of the billions the taxpayers of America pay, to begin this problem of psychological training for the individual at the time we should be at it and not wait to do the job, we'd get the job done. We should be getting at this problem in the earliest grades of school.

We need to study the human personality; we need to develop the whole philosophy of one's reactions and reflexes and responses which are involved in any moment of emergency. What's the test of a man's character anyway? If we should have at this moment some great catastrophe; if there should be an explosion; if this roof would start falling in—we would all be experiencing some great emergency.

Let me see you in the first minute of that emergency and I'll read your character. Let some tragedy come into your life in the next 30 minutes. Let something happen and let me see how you handle that and I'll tell your character.

Most of us can be honest most of the time. Most of us can be true to one woman most of the time. Most of us can pay our debts most of the time. Most of us are pretty decent most of the time. Most of the time doesn't matter, it's what we are the rest of the time that matters, not most of the time.

EMERGENCIES REVEAL CHARACTER

A person is fundamentally what he does and how he responds and how he reacts in an emergency. If you can shape the human personality early enough to build a fortification for the emergencies of life you've done something to transform the whole area of our modern world.

This is a battle for personality and that's why I think that there are psychological tests that are now so definite in their character and so unimpeachable in their authenticity that I should think we would require a psychological analysis of each driver's personality.

There are people who have most of the major requirements but are so sufficiently defective in fundamental requirements that they go to pieces and you wonder why a sudden flare up in the highway happens, when sudden anger arises.

If my chauffeur who's been with me for many years ever told me I had the right of way, I'd fire him. There isn't any right of way, fundamentally. There is only a right way and yet there are those on these highways whose character becomes suddenly transformed and anger comes quickly. That's part of his personal character.

POWER AGE GROWING

It hasn't anything to do with his ability to drive or the principle of safety. It's a psychological factor in that person's life and I think we're wasting a whole lot of time and a great deal of our emphasis: first, by not beginning early enough. This is a power age and it's going to increase in power as the days go by; we haven't even started yet.

The automobile itself will undergo such a great transformance in the next 25 years that none of you would hardly recognize it today. Safety problems are going to increase not decrease. Let us, in the great area of the mind and in the psychological

aspect of it, recognize how important that phase is, too.

You let me see a person in traffic with responsibility and let me sit along side of him and analyze his reactions and I will grade that person's basic responsibility and understanding of safety to an uncanny degree of perfection. Let me see his reflexes and his responses and I will ascertain the quality of his understanding of safety. If pride and self-importance and right of way and all such factors are predominant, he's dangerous. And sooner or later he'll have trouble.

Of the awards that we have made in the city of Chicago for safety, and I've been making them to the Police Department and the Fire Department and to other institutions in our city, the recipients have been the most highly integrated characters in the departments.

A man for safety is an integrated personality. He's a man who is completely in control—first of his mind, next of his emotions, next of his body, so that he is in control of every given circumstance. That man knows and practices safety. Let us have more of those kind of men.▲

REPORT OF THE NATIONAL FLEET SAFETY CONTEST COMMITTEE

by E. G. COX

chief, Section of Safety, Bureau of Motor Carriers,
Interstate Commerce Commission, Washington, D. C.

Each year we report the current National Fleet Safety Contest, bigger and better than the year before. To some, this might sound repetitious and uninteresting. We know, however, that the situation indicates progress both in volume of accident data and in the accident frequency rate of reporting fleets. The mileage of participating fleets increased 215 million miles in 1957 compared to the previous year, yet, accidents dropped 200. The result was a decrease in frequency rate of five per cent.

The average frequency rate of 1.51 accidents per 100,000 miles operated is the second lowest frequency rate in the history of the contest. It is only exceeded by the 1954-1955 contest rate of 1.44.

Records of winning fleets were verified by personal audit for the seventh year. The largest number of contestants were checked by audit than ever before. The 325 audits represent over 93 per cent completion despite the difficulty of obtaining representatives of the contest committee in each state, Canada and the Territorial Hawaii.

From the audit work sheets reviewed by members of the contest committee, it was found that 70 per cent of the contestants were certified exactly as they reported to the contest. Twenty-one per cent of the audits resulted in some change up or down in mileage or accidents and in nine per cent of the audits, the contestant dropped out of the running.

250 AWARDS PRESENTED

More than 250 awards are being presented to contestants in the 1956-57 National Fleet Safety contest.

These consist of first, second and third place awards, as well as perfect record certificates.

To each of the winners, we extend our heartiest congratulations and to the runners-up our hope for improvement during the coming year. To every contestant who participated in the contest, we offer our thanks.

Needless to say every contestant cannot be a winner. Yet, every fleet that improves its record in each succeeding year is a winner by virtue of savings to the company in dollars and lives.▲

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CURRENT SAFETY TOPICS

Volume 21

GREEN CROSS FOR SAFETY®

OCCUPATIONAL HEALTH NURSING SECTION

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the [illegible] page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts, with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE OCCUPATIONAL HEALTH NURSING SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Occupational Health Nursing Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Occupational Health Nursing Section carries on in behalf of its members, and for the benefit of accident prevention work in industrial nursing generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of industrial nurses. The activities of the Section are under the direction of its executive committee, the members of which are listed at the close of this volume.

INTRODUCTORY REMARKS

by VERNA PASKUNA, R.N., General Chairman
Owens-Illinois Glass co., Streator, Ill.

There has been a session for nurses at the Congress since and including the third congress in 1915. This is proof that the National Safety Council recognized early the importance of the nurses' part in the accident prevention program. The fact that the nurses petitioned for a Section indicates that they wanted to take an active part in the overall objective of the Council, namely accident prevention.

This year a call has been sent to the nation to "Back the attack on traffic accidents" and we as nurses have a big responsibility in this endeavor.

The drive will be successful if we never overlook an opportunity to speak a word of caution, educating the impulsive to take care, guarding against the hazards so well known to all of us but so frequently ignored. To us accident prevention should be an ever present activity. Like religion it should be practiced every day and in every act we perform.

So team work again becomes the important factor. Each and everyone of us in the safety movement should join forces to help eliminate these tragic accidents on the highway that bring grief, pain, reduce man's earning power. All these factors affect production in industry.

As occupational health nurses we are in a strategic position to promote health and safety off the job as well as on the job. May you return with new ideas and zeal to help carry out this program in your own areas after attending this 45th Annual Safety Congress, and the 43rd in which the nurses have met in special sessions.

These meetings are set up primarily that those in attendance may derive some benefit from them and help you do a better job.

I want to express my heartfelt thanks to each and everyone on our committee for the time, interest and ideas they have contributed for the good of the Section. We are grateful to the staff of the National Safety Council for the moral support given us and especially to David Arm and his industrial staff and Miss Jane S. Weir, R.N., our Section staff representative, for their fine help and guidance.

EMERGENCY FIRST AID PROGRAMS IN INDUSTRY

by EARL H. BREON
director, First Aid Service, American National Red Cross, Washington, D. C.

Most people are satisfied that the definition of First Aid states the issue. This is far from true. A history of more than a half century of experience keeps insisting that the remedial values of First Aid education are about 10 per cent of the total and that preventive values are 90 per cent of the total.

Good safety education programs are concerned with CAUSE—EFFECT—and PREVENTION of accidents. First Aid education is concerned with these three and adds the all important fourth—CARE.

Because we deal with humans, we must face the fact that preventive measures can only reduce accidents to a certain unspecified minimum and then only under controlled circumstances. The uncontrolled situations create enough injuries to warrant training people in simple remedial measures. *PREVENTION* then is a *primary* goal of First Aid education.

In addition there are certain emergencies such as severe hemorrhage, suspension of breathing and ingestion of poisonous substances when immediate action is imperative.

Teaching lifesaving skills is a *secondary* goal of First Aid education.

When an accident happens, the victim suddenly has new problems and needs. Events seem unreal or remote and his mind is dull. The emotional reaction associated with a serious accident subsides only gradually. The first aider is taught to deal with the *whole* situation, the person, and the injury. He knows that handling injured parts should be avoided if possible and movement of the injured person should be attempted only if surrounding hazards pose a threat to life. The third goal of First Aid training then is *PROTECTION OF THE INJURED.*

REMEDIAL VALUES FIRST AID TRAINING

Emergency care cannot be confined to the health room or First Aid posts throughout the plant. A severed brachial or femoral artery will not wait for the nurse or doctor to come from a remote part of the plant before it starts to bleed. Paralysis of the respiratory center, accidents excluding air from the lungs, or inhaled gases that displace oxygen in the blood stream are examples of the need for action on the part of those at the accident scene.

How much time do you have after breathing stops, before brain damage occurs, and loss of life is imminent—not much time—a few precious minutes. The same is true of accidental oral poisoning and chemical burns, especially those burns involving the face. Industrial emergency First Aid programs must teach *all* personnel what to do in these emergencies.

The industrial nurse can and does play a vital role in planning good programs by (1) conversational teaching, (2) lectures, and (3) posting visual aids. But one additional step is necessary. The employee must practice safety skills (including First Aid skills) if retention is to be good. Studies in other areas confirm the fact that participation is essential if the learner is expected to remember motor skills for even short periods of time.

If we can agree that simple First Aid procedures for use in dire emergencies are a basic requirement for each employee, the next step involves areas of team work to handle skeletal injuries properly. If your plant is one where injuries to the long bones of the body, the back, and the head are high, your emergency care program should include training groups to transport the injured. When movement of a victim with a skeletal injury is attempted by a group of three or four even with some previous training, lack of team work often may bring disastrous results.

It is not an easy task to keep the body joints locked while moving a victim to a supporting frame or litter for transfer to the health room or dispensary. Those involved in the task must know the principles involved *and* be able to work well together. A competent leader for the team is essential. Selected, identified groups should function as units when accident victims must be transferred from any section of the plant to the health room.

The third step extends benefits beyond the four walls of the plant—to the employee's home and family, to his community, and to his own off-the-job activities. The same remedial values apply here. The lifesaving skills learned in the plant are brought to the home to be used, not only by the employee, but members of his family too.

The remedial aspect of First Aid training in industry should add up to these three things:

1. Training every employee in lifesaving skills.
2. Group training to provide essential teamwork for handling transportation of the severely injured.
3. Extension of the program to the family and community.

One final word about remedial First Aid. Advise changes frequently and sometimes drastically. Keep up to date.

PREVENTIVE VALUES OF FIRST AID TRAINING

The primary objective of First Aid training is prevention of accidents. The accident prevention impetus comes from active participation *in*, not passive acceptance *of* a program.

When the learner associates falls with fractures and practices immobilizing these hypothetical fractures on friends and coworkers, the association becomes deep-rooted and awareness of consequences of falls become something tangible. A motion picture or a lecture is a weak substitute. Safety awareness generated by participation in first aid skill activities is a lasting thing. It is "portable"—it goes with the owner. It has wide range of application on-the-job and off-the-job.

First aid cannot cure *all* the ills, but it can cure *some* of them. The whole plant safety program is made up of many ingredients. Emergency care is one of these and emergency first aid programs play an important role. Those who say First Aid is an "after the fact" activity just haven't had experience with it. First Aid training sharpens the desire for safety.

Safety doesn't stop when the accident occurs. Minor accidents do not become major ones and major ones fatal when basic principles of caring for injuries are understood and applied. Since 1882 when the Red Cross first became interested in this activity, these preventive values have been a by-product of First Aid training whether by intent or not.

The following equation is not for thermonuclear explosions but for simple human engineering.

MAN + MOTION = ACCIDENT

MAN + MOTION + JUDGMENT = ACCIDENT

MAN + MOTION + JUDGMENT + TRAINING = ACCIDENT

MAN + MOTION + JUDGMENT + TRAINING + DESIRE = ACCIDENT

With each addition the accident is postponed, made smaller and less vicious, but the accident never leaves the equation as long as MAN AND MOTION are involved.

Good "Emergency First Aid Programs in Industry" are:

- tailored to fit the plant needs
- part of the safety program
- part of the health program and in small industries they may be the total program
- programs with carry over value to the employee's family
- contributing to better community life
- creating large groups of self reliant people who should act better in emergencies such as disasters, man made or otherwise.

Building programs that do these things requires complete understanding at the operating level and complete support of management.

The physician, the nurse, the safety director and the employee must cooperate for the good of all.

To the industrial nurse—participate in formal and conversational teaching of employees, and each time you do this, have the man's family in mind. Show him how his training and skills can be adapted to his home life—help him to become more interested in first aid and safety. There isn't a higher dividend obtainable in any other company project.

Handling Problems of

ASPHYXIA IN INDUSTRY

by JOHN B. DUNNE

sales manager, medical and hospital dept., Globe Industries Inc., Dayton, Ohio

In a popular radio commercial, a voice on the phone asks a harrassed J.B., "Are you immune?" In a startled voice he asks, "Immune to what?" The answer comes back, "Immune to odor causing bacteria on the skin."

We're not interested in bacteria, whether they cause odor on the skin, but whether you are immune in your plant. Immune to what? Immune to accidents causing asphyxia.

During the last war, a plant manufacturing delicate instruments must have thought they were surely immune to such cases. One

night, however, a maintenance man set about repairing a test bench of one woman employee. His shoulder touched an electrical grid, his leg was touching a metal bench leg. The result was, according to the coroner's report, "Death caused by asphyxia due to electric shock." Then they knew their plant was not immune.

Several weeks ago, the manufacturers of a popular brand of coffee awakened to the fact that they weren't immune when sixty workers were overcome by inhalation of trichlorethylene escaping from a tank. Eighteen were hospitalized; fortunately none died. These purveyors of pleasant aromas of coffee may have thought they were immune to asphyxia.

Management can take positive steps to render plants as free from this type of accident as possible.

In order to do this we fall back again upon the "Triad of Safety." This three pronged attack on asphyxiating accidents we plan to use is composed of three parts:

Detection; Protection; Treatment.

DETECTION

The ideal way to prevent respiratory emergencies is to detect the causes at the source. Instruments now available permit the safety engineer or industrial hygienist to detect carbon monoxide, hydrogen sulphide and other harmful gases down to three or four parts per million. This equipment is portable and its use is only common sense. Routine checks with these instruments will determine the presence of most potential killers. The men can be alerted to the danger and protective measures can be taken.

In the case of the presence of carbon monoxide the instrument will give warning of the need to ventilate the garage or other area where internal combustion engines are used or where carbon monoxide from any source might be present.

Of course these instruments are most useful to determine leaks and give early warning of the presence of toxic atmospheres. They scarcely can be expected to predict a fulminating escape of gas. It is safe to assume usually where there are traces of gases there is the chance that larger amounts may be present later. Detection therefore, is of utmost importance in every industry. It should be part of every far reaching safety or industrial hygiene program.

Great advances have been made in this department of the "Triad of Safety" in the past 10 years. Workers used to depend on the dubious protection of filter type masks. They now can rely on air supplied, self-contained air or oxygen masks and work in safety. Since these units are independent of the surrounding atmosphere a man can go into a very toxic environment or one completely devoid of oxygen and perform his duties with complete confidence.

PROTECTION

The use of these masks also makes possible the immediate rescue of victims who have been overcome by gas or fumes of any sort. While much work has been done to educate the men to use this equipment, a lot more can be done. If there is any doubt in the mind of a foreman about the presence of gas he must be educated to insist on the men donning protective equipment to do a job.

Selecting the proper type breathing apparatus for various jobs will make teaching the use of this equipment easier. Using a half hour apparatus which weighs over 30 pounds is not justified for a short inspection job. By the same token where he has to work in a toxic atmosphere for several hours the worker needs more than a half hour apparatus but he should not have to carry a heavy load on his back to get his supply of fresh air or oxygen. There are other jobs which can be done ideally with the traditional half hour demand apparatus.

It is incumbent on the supervisors and safety personnel in the plant to analyze the jobs to fit the mask to the work it is best suited. It is incumbent on the mask manufacturer to put a variety of masks at the disposal of industry best suited to specific jobs.

These manufacturers must give thought to comfort of the mask, proper distribution of weight, greater safety for the mask wearer and on continuing development program for improvement of this equipment. Thus the safety men in industry and the manufacturers can jointly contribute to a better mask program. Education and development can go hand in hand to prevent accidents and aid production.

TREATMENT

In considering treatment of cases of asphyxia, it would be well to list the most likely causes. Industry today is faced with many more respiratory hazards than were present 25 years ago. Complex chemicals used in manufacture of plastics, development of synthetic substitutes, production of components of atomic energy, are just a few of the situations now integrated into our manufacturing picture which make the atmosphere more hazardous. Many plants have increased their electrification a hundredfold in this period, and thus hazards from electricity have multiplied.

Another element in the over-all picture is the introduction of thousands of new workers into new jobs where they are not acquainted with the hazards that are present. Production in heavy industries is being pushed to capacity with fatigue from equipment a very real threat. Small industry and commercial establishments are faced with an aging employee population, and cardiac cases are more prevalent.

Therefore, the most likely causes of asphyxia in industry are:

1—Carbon monoxide
2—Electric shock
3—Cardiac cases
4—Inhalation of hydrocarbons
5—Toxic chemical inhalation, including chlorine, hydrogen sulphide, ammonia, higher oxides of nitrogen, hydrofluoric acid gas and others
6—Exposure to oxygen deficiency.

There are over one hundred toxic agents. Here we'll discuss the five causes of asphyxia in industry according to their relative importance.

CARBON MONOXIDE INHALATION

Probably the most insidious gas known is carbon monoxide. It is colorless, odorless and tasteless. It can be generated almost anywhere without warning and unless special detecting instruments are employed, its presence may not be realized until someone collapses. It is generated wherever carbon products are burned without sufficient oxygen. Common generators of carbon monoxide are automobile engines, gas hot water heaters, unvented space heaters, coke ovens, coal furnaces with faulty flues and others.

Carbon monoxide has a combining power 250 times greater than oxygen with the hemoglobin in the red blood cells. These are the cells which normally carry the oxygen to the tissues. Even with a small percentage of carbon monoxide in the inspired air (a few parts per million) it is possible to displace the oxygen in the blood and saturate it with this other gas. With one per cent carbon monoxide in the surrounding atmosphere a person can become unconscious in a matter of three or four minutes.

SYMPTOMS

The victim usually experiences extreme feeling of fatigue with an overpowering tendency to yawn. A headache quite severe and rapid in onset may strike the front of the head. Dizziness and nausea may be present. Unconsciousness follows and then the stoppage of breathing. The color of the victim of carbon monoxide may be cherry red due to the change in hemoglobin. This often misleads the onlookers into thinking he is well oxygenated. Death will follow if the victim is not soon given artificial respiration.

TREATMENT

The patient should be removed from the gaseous atmosphere but *not exposed to cold*. So doing may cause death from acute cardiac dilatation. Artificial respiration should be started at once. Oxygen should be administered during artificial respiration and for several hours after normal breathing starts.

It is difficult to disassociate the carbon monoxide from the bloodstream once it has replaced the oxygen in the hemoglobin. The patient should not be allowed to get up after restoration of breathing, but should be kept lying down to protect his already overtaxed heart. He should be kept under medical care for as long as deemed necessary.

ELECTRIC SHOCK

Shock from electricity may be brought on by contact with a manufactured electricity source or by being struck by lightning. Voltage, amperage, duration of contact and type of ground all have their part to play in the seriousness of the case. The damage may be due to current passing through the brain, or through the heart, or it may be that the convulsive effect of the shock paralyzes the muscles of respiration.

SYMPTOMS

Victim is usually unconscious and not breathing. Burns are often apparent or may be present under the flesh. The body is often rigid, and the color of the patient is blue.

Immediate removal from the electric current is necessary, and should be done so as not to endanger the rescuer. A dry board, heavy rubber gloves, or dry woolen blanket can be used to pull the patient away.

A common symptom of electric shock which cannot be detected by the nurse, first aider, or rescue worker is ventricular fibrillation. This means that the muscle fibres in the ventricles of the heart are not working in unison, and thus the heart is rendered incapable of pumping blood. Much work has been done by medical investigators to develop a defibrillating device which can be applied to the outside of the patient to get the heart back to its normal function. Encouraging results have been obtained in this field of research.

TREATMENT

Artificial respiration is often difficult to administer manually because of the body rigidity. It must begin at once, however. A reliable resuscitator should be used if available, as this will ventilate the patient through a mask and not rely on movement of the chest wall. Maintain the patient's body temperature at normal.

CARDIAC CASES

Some heart attacks are accompanied by extremely distressed or depressed breathing. In many cases breathing may cease entirely. These cases require artificial respiration. If a reliable resuscitator can be procured, it should be used dispensing 100 per cent oxygen. The victim of such an attack should be kept absolutely quiet. Even when breathing and consciousness have returned, he must not be allowed to sit or stand. He must be transported on a stretcher.

There are heart cases which do not involve stoppage of breathing, but which need oxygen and must be handled with extreme care. These must be kept lying down and extremely quiet. The person should be kept from getting chilled and a doctor should be summoned. Oxygen should be administered continually.

INHALATION OF HYDROCARBONS

There is a long list of solvents which will cause asphyxia very readily. Among these are: gasoline, naphtha, benzine and carbon tetrachloride. When working in a confined space with these the victim may at first experience many of the feelings of intoxication from alcohol. These solvents being highly volatile can be breathed into the lungs, where they are rapidly transmitted through the lung cells to the bloodstream. Loss of ability to focus, staggering gait, thick speech are all part of the picture. Continued exposure will result in unconsciousness and asphyxia.

The patient should be removed to fresh air and artificial respiration begun at once. Severe headache and nausea will probably follow recovery of consciousness. Administration of oxygen over a three or four hour period will alleviate these symptoms.

INHALATION OF TOXIC CHEMICALS

There are any number of chemical irritants which may be encountered in industry today. Chlorine, hydrogen sulphide, ammonia, hydrofluoric acid gas, phosgene, the higher oxides of nitrogen, aldehydes, benzene, benzol, and many, many others. These share in common the ability to irritate the respiratory organs and even do permanent damage to the bronchial tree and lung cells.

When we consider that our lungs are made up of 5½ million alveoli, each a little individual cell capable of transferring oxygen through its wall into the bloodstream and removing carbon dioxide through the wall to be exhaled, we have some idea of the delicacy of these tissues. It is common knowledge to all of us what happens when we scald our hand or some other part of our body. A blister forms quickly as plasma is released into the traumatized area. How much more readily would this occur if a searing, burning gas is taken into our lungs where tissues are so much more delicate!

Fluid perfuses through the wall of the affected lung cells and soon we have a full blown pulmonary edema. If enough fluid fills up the cells, little room is left for air, and as one doctor aptly put it, "We drown in our own juice." Pulmonary edema, then, is a real threat in any of these irritant gas cases.

Still another threat is that when the victim starts to inhale the irritant he may get laryngospasm. If this occurs, he will get less gas in his lungs, but he may promptly suffocate, so his case is equally serious.

TREATMENT

The victim of inhalation of an irritant gas should be removed to fresh air immediately. If he is not breathing he should be given artificial respiration either manually or by means of a resuscitator which can give intermittent positive pressure. *Negative pressure should not be used in these cases.* If laryngospasm is present, it will be apparent that no exchange of air is occurring. The head should be pulled back, hyperextending the neck, and every attempt made to establish an open airway.

If the patient is still breathing he can be assisted with intermittent positive pressure oxygen. He can usually tolerate 4 to 8 mm of mercury pressure. This assists him on inhalation and will gradually overcome his apprehension. There is a slight positive pressure left in the lungs which exceeds the partial pressure of the fluid, which should prevent further perfusion into the cells. This treatment should be continued until he is transported to a hospital or until other treatment is designated by a physician.

Remember, these cases are tricky and the onset of pulmonary edema may be delayed. Thus, sending an employee home prematurely after exposure to an irritant gas may be dangerous. He may require periodic sessions of intermittent positive pressure oxygen for twenty-four hours or more. Much can be done towards preventing permanent lung damage by adequate emergency treatment.

EXPOSURE TO OXYGEN DEFICIENT ATMOSPHERE

We have pointed out previously that 16 per cent oxygen must be present to sustain human lives. Asphyxia brought on by being exposed to atmospheres deficient in oxygen is especially serious. The reason for this is that often the victim of oxygen starvation may not only stop breathing, but may also undergo acute cardiac dilatation. This means the heart expands rapidly and death ensues. Since it is not probable that the lay person can differentiate between asphyxia and death, he should perform artificial respiration until a physician has made his tests for death or until breathing is restored.

Oxygen deficient atmospheres are encountered often in cisterns, old wells, abandoned mines, chemical or oil tanks, vats or in any place where ventilation is poor. Tank cleaning is especially dangerous because the sludge may contain sufficient fumes to exclude the oxygen. No rescue should ever be attempted in these cases without an air or oxygen supplied mask. Filter masks are of no use in such cases.

SYMPTOMS

It is fairly easy to ascertain one's exposure to an oxygen deficient atmosphere. Of course, if the oxygen content is extremely low, the onset of unconsciousness and even death may be immediate. But if the percentage below 16 is not great he will be able to recognize his danger and get out. He will experience a feeling of apprehension. He will find his breathing will become rapid and labored and he may break out in perspiration. If such symptoms are experienced, he should walk or crawl slowly out of the atmosphere, taking care not to hurry unduly. This precaution may save his life.

It seems that it would be timely to say a word about establishing and maintaining a good airway. The finest artificial respiration, manual or automatic, is doomed to failure if the air passage to the lungs is not kept open. It is so important that some anesthesiologists have advocated teaching the technique of intubating to all nurses and first aiders. They have arrived at the decision that many lives are lost each year because air does not get beyond the throat, and the efforts at resuscitation are fruitless.

Inserting a metal or plastic airway will help to some extent. Also the tongue roots should be elevated from under the chin and the head pulled well back. Sometimes even these efforts are to no avail. Nevertheless, *do not neglect this detail.*

No plant, no matter how small, is immune to the hazard of asphyxia. Since this is true, industry should employ the "Triad of Safety"—*Detection, Protection* and *Treatment* to cope with this danger. Because the nurse is concerned mostly with the treatment aspect of the Triad, more attention

was given to this. In maintaining a safe plant, however, all three must be given equal importance.

Since asphyxia has become an increasing threat in our more complex industrial world, it behooves us all to do our utmost to combat it. As industrial nurses you can do your part by learning more about the hazards in your own plant, and then by being ever ready to act immediately. By applying your knowledge and skills you may be able to restore breathing and save human life.

NEW TRENDS IN OCCUPATIONAL HEALTH PROGRAMS

by DR. H. GLENN GARDINER
medical director, Indiana Harbor Works, Inland Steel co., East Chicago, Ind.

The inclusion of the words "trends" and "new" necessitate establishing a base from which to launch.

To identify the subject matter, I avoid the highly technical changes in the complex field of chemistry generally and the atomic energy area particularly. The more technical phases of these special fields seldom concern the nurse and few physicians. Yet, the impact of these developments is felt throughout the industry.

Going back to the beginning trends in occupational health in 1937 we will first discuss the field of patient care. Few important medications used then are still in use today. Of course, the principles of good, clean, basic surgical care have not changed. Some antiseptics today were then new and still to prove themselves. Tetanus antitoxin was widely used, but their problem of serum sickness and various other potential allergic phenomena attendant to its use are still with us today. Immunization of large groups with booster shot follow-ups was not yet practiced.

None of our present battery of chemotherapeutic and antibiotics were then available. There were such things as antitoxins, specific antisera, vaccines of general and specific types, the mysterious bacteriophages and immunogens being used with hope, but the effectiveness never approached the success we now routinely anticipate with our medicines.

Many adjuncts of yesteryear are little used or unknown today. Similarly, the diseases they were calculated to control are little known or rarely seen today: functional knowledge of fluid and electrolyte balance, early postoperative ambulation, internal fixation materials (metal alloys) used in bone surgery such as intramedullary pins and plates better tolerated by the tissues. Plastic and metal suture materials producing little or no tissue reaction are further examples of technical progress in traumatic surgery. Amphetamines and antihistamines have come into their own.

WORKMEN'S COMPENSATION LAWS

Secondly, 1937 was the year of legal awareness of occupational disease. For the first time industry and the business firms concerned with Workmen's Compensation were forced to take cognizance of liability for certain occupational diseases.

The big bad monster was silicosis. How well I remember the fear and consternation in Industry and Casualty Insurance Carriers of Workmen's Compensation when legislation enforced these responsibilities. So little was known about the disease at that time. The widespread industrial exposure to free silica was fantastic. Some people predicted total bankruptcy for industry and the allied insurance people. Time and reason have taken the place of fear.

Silicosis is known, but completely controllable in our modern industry by better housekeeping, improved handling techniques, substitution of safer, yet suitable materials and where necessary, the use of personal protective equipment. Management has been compelled to change its attitude or be refined by legal action. Desirable working conditions as contrasted to minimal legally allowable conditions have many favorable aspects which pay off in the long run, both directly and indirectly.

Now occupational disease must embrace many things: the pneumoconioses, the dermatoses and the many toxic exposures. The hazard of uncontrolled exposure of lead fumes, benzol, carbon tetrachloride, beryllium, cadmium, trichlorethylene, insecticides, and now more recently radioactive materials have opened a new field for exploration.

INDUSTRY FOLLOWED LEGISLATION

With the coming of O.D. acts, people realized the need for promoting occupational health programs in industry. The existing units in city, county and state health departments were expanded—new departments were established where none existed before. Large industry found it economic to seek their help. Where the problems were great and the demand exceeded the existing facilities, some of the more foresighted industries developed their own programs.

Large casualty insurance carriers responsible for the smaller industries pursued the course of enlightened preventive medicine beyond the field of simple mechanical principles of safety. Other allied groups, dedicated to saving life and limb created or expanded such programs, notably, the National Safety Council, the American Medical Association and the Industrial Hygiene Foundation. Pre-employment physical examinations, including chest x-rays, were desirable in most industries and a must in others. Selective placement became a reality to employ certain people without liability risks to employers.

Occupational health was influenced by the effects of World War II. Even before the United States became an active participant, industry moved into high gear production-wise. The resultant attendant hazards were apparent and often resulted from constant demands for increasing quality, as well as quantity. With active war declared, governmental agencies were concerned both directly and indirectly in all plants handling war or defense contracts.

Their concern was not limited to sabotage alone, but included development of new products and processes. Industry produced large quantities of high quality products both old and new, and as expeditiously as possible with due regard to health and safety of the people producing. With the wartime economy, programs previously considered too expensive suddenly began. The cost plus war contracts allowed the introduction of things long wanted and considered worthwhile. In the health field particularly these programs were favored.

WAR EXPANDED INDUSTRY SAFETY

With the O.D. acts and World War II, occupational health came of age and gathered momentum. The unprecedented post war prosperity has been a potent factor. The creation of new groups and expansion of old groups represented physicians, nurses, hygienists, dentists and physicians. A board of occupational health as a subspecialty of preventive medicine with public health and aviation medicine has come into being. Special training at postgraduate level is now available in a number of medical schools for special degrees certifying training and proficiency in this field.

Competition exists between the various organizations representing the interests of the professional people but it is a healthy, cooperative competition, adding to the accomplishments of each other and the ultimate goals of all.

In the field of occupational health, safety and health are inseparable. Industry has learned that it is economic to give formal attention to matters pertaining to health and safety. Large industries provide their own, small industries buy from or though insurance carriers or groups providing medical, dental, nursing, hygiene, engineering or other applicable services. More professional people are devoting part or all their time to problems related to occupational health than ever before.

Permanent impairment, time lost from work and the mortality and morbidity of occupational origin is at an all time low per unit produced. Our old problems are largely controlled, and new problems anticipated and minimized. Those escaping temporarily are soon identified, classified and dealt with. More and more the expert is called during the planning stage. By this means the recognizable hazard in the new product or process

is considered and often with great economic advantage. The delay in marketing a product after discovering an unsafe process can be disastrous. Materials or procedures can be altered when anticipating a toxic hazard of intolerable scope will occur.

CONTROL ENVIRONMENT FOR HEALTH

Environmental controls by the engineering and occupational hygiene approach in the better organized plants give attention to minute details. Not only hazards, but nuisance problems receive attention. Dust, gas, smoke, fumes and vapors which may be a community, as well as a plant problem, are seen. The very presence of these things in some manufacturing processes may indicate an inefficient or uneconomic operation, and correction would serve a multiple benefit. Also, under this general program are food available to workers, its preparation, handling and disposition in a safe, clean, appetizing manner, a place to eat, and garbage and sewage disposal in a safe and acceptable fashion.

Water pollution is often a greater problem than air pollution. The sportsman and the nature conservationist, backed up by laws, keep us alert to the dangers and damages of polluting lakes and streams. Sanitary facilities, bath water, drinking water, salinized as a convenience if general plant area is hot and pest control, should not be overlooked in the area of environmental control.

The rapid developments in chemistry and physics are almost beyond comprehension. Competition brings almost a daily announcement of an improved product, something that will do more for less and easier. With this comes the problems of employees' danger in toxicity of products, its basic components, its by-products, its production techniques, and also the hazard to the community, the ultimate consumer, the consumer's neighbor and customers. Here we are talking about the present day insecticides, the solvents, i.e., hydrocarbon derivatives such as in the rubber and synthetic rubber industry, and the radioactive materials. Geiger counters are now as commonplace to the hygienists as was the impinger a few years ago.

More pre-employment physical examinations are being carried out. Fewer injuries per unit produced are encountered. Earlier treatment and new techniques with present medications hastens healing with less production time loss and less permanent impairment residual. Union Health Centers are daily assuming a more important role in the health matters of the worker, his family and the community.

Far more nurses are employed in industry and their presence and proper functions are better understood and supported by management. The need for their collaboration with the physician responsible for the plant health program is soundly established, but not practiced as closely as desired in many instances.

EDUCATION AIDS O.D.

With the advent of visual aids in training and safety programs, we have the most advanced media for health education purposes, for on-the-job and off-the-job activities. These messages relate not only to the employee, but the various members of his family. Perhaps more familiar are the health messages presented through payroll envelope inserts, bulletin board and various magazines, newspaper and other media. The trend is increasing utilization of services through effective application of expert knowledge in a broadening and growing field of specialization.

TWENTY YEARS INCREASED PROBLEMS

Are all of our problems solved? Not by a long way. Automation and industrial research and progress generally will see that this does not occur. The effects and affects upon emotions and morale may create problems not easily solved. This has increased the need for nurses, psychologists, physicians and other specially trained personnel. The newer drugs termed "tranquilizers" have proven helpful when used judiciously.

Now 20 years after the O.D. furor of 1937 are we facing a problem of similar size and similar concern? Strangely and coincidentally we are. Noise and occupational deafness right now is a very major concern of many industries, businesses and casualty insurance companies, similar to the near-panic from the early version of silicosis.

Recently we learned a great deal about noise and its harmful effects on human hearing. There is still a great deal to be learned. Some of the early hysteria is abating. Representatives of joint committees of medical specialists and others are releasing conclusions on the basis of our present knowledge for guidance. We can not yet say with reasonable certainty some of the things that must be said and sustained before legislation amends the Workmen's Compensation Laws.

Workmen's Compensation is a means of providing a cost of living during periods of disability due to occupational illness or injury and to offset the loss of future earning capacity (based on past experience of the individual) of a person permanently impaired by occupational illness or injury. Some states still provide little or no remedy under the law for the employee, and there is a great disparity between benefits provided in the states. Due to the lag in our legislative system, no state provides adequately and probably never will unless a more practical, flexible, realistic, applicable formula is legislated to follow the constantly changing cost of living.

Amendments to Workmen's Compensation acts in recent years have done little to improve the situation. In addition, the interpretation of the existing acts by politically qualified, but otherwise unqualified representatives, have led to widespread abuses which embrace the creeping socialism so despised in principle by many of us. There is no doubt that there are many people deserving of help from public funds, yet this scarcely constitutes reason for calling upon Workmen's Compensation benefits at the immediate expense of industry to pay compensation for conditions not even remotely related to the man's job, simply because there is presently no other place wherein money can be made available to him. Industry has been and continues to be the whipping boy of our inadequate social system as it exists today in the legal sense.

We must say something to discourage complacency, carelessness and the indiscriminate use of wonder drugs, including tetanus antitoxin, the sulfas, penicillin and its derivatives and all the other chemical and antibiotic preparations. They are two-edged swords. There are definite indications for their use and definite contra-indications, and also a broad area of uncertainty where good judgment and experience must be relied on. To date we have no reasonable substitute for experience. The indiscriminate use of these drugs is reprehensible and at times approaches criminal. The potential of mishap, sensitivity, etc., is great and must not be taken lightly. As a rule when in doubt, don't. Make your mistakes on the safe side.▲

SOME CURRENT ASPECTS OF MEDICAL QUACKERY

by OLIVER FIELD

director, Bureau of Investigation, American Medical Assn., Chicago

In discussing the subject of "Some Current Aspects of Medical Quackery," it is perhaps advisable to consider the present status of pretension to medical skill in the light of what has gone before, particularly during the past half-century.

The Bureau of Investigation has been functioning for more than 50 years as a clearing-house of information on matters in this category. The Bureau was started as a department of the *Journal of the American Medical Association*, partly because of the zeal of the young physician who, soon after graduation from medical school, came to work as an editorial assistant. But his own personal experience caused him to begin a crusade of exposure of the evils of quackery and the venality of a large segment of the "patent medicine" industry.

At about the time this physician arrived as an employee of the American Medical Association, the Congress passed the first Pure Food and Drugs Act. The examples that we have of "cures" and products and their labeling in those days illustrate the

changes that have come about, particularly by the passage of the 1938 Federal Food, Drug and Cosmetic Act.

NO INFORMATION SOURCE

Before the passage of that Act, which, among other things, requires the revelation of the active ingredients on the retail label, there was no source except perhaps the Bureau of Investigation to furnish the medical profession and the public the information. Books, pamphlets, and reports in the *Journal* itself constituted the media whereby Dr. Arthur Cramp did his very effective work.

Before the discovery of insulin by Banting and Best of Toronto, there were a good many diabetic quacks. Their principal products were diuretics. Their claims were broad, their performance woefully inadequate.

Today, however, it is in the field of cancer that the particular interest of both the public and the medical profession lies. In a period of 10 months we counted, in a little more than 4,000 inquiries, more than 1,000 on the subject of cancer "cures" and treatments.

The example that we have here, particularly the Hoxsey cancer treatment, and examples of the methods of promotion, make it evident that over the years the quack has learned by experience that he is ever so much more effective when he hides behind religion and when he sells the public on the claim that he is a martyr to medical persecution.

FEDERAL GOVERNMENT HELPS

The federal government, in the agency of the Food and Drug Administration, has sought for several years to stop not only Mr. Hoxsey, but others, one of whom is particularly known in Vancouver, namely Dr. William F. Koch, who began his promotion from Detroit in 1919.

Although Dr. Koch has been ordered by the Federal Trade Commission to cease advertising that any of his preparations has any value in any disease category, his successors, the Christian Medical Research League of Detroit, continue to sell "Glyoxylide" for $25.00 for a 2 cc. ampule. Glyoxylide is labeled to be a *one to a trillion aqueous* dilution of several alleged ingredients. It is not at all surprising that no chemist has been able to find anything in the ampule but water.

In other fields the quack capitalizes on the advancements of science. We have, for example, the products alleged to be radioactive, which originated in the United States, at least, in the mid 1920's. These were sold as rejuvenators and "cure-alls." Some had no radioactivity whatsoever, others were dangerously radioactive. The modern-day application is the uranium-mine promotion. This has had the benefit of publicity and large patronage in Montana, California, and several other states.

The same is true of the radio. When radio became popular in the 1920's, a California physician, Dr. Albert Abrams, announced his "E.R.A."—Electronic Reactions of Abrams—claiming that he could diagnose from a drop of the blood, and that all disease had "vibratory" rates. Abrams had many imitators, among whom was a chiropractor in Los Angeles named Ruth Drown. Dr. Drown claimed, also, that she could diagnose from a drop of the blood, but failed miserably when put to a test before a committee of scientists at the University of Chicago.

There are many other categories in which the quack flourishes—in the field of reducing preparations, arthritis and rheumatism cures, rejuvenators, the special dietary foods, and the cure-all gadgets. It was Voltaire who said that the quack was born when the first knave met the first fool. The Bureau of Investigation has never accepted that as an adequate definition, feeling that if the person had some knowledge, it would be more difficult for the quack to fool him. That is the premise upon which the Bureau has operated, and hopes to operate in the future.

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URRENT SAFETY TOPICS

Volume 22

GREEN CROSS FOR SAFETY ®

PETROLEUM INDUSTRY

Transactions of th

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE PETROLEUM SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Petroleum Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Petroleum Section carries on in behalf of its members, and for the benefit of accident prevention work in the petroleum industry generally. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of petroleum companies.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

A MANAGEMENT LOOK AT PETROLEUM INDUSTRY SAFETY

by H. W. FERGUSON
vice president, Humble Oil & Refining co., Houston, Tex.

At first glance, of course, there is little new or novel about this subject. Ever since our industry came into being 98 years ago back in Pennsylvania, men in the petroleum business have been confronted with a multitude of safety problems. As was the case in many other industries, safety practices and principles evolved slowly.

Accident prevention had to travel the painful road of trial and error. It had to move through numerous stages of development. But today, throughout the industry, safety is recognized by all levels of management as an indispensable engineering skill. It has become an indispensable factor in keeping America abundantly supplied with oil.

That is the story of petroleum industry safety in a nutshell, but it is far from being complete. For we are living today in an era of great and far-reaching changes which are having, and will continue to have, an impact upon almost every aspect of our social, economic, and technological environment.

These changes may be observed, for example, in the size and make-up of our population, in our automobiles and our homes, in our jobs and the tools we use. This climate of change must inevitably have an effect upon the operations of the petroleum industry and, at the same time, upon the extent and variety of the industry's safety problems.

For a few moments, then, let's explore the changing future of petroleum industry safety. Let's consider some of the factors, both old and new, that will probably influence our accident prevention work and examine some of the problems we may encounter. Finally, let's look at our prospects for solving these problems and review the role that management can and should play in this overall safety effort.

One important factor—one facet of change—will undoubtedly be a substantial growth in all branches of the industry's operations. Such growth may be hard to visualize in these days of over-supply, but the economists assure us that it is very much in the cards. By 1965, for example, it is estimated that America's domestic consumption of oil and liquid hydrocarbons will be in the neighborhood of 13 million barrels a day—an increase of more than 40 per cent of today.

EXPECT INDUSTRY GROWTH

To keep pace with this anticipated growth, some 600,000 wells will have to be drilled over the next 10 years. The industry will have to make tremendous investments—not only in the exploration, drilling, and producing phases of the business—but also in transportation, refining, and marketing facilities.

Growth on this order, as it materializes over the years, can hardly escape multiplying the incidence of safety problems in the industry. It will pose a sharp and continuing challenge to our ingenuity in the field of accident prevention.

TECHNOLOGICAL CHANGE

Another aspect of this challenge—another factor with an important bearing upon our safety achievements of the future—is the industry's changing technology. If the old saying is true—that the future is but the past entered through another door—then we must look forward to new equipment, new methods, and new techniques.

Such changes have always gone hand-in-hand with our industry's growth and progress, and they have usually brought with them new or slightly altered problems in safety. As in the past, we must be prepared to adapt to the changing situation in every phase of our operations.

In exploration, for example, new electronic devices for detonating the explosives used in seismic work seem to be emerging from our research centers almost every month. Seismic techniques are also becom-

ing more complicated, the pattern shooting of recent years being a case in point. Where once we had to worry about shooting only one hole at a time, we now find as many as 36 holes hooked up in a single shooting sequence. Offshore, we are having to deal with large quantities of explosives, often several tons in just one small vessel.

Exploration, then, will continue to pose tough safety problems, especially as we move more and more into isolated areas—offshore, into the swamps and marshes and deserts, and into Alaska and other far-flung places. In offshore work, for instance, close operating quarters have a way of magnifying our safety problems.

Falls, fires, and other accidents are usually more severe and more dangerous there than they are elsewhere. In many locations, weather must also be reckoned with as a great potential hazard—not only in exploration, of course, but in all our operations. Hurricanes Audrey and Bertha drove that point home with considerable force.

DRILLING DANGERS

Drilling operations offer another fertile field for the safety work of today and tomorrow. As deep drilling increases, which it shows every sign of doing, we may encounter some tremendously high and exceedingly dangerous pressures. Just last month, for example, in Louisiana's Lake Washington field, a well in the 19,000-foot class—the second deepest producing well in the world—registered a surface pressure of 11,400 pounds per square inch. This was the highest pressure ever recorded in the history of the industry.

New drilling techniques may also be expected to add certain hazards around the rigs. Already, oil emulsion muds are contributing to more slippery working surfaces and to a greater danger of fire. Jet bit drilling, with pump compounding, puts more dangerous pressures on the hydraulic systems of our rigs. The use of air and natural gas as circulating media has created new possibilities for severe fires and explosions. As drilling equipment becomes heavier and more complex, there will be an increased need for better engineering, more safety devices, and better safety practices.

Those, of course, are only a few of the aspects of drilling safety which will require our best efforts in the years ahead. Gun perforating, formation fracturing, drill stem testing, acidizing, cementing — these and many other specialized tasks will continue, then as now, to call for careful job planning and close safety coordination among all personnel concerned.

ATOMIC ENERGY EXPANDING

In refining, to give you still a third example of our changing safety picture, there will probably be an increasing use of atomic energy in petroleum processing. That means we shall not only have to worry about fire prevention, but we shall also have to cope with the additional hazard of radiation. At the same time, expansion of the petrochemical business will be bringing in new processing techniques—operations that are often quite different from the usual refining processes. Moreover, at certain stages, some of the new petrochemicals are toxic.

Other safety problems in the refinery will arise out of increased mechanization and automation. It is getting to a point, in fact, where a man almost needs a college training to understand what some of the dials on a refinery instrument panel mean. There will undoubtedly be more built-in safety devices, but as our refinery processes become more complex, the men who operate the equipment will have to be better trained than ever and safety conscious to a very high degree.

These three fields—exploration, drilling, and refining—are enough to indicate the variety and extent of our safety problems of the future. We could go on, of course, with other examples—in transportation, with its growing number of super-tankers on sea and its high pressure pipelines on land; in research, with its Van de Graaff accelerators and its other futuristic scientific tools; in marketing, where the problems range from the handling of jet fuels to keeping people from smoking on service station driveways. But I have gone into enough detail to show that accident prevention will be just as demanding a job in the years ahead as it has been in the past.

TRAFFIC SAFETY

The most difficult problem of all, however, I have saved to the last: traffic safety. More Americans, as you probably know, have been killed in automobile accidents than in all of our wars put together. In the petroleum industry, automobiles used in getting to and from jobs have proved far more lethal than any other industrial hazard.

Traffic safety is a broad, encompassing problem—a community problem—but it is also one in which industry and its people have a tremendous amount at stake. A reduction of the senseless toll of life, limb, and property on our nation's streets and highways must, therefore, rank as our No. 1 goal.

Currently under way, of course, is a project that many people think will help brighten the traffic safety picture—the 13-year road building program which will add 41,000 miles of new interstate superhighways to our country's road system. But as every safety engineer knows, it will take more than improved highways to minimize the present carnage. Let me give you an example.

Down in Texas, there was until just recently a 17-mile stretch of brick highway between the towns of Temple and Belton. It was narrow and had many curves, but for five straight years there was not a fatal accident on this road. Early this year, this road was straightened out and otherwise improved. Within a period of six weeks, traffic accidents on the improved highway took four lives.

CREATE SAFE ATTITUDES

So traffic saftey is more than just engineering, education, and enforcement. The answer probably lies in the word attitude, and it is there—through the creation of safe-driving attitudes in all of its employees —that the petroleum industry can make its greatest contribution to a solution of the traffic problem.

I have listed some of the safety problems of the future. How successful will we be in meeting these problems? Can we measure up to the challenge? A backward look over the history of accident prevention in our industry offers every indication that we can. For we have come a long way from the time when accidents were looked upon as acts of God, when the petroleum industry was thought to be an inherently dangerous business where accidents were bound to happen.

Good safety engineering has provided guard devices for exposed operating equipment. Safety rules and safe practices have been established for every phase of the industry. Safety equipment—hard hats, breathing apparatus and goggles—now provide almost every conceivable type of protection. Safety meetings and training of supervisors and employees have become standard operating procedure. Good housekeeping has come into its own as a safety measure.

None of these factors has, by itself, been the whole answer to our safety problem, but collectively they have all led to the development o. the most important factor in accident prevention—the development of the proper attitude, the development of safety consciousness, on the part of employees, supervisors, and management.

LOW FREQUENCY RECORDED

This attitude and all of the industry's other safety measures have enabled us to greatly improve our safety record. Last year, as reported in the API's "annual Summary of Injuries in the Petroleum Industry," 255 leading oil companies with slightly more than half a million workers (539,651) accounted for more than one billion hours of work (1,132,586,195).

They had 8,219 disabling injuries and 109 deaths and permanent total disabilities, but their accident frequency rate was the lowest in the history of the petroleum industry—7.2 disabling injuries per million hours worked. The average days lost per injury was 119.

Compare these figures with the API's safety statistics of 1928, the first year the API made an aggregate recording of statistics for the petroleum industry, and you can see the progress we have made. In 1928, the API recorded the safety experience of 108,000 workers who worked a quarter of a billion hours (248,962,652). They had 6,800 disabling injuries and 77 deaths and permanent total disabilities. Their accident frequency rate was 27.3.

In 28 years, then, we have reduced our accident frequency rate from 27.3 to 7.2—a 73 per cent reduction.

INDIVIDUAL GROUPS' SUCCESSES

Nor do these figures, impressive as they are, tell the whole story. There are drilling rigs, for instance, now working in their eighth year without a disabling injury. Single refineries have worked more than seven million hours without a disabling injury. In our larger refineries, a million hours of safe work has become common-

place. Two research and laboratory groups I know of have worked more than 10 years and 10 million hours without a disabling injury. A gas plant in one company is in its fifth million hours of work without a disabling injury. A marketing organization has passed the four-million-hour mark.

And so it goes. You need only consult the annual summary of the National Safety Council and American Petroleum Institute awards to find many other examples of outstanding achievements. Where the future is concerned, they point to a steady increment in our safety knowledge and to increased effectiveness in our accident prevention work.

In other words, as excellent as our safety record has been in recent years, there seems to be every reason why we should make further gains in the years ahead. Our safety engineering is better today than it has ever been. Our industry's personnel is more highly trained. Great strides are being made in the field of safety devices and protective equipment. There is more automation and less physical effort in all phases of the industry. And, not least of all, there seems to be a greater and more widespread effort on the part of management to bring safety to the highest possible level of development.

MANAGEMENT AIDED

Management's contribution, I think we all realize, can have an important bearing on future results, for as management goes, it has often been said, so goes safety. If our safety record is to be further improved, management must continue to provide safe working conditions and safe equipment. It must set up safety rules and see that they are carried out. It must try to stimulate job interests and job satisfactions, since disgruntled employees are more accident-prone. Management must do everything possible to build up safety consciousness on the part of each employee.

Most important of all, however, management must render active service to the cause of safety. It must personally participate in the program. Lip service won't do. For as all of you must know by now, you can't sell safety through the backdoor. A sound and successful safety program demands the wholehearted and unstinting support of all echelons of management—from the top right down to the bottom-rung supervisor.

In my own company, we are trying to practice what we preach. Just recently, for example, one of our electrical foremen in New Mexico used artificial respiration to save the life of a farmer who had come into contact with a high-voltage wire. When our foreman was awarded the National Safety Council's President's Medal, our company arranged for a presentation of the medal at a family barbecue in the foreman's hometown. And our company president took time out from a busy schedule to travel more than 600 miles to present the medal.

Participation such as this on the part of top management does more to build safety awareness, we believe, than several reams of impersonal statements.

I am exceedingly optimistic as to our safety accomplishments of the future. The main danger is that of our slipping into the attitude of a certain farmer I heard of down the way. A brand-new agricultural agent, fresh out of college and eager to make a good impression, called upon this gentleman. The young county agent offered to provide the farmer with all sorts of pamphlets on terracing, crop rotation, and all the other essentials of modern agriculture. He volunteered to get the farmer's soil analyzed and to help him in many other ways.

"Well, much obliged," the farmer drawled, "but I don't believe I need all that stuff. I'm not farming as good now as I know how."

Those of us interested in the safety movement, I think you will agree, are quite familiar with the potential dangers of that attitude. Our industry has sown seeds of safety information for many years now. We have harvested a large amount of good results. If there are any shortcomings in our future efforts, these shortcomings can hardly be attributed to deficiencies of safety techniques or equipment or to a lack of knowledge. It seems more likely that we'll just not be farming as good as we know how.

It is the responsibility of all of us in the petroleum industry to see that this doesn't happen—to see that we farm the best we know how—and thus help insure a safe present and an even safer future for all of our people.

SAFETY—A NATIONAL NECESSITY

by MIKE McCARTHY

industrial safety consultant, Columbus McKinnon Chain corp., Detroit

The prevention of accidents has been uppermost in the minds of industrial management for many years. Industry has toiled long and hard with this problem and has been successful to a great degree. However, accident prevention is a problem of national scope.

Through the medium of safety conferences throughout the 48 states rapid strides have been made in stressing to all citizens the need for further effort in the field of safety. Many of us do not recognize the enormity and seriousness of the problem and the toll taken each year.

All schemes for prosperity include what we have to do in the international field, what is necessary to improve our domestic economy, to increase employment so more and more of people can be gainfully employed.

Practically all of these ideas are based on some arbitrary plan for managing money. Others are based on some manner of settling accounts, all based on currency values. Each and every discussion omits the one basic fundamental necessary to keep our country in the forefront.

The thing to count on, the only thing to use for sound and enduring prosperity, is real wealth. The only real wealth in any country is natural resources and above all, *human resources. . . .*

Great as America may be, we are not big enough or smart enough to kill 100,000 people each year, maim 10,000,000 and still maintain our position with the nations of the world.

EDUCATION—PROGRESS

I have been asked many times to what I attributed the greatness of our country. My answer is the compulsory education system in this country. When realizing we have 40,000,000 people in educational institutions, and another 3,000,000 doing the educational work required, you can understand that education has played a large part in the development of our country.

You may wonder whether this education has been carried far enough when you realize that, previous to the war, for every accidental fatality in Germany, we had two fatal accidents in America. For every accidental fatality in Japan, we had three in America. Year after year we maim or kill the equivalent of every man, woman and child in the state of Kansas, Nebraska and Iowa. With all our ingenuity and know-how to build a higher standard of living, we fail in preserving the greatest wealth in our country—the men and women of America.

In the last 180 years mankind has really begun to experience equality, justice, freedom, and opportunity. Before the Declaration of Independence, people were tortured because of religion; slavery was accepted; a shoemaker's son could only be a shoemaker, and a king by the nod of his head, could send a man to his doom.

Within the last 60 years, mankind invented telephones, electric lights, refrigerators and automobiles. Is all that progress going to stop short today? I don't think so. We may not be able to see where we are going, but we are still going ahead!

Safety is a national problem as indicated by the fact that practically all states now hold safety conferences. This is a good indication of their recognition of the need for accident prevention.

SAFETY IS NATIONAL

The safety movement has been national, the only difference being in the amount of support given, first by industry, and then by state and federal government. Finally insurance carriers took a hand, until today captains of industry march arm in arm with governors, professors, teachers and scientists, all working with one purpose in mind—the preservation of human life. To make safety a part of our everyday way of life requires the active participation of all people.

The progress of the safety movement was slow until 1913 when a small gathering of

men, known as the Association of Iron and Steel Engineers held a national conference of safety engineers at Milwaukee, Wisconsin. From that meeting was organized the National Safety Council, first called the National Council for Industrial Safety.

Today this great humanitarian organization is made up of more than 6,000 industrial organizations, other associations, and influential individuals. They comprise a cross section of our national life, dedicated to the preservation of life and limb.

CAN'T FORCE SAFETY

The general conception of safety and industry was that all employers and employees could be forced to adopt safe standards of work. Employers' liability and various legislation was placed on the statute books, state inspectors attempted to enforce rigid machine guarding measures, and then employers themselves drafted some drastic measures for their own employees.

It didn't take long for everyone to realize you can not regulate a man's thinking. Management tried to reach the man on the bench by appeal, persuasion, through instructions, bulletins, and various educational media. Many industrial establishments now have a program aimed at off-the-job accidents, realizing that an accident on the highway, or at home incapacitates an employee just as much as one occurring in the plant.

Being closer to the men in the plant, management understood their problem and carried safety activities beyond any official regulations. Accident prevention was economically sound, and many industries, particularly the larger ones, observed a noticeable decrease in accidents.

Manufacturing methods and factory measures were altered for better conditions, and industry played a large part in bringing to the attention of the manufacturers the need for building safety into the product to eliminate hazards and to lighten the burden for our workers.

Much has been acomplished in this direction—hand trucks have been replaced by motor driven trucks, automatic screw machines, oil burners in power houses, conveyors, line shafts and belting eliminated on machines, automatic stokers, all devised to remove hazards and back-breaking labor of these occupations.

Industry has continued to maintain its interest at a high standard and will continue, not only in plants but in the communities and every other field of accident prevention.

One of the most outstanding examples of industry's continued interest in safety occurred about 10 years ago when the automobile industry set up a $500,000 foundation, controlled by the National Safety Council for research work in highway and traffic accidents.

Considering the increased activity, in all but two of the 40 years since the advent of organized safety, the industrial death rate has been lower than it was in 1913. This result speaks well for the industrial effort. But one result transcends all others—people in all walks of life are becoming safety-minded.

In industrial plants, among the majority of thinking people, there is now a serious and definite attitude toward safety. There is a better understanding of the cost of accidents, and a realization of the tragedy which travels hand-in-hand with injuries of all kinds.

There is a growing feeling of the personal responsibility for safety losses in traffic and highway accidents as well as industrial injuries.

The cause of greatest concern in the field of accidents is motor vehicles and home accidents. The state and highway problem lacks the control we have in industry. We must first make the public understand the enormity and seriousness of the situation, and then organize effective leadership.

We should promote safety in the following channels:

PUBLIC SAFETY

Lend every effort toward a solution of the automobile accident problem. Prohibit from the highways unfit and reckless motor vehicle operators. Adopt strict driver's license laws, uniform traffic laws for every city, and standard traffic signs and signals.

Accident reporting systems, should be standardized, necessary street and highway improvements made, strict enforcement and observance of traffic laws and a recognition of the rights of others whether motorists or pedestrians should be stressed. Observe the principle of the golden rule.

INDUSTRIAL SAFETY

Regular and complete inspection and research should be done in all industries, large and small, followed by prompt application of approved remedial measures. Safeguard all dangerous mechanical equipment and use all such devices. Revise hazardous manufacturing processes, continue safety education throughout all plants and enforce full cooperation with all state, municipal agencies and safety councils in carrying on the safety program.

EDUCATION

Let education be the keynote of the coming year so that the lessons and well-defined principles of safety can be firmly implanted in every home and school throughout the state. Let youth be given an opportunity for a full understanding and appreciation of the real meaning of safety so the citizens of tomorrow may enjoy the blessings that safe conditions bestow.

Finally, remember that you stand today in much the same position that our safety pioneers did 40 years ago, when they organized, made new plans, and mutually resolved to do everything possible to save men, women and children from the tragedy of useless accidents.

Every citizen should lead the way recognizing at all times the safety of our people is more than ever a national necessity.

SAFING OF STORAGE TANKS BY THE ABSORPTION METHOD

by W. W. COLKET

coordination engineer, Sun Oil co., Marcus Hook, Pa.

Tanks are necessary for any industry that produces or uses liquids and in the petroleum industry, tanks for storage or processing purposes represent a major capital investment.

Eventually, all tanks must be cleaned for a change of service, for maintenance and repair or eventually, to dismantle and scrap the vessel. To clean those with flammable products, it is mandatory that they be made safe before personnel are permitted in the vessel.

Over the period of years, many accidents have occurred in the industry, primarily because of a lack of a tank safing procedure. In some cases, the only result was damaged equipment; others have resulted in injury to personnel. A great effort should be made to eliminate accidents, since human life is invaluable. Furthermore, they will undermine the confidence of the plant personnel, and create adverse publicity; even minor accidents are costly.

The Sun Oil company has developed a safing procedure through the combined efforts of the operating, mechanical, safety and laboratory personnel. After this plan was perfected, it was strictly adhered to. This procedure has been developed primarily for the protection of our personnel, and secondly, as a safeguard for the equipment. Because of this safing procedure, the tank cleaning operation, which is mostly hand labor, is more efficient due to the increased confidence of the workers.

CATEGORIES OF TANKS

For Sun's safing procedures, tanks are classified according to the products stored:

1. Products having a flash point higher than 125° Closed Cup Flash (Flash Pensky Martin).
2. Products having a flash point of 125° Closed Cup Flash (Flash Pensky Martin) or less.
3. Products containing tetraethyl lead.

Tanks that have been in leaded service are considered contaminated until cleaned, no matter what product stored thereafter.

The tanks in service having a product with a flash point well above 125° F. are comparatively easy to safe for any part of the cleaning operation. They are pumped down, stripped as low as possible and then the vapor space tested with a combustible gas indicator to determine if the vapor space is flammable. In most cases, the indicator shows the vapor is below the flammable range and the tank is safe.

All oil and gas lines are blanked on the tank side of the valves. Up to this point, no manheads have been removed from the tank. Next, the shell and roof manheads are removed and one or more air movers are installed on the roof manways, depending on the size of the vessel. From this point, personnel may enter the tank and cleaning is a routine affair by any method desired.

The tanks in which the products have a flash point of 125° F. or less, are the ones that concern us most. When such a vessel is safed, it must be pumped down and stripped as close to the bottom as possible. The bottom is then covered with an absorption oil (gas oil or fuel oil, having a minimum flash of 150° F.). This is done by pumping in, through a suction, discharge or stripping line, approximately two feet of absorption oil at ambient temperature, letting it soak for approximately 24 hours and then pumping it out, following the original stripping process.

USE ABSORPTION OIL

The tank, if it has a cone roof, is then filled close to the top angle with an absorption oil, and if a floater, it is filled to the point where the roof is floating. Depending upon the amount of bottom sediment and water, (b.s.&w.) that is estimated from gauge measurements to be on the bottom of the tank, it stays dormant for as long as a week. This part of the procedure permits the oil to absorb the hydrocarbon vapors in the vapor space, most of the light ends trapped in the b.s.&w. and behind the scale on the shell. After the soaking period, the tank is again pumped down and stripped.

A vapor space test with a gas indicator is then made from the bottom to the top, through a gauging device, under which there is no stand pipe. If it shows the tank is still within the flammable range, the filling procedure is repeated. When the vapor is below the flammable range, all oil and gas lines are blanked on the tank side of the valves. Then all shell and roof manheads are immediately removed and air movers installed on the roof manways and placed in continous operation until the tank has been cleaned. Personnel may enter when the air movers are in service.

Tanks that have been contaminated by tetraethyl lead are, with one exception, treated in exactly the same manner. This one exception is the mandatory order that no one enters the vessel without complete tetraethyl lead equipment, until such time as the tank has been declared lead free.

INCREASE OIL HEAT

There are many variations in the procedure for tanks in which the products have a 125° F. flash point or less, depending mostly upon the quantity and consisitency of the b.s.&w. on the floor of the tank, the viscosity of the material stored and the amount of scale and dirt deposited on the floor, roof columns and shell. It is sometimes desirable to use several floor washes before filling the tank. If the material on the floor is heavy after the initial wash, warmer (150° to 180° F.) absorption oil may be injected to insure penetration of the heavier b.s.&w.

It has been our experience on several extremely difficult tank safings, that after the second filling, it is necessary to fill the tank for the third time with absorption oil at approximately 180° F. One tank in particular, in which there were 15 feet of b.s.&w., was put into hot gas oil service (180° to 200° F.) for several months until the level of the b.s.&w. was reduced to two feet innage.

Many times after a tank has been made safe to open, the material left on the floor still has light ends mixed with it so that when stirred, it will release sufficient hydrocarbon vapors to make the vapor space flammable or explosive. This condition is eliminated by the use of air movers and by stirring the material on the floor with a high pressure water stream, using a grounded nozzle, (150#, using a 2½" fire hose and a ½" or ¾" nozzle).

The water and the material that is being slurried, are constantly pumped from the tank during the washing process. In one or two cases, when the b.s.&w. was extremely viscous, a high pressure, high flash, gas oil stream was used in the same equipment, to break up the b.s.&w. and to absorb the light ends it contained.

No personnel is allowed in any tank until the vapor space tests below flammable limits. A gas tester is in constant attendance when cleaning a tank which had contained liquids of 125° F. F.P.M. or less, staying inside the tank with the cleaning personnel, continually taking gas tests. If the vapors approach the flammable range at approximately 18 inches from the floor, all personnel are instructed to leave the tank until the vapor space is again safe. In the case of higher flash products, gas tests are made every morning and noon while the cleaning operations are in progress.

No part of the procedure is by-passed at any time, and regardless of the time consumed, no one is permitted to enter a tank or remain in one, if the vapor space reaches flammable limits.

RULES FOR EQUIPMENT

There are certain basic rules governing the types of equipment used and the location of the equipment at the tank site. Air movers used on tanks must be the induction type with a capacity of 4,000 CFM. No automotive equipment, such as engine-driven pumps or compressors is allowed within 100 feet of any open manway. All equipment used in or on the tanks, such as air movers, hoses, must be properly bonded to the tanks. All tools that are used on or within tanks must be fabricated from non-sparking materials.

The air movers are kept in service 24 hours a day, until the tank has been declared gas and/or lead free. At Sun Oil, the air movers are often used until the tank repairs are finished.

An alternate procedure has been developed to handle tanks with a flash point of 125° F. or less, that are located in areas where the use of an absorption oil is not practical or where the disposal problems of the oil and contaminated material becomes difficult or uneconomical. This method may be used where there is a possibility that tetraethyl lead from the recovery of the absorption oil could affect certain catalysts, for use in marketing division tanks, or at outlying tank farms.

PROCEDURES DIFFER

The pumping down and stripping operation remain the same but the balance of the procedure is radically different. After the tank has been stripped, all oil and gas lines are blanked off, and then it is filled with water. While filling, a sufficient quantity of absorption oil is injected with the water to cover the surface of the water with a ½" to 1" film of oil.

The quantity of oil is injected before the tank is ¼ full. When safing a cone roof tank, it is filled to above the top shell angle. When safing a floating roof tank, sufficient water is pumped to raise the roof approximately one foot off the supports. This places the liquid level in close proximity to a roof manhole for skimming operations.

Speaking only of the cone roof tank procedure, after filling with water, a vapor space test with a gas indicater is made above the oil and water level. If it is in the explosive range, an inert gas, such as nitrogen or CO_2 is slowly injected into the vapor space, forcing the hydrocarbon vapors through the roof vents to the atmosphere.

As soon as the gas tests show the vapor space to be inert or below the explosive range, all roof manheads are removed and all other roof connections opened if possible. One or more air movers, depending on the size of the tank, are installed on the manways or roof connections. These air movers stay in service 24 hours a day until the tank has been declared safe and/or lead free.

GAS INDICATOR TEST

The vapor space is again tested and if still below the explosive range, the oil skimming operation is started. This operation consists of the installation of a skimming pan (fabricated from non-sparking material) through a roof manway. The pan elevation is adjusted to skim the oil off the water. The oil and water accumulation in the pan is pumped into tank trucks, using bonded rubber hose and an air driven reciprocating pump. It is possible to skim the oil to a film thickness of approximately ¼".

When the skimming is finished, the water is drained and a gas indicator test is taken

through the open roof manway, to check the quantity of hydrocarbon vapors in the tank. If the test is below the explosive limits, the shell manheads are removed. The cleaning operation is not started until the gas indicator tests show the vapor space to be below the flammable limits.

If the tests indicate an explosive mixture, the filling process, using water and absorption oil, is repeated. Inert gas is not used since the air movers are kept in constant service.

After following the above procedure, the actual cleaning is done in the manner as previously described. All rules and regulations pertaining to safety of personnel are unchanged.

The procedure for floating roof tanks is somewhat different from that for cone roof tanks. After the roof has been floated, the primary seal is loosened at two points so that two bonded air movers may be connected to the annulus between the bulkhead and the shell at locations 180 degrees apart. A third bonded air mover is connected to some roof opening other than the center manway. All air movers are located above the top of the shell and connected to the roof openings by Snorkel Tubing. This is done to avoid collecting gases above the roof level inside the tank shell.

One air mover, connected to the annulus, is put into service sucking air through the mover, thereby sweeping all fumes from the annulus. After the sweeping process has been started, the center roof manhead is removed and the draining of water is started. This draining continues until the roof comes to rest on the roof supports and the water level is one to two inches below the lowest point of the underside of the roof. At this time, both air movers, taking suction at the annulus, are put in service.

AIR MOVER PREVENTS EXPLOSION

After the start of the draining process, the third air mover is put into service as soon as the liquid level is an inch or two below the bottom of the open manway. This air mover prevents the vapor space that is being created under the roof by the water draining from becoming explosive.

After the partial draining is finished, the skimming operation, such as described for cone roof tanks, is started. When the skimming is finished, the water is drained out of the tank and when empty, the vapor space is tested with a gas indicator.

If the test is below the explosive limits, the shell man heads are moved. The cleaning operation is not started until the gas indicator tests again show the vapor space to be below the flammable limits.

If the tests indicate an explosive mixture, the process is repeated, with two exceptions: first, the air movers are kept in service, and two, the roof is not floated, the liquid level after filling is 1" to 2" below the underside of the roof.

We prefer the procedure using the larger quantity of absorption oil. The alternate procedure should only be used where there is a shortage of oil or where the disposal of the oil is a problem. The relaxation of the hydrocarbon vapor limits that are allowed by the alternate procedure when removing the manheads permit a hazard that we recognize, but such a procedure is better than one that permits tanks to be opened while explosive.

EVOLUTION OF SEISMIC EXPLOSIVES

by J. W. COCHRAN

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This may be the atomic age, but conventional explosives—dynamite and its many variations—are still our demolition workhorses. In 1956, more than 900 million pounds of commercial explosives were manufactured in this country. More is expected to be produced this year.

Explosives are truly one of the key materials used by man. They are a basic material to some of our primary industries. Without them many—if not most—of the raw materials we take from the ground would be virtually unavailable to us. They are equally as vital to the construction industry—for the excavation of rock for building stone and concrete and for cutting through natural rock obstacles.

The use of explosives in seismic exploration is a relatively recent development—only some 30 years old—but it is not the *most* recent. Today high explosives are even breaking into the guided missiles field, not just as a destructive force, but as a component of guidance systems. Controlled quantities of explosives are used to power fast acting electronic switches and similar devices. So although explosives are one of the oldest materials known to man, new uses for them are constantly being discovered.

HISTORY OF EXPLOSIVES

In order to discuss the development and use of explosives in seismic exploration perhaps we should disgress to take a look at the history of explosives. As we do this one thing will become evident: that the desire for greater safety has probably been the greatest single continuous force in their development. Greater control to provide greater confidence, has been and still is the goal of nearly every new development in the explosives industry.

Many people, the Chinese, Hindus, Greeks, Arabs, English and Germans, claim credit for the discovery of black powder—the world's first commercial explosive. Credit is generally given to England's Roger Bacon as the inventor, and to Berthold Schwarz as the first to put it to practical use. The first authenticated use of Schwarz's guns was in England in 1314. They signalled the death knell of the knight in armor, the Feudal system, and the Dark Ages.

More than 300 years passed before gun powder was put to the service of man. Crude blasting techniques—techniques that would send shivers down the spine of any blaster today and would probably give a safety engineer apoplexy—were introduced in the mines of Hungary in 1627. It is not surprising that it took a long time to persuade workers to accept the new tool. It apparently replaced crude hand and fire methods in the mines of England in about 1672.

The first use of black powder for blasting rock in a construction enterprise was in widening the Albula Road in Switzerland in 1696. Throughout these early developments the lack of effective boring machines and the high cost of black powder slowed industrial application.

SAME FORMULA TODAY

Despite the crude, virtually uncontrolled methods of testing and manufacture, the formula prescribed by the first powder makers for black powder was essentially the same as it is today. It was, and still is, an intimate mixture of finely ground solids: approximately 75 per cent potassium nitrate, 15 per cent carbon and 10 per cent sulphur. The potassium nitrate was obtained from saltpeter either in its natural state or as a product of decomposed organic matter. The carbon was wood charcoal and sulphur was obtained from volcanic sources.

In the New World the colonists manufactured their own powder from saltpeter obtained by wetting refuse piles and leaching the piles with water. Evaporation of the resulting liquor provided saltpeter crystals. Despite the fact that several powder mills were erected in Massachusetts in the 1600's, the Colonies were still inadequately supplied at the time of the Revolution.

Some claim that we could not have won the Revolution without powder imported

from France. Then in 1800, E. I. du Pont de Nemours migrated from France and established a powder mill on the banks of the Brandywine—the forerunner of three of today's leading explosives manufacturers.

Some of the construction jobs that were dependent upon black powder in the early 19th century were the National Highway joining the Potomac and Ohio rivers, the Erie Canal, the Baltimore & Ohio Railroad, and the Croton Aqueduct in New York.

POWDER'S DISADVANTAGES

Black powder had serious limitations. Charges were commonly ignited by an unpredictable train of fine powder—sometimes crudely enclosed in do-it-yourself tubes of goose quills, straw, rushes, paper or wood. The interval between fuse ignition and the blast was a matter of speculation, and accidents from premature ignition were common. "Miner's Safety Fuse," introduced in England in 1831, made initiation much safer. In its first application, the safety fuse reduced fatalities and blasting accidents in the West Cornwall coal mines by more than 90 per cent.

However, other factors still limited the utility of black powder. Since its explosion is a deflagrating reaction requiring ignition by flame, black powder can't be used in wet areas—a real limitation in most work. In addition, it is bulky, and detonates with low velocity. Even modern improvements haven't been able to overcome these drawbacks which severely limit its efficient use in the field.

Most modern high explosives are based upon the explosive properties of nitroglycerine. When these properties were discovered in 1846 by an Italian chemistry professor, the compound was considered too dangerous for commercial use and manufacture. For years nitroglycerine was primarily a scientific curiosity with only one practical use, as a heart stimulant. As an explosive, it was impossible to handle, ship or detonate precisely or safely.

BENEFICIAL "MISTAKE"

Then in 1866 Alfred Nobel mixed—some say by mistake—nitroglycerine with kieselguhr, a porous earth, to form a pasty substance which could be handled relatively safely, detonated easily and precisely—the first dynamite. The first "Nobel" nitroglycerine dynamite manufactured in the U. S. was made by the Giant Powder Co. of California, which became a part of Atlas Powder Co. about 45 years ago.

Since Nobel's discovery many other materials have been used to mix with the "oil," as nitroglycerine is called in the trade. Today, these materials, called "dope," include ammonium nitrate, coal dust, ground walnut shells, almond hulls, olive and apricot pits, and others.

Continuing research has resulted in the manufacture today of dynamites and other commercial explosives which are much safer to handle and use than the first Nobel dynamite which—despite its vast superiority to straight nitroglycerine—was touchy and finicky at best.

One development which might bear mentioning is the use of ethylene glycol—the basic ingredient of automobile permanent-type anti-freeze. It is added to dynamite—which normally has a relatively high freezing point—for the same purpose. Thus, frozen dynamite, once a potential hazard because of its unpredictable nature, is no longer a problem.

ELECTRICAL BLASTING

The development of electrical initiation with the electric blasting cap has probably been the most significant development in the industry since Nobel discovered dynamite. Safety fuse—though a vast improvement over older methods—still has an unpredictable nature. In addition, once the fuse is lit the action is inexorably begun and the blaster is dependent upon the fuse to give him time to reach safety, and upon his own ability to reach safety in that time.

Electrical blasting enables the blaster to fire the charge from a safe distance or from a protected location. It also permits safety checks right up to the time of firing and the firing of many charges simultaneously. These features are recognized in the mining laws of many states.

The purpose for which explosives are used in seismic exploration is different than in its more common application as an agent of purposeful and constructive destruction. Here explosives are used to start a shockwave in the earth. These waves are reflected and refracted as they travel in the earth and by recording them, underground formations can be located.

The first recorded use of explosives for this purpose—to measure the velocity of a shockwave in the earth—was in Ireland about 100 years ago. During World War I the Germans used seismographs to locate artillery pieces. But, it has been only since about 1925 that the seismograph has been teamed with commercial explosives for the seismic exploration of oil. Today the quantities used for this purpose are a sizable percentage of all commercial high explosives manufactured in the United States.

EXPLOSIONS UNDER GROUND

At first, seismic exploration parties had to use conventional explosives and blasting supplies. In those days, charges were often detonated on the surface or in shallow holes. Almost any type of explosive was satisfactory. However, refinements in technique called for the use of smaller charges exploded deep within the ground, usually well below the water table, where the superimposed pressures of water and drilling mud limited the type of explosive which could be used to the water-resistant gelatin dynamites.

As the needs of the seismic market increased, explosives' manufacturers began the development of special explosives and blasting supplies for seismic exploration. As drill holes became deeper, ordinary gelatin dynamite sometimes became desensitized by high pressure. Apparently, these high pressures compressed the explosives. Therefore, high velocity gelatin dynamites were formulated containing relatively incompressible substances to resist compression. A few of these materials were balsa wood, cane pitch, corn flakes, and corn cobs.

The decrease in density occasioned by the use of these materials created another problem. The density of the dynamite sometimes was so low that it would not sink in water. Therefore, explosives with greater density to enable them to sink were developed.

INDEFINITE PRESSURES

It cannot be stated definitely under what pressure any given seismic explosive will fail nor how long it can withstand a given pressure and still fire. High velocity gelatins, if detonated immediately after loading, should withstand all pressures encountered in ordinary prospecting. If the charges are left to "sleep"—under pressure in a deep wet hole for any length of time, the chance of failure increases as the pressure and the "sleeping" time increases.

Of course, not all seismic exploration is performed under adverse water conditions. Less expensive gelatin dynamites can be used where the water heads are less than 100 feet, but they are not recommended[4] for "sleeper" charges.

Even more recently, nitrocarbonitrate blasting agents have come into use in seismic prospecting. The increasing use of these blasting agents, many of which are little more than fertilizer grade ammonium nitrate, can be traced to their low cost and their insensitivity. They are not cap sensitive—that is, they require a charge of high explosive to detonate them—and they are so insensitive to detonation by shock or friction that they need not be shipped or handled as a high explosive.

On the other hand they do require the presence of high explosives—which must be cap sensitive, of course—to initiate and maintain detonation. As a result, once joined with these high explosive primers and boosters the entire charge must be treated as a high explosive.

WATERPROOF BLASTING AGENTS

Most blasting agents deteriorate in contact with water. The problem of shooting seismic blasting agents in wet holes has been solved by packaging them in special waterproof cans. The cans are threaded so as to be easily assembled into continuous rigid columns for deep loading in small diameter boreholes. The high explosive boosters, which contain cap wells for the insertion of an electric blasting cap, are packaged in similar cans for assembly into the column.

These are but a few of the developments inspired by the special needs of the seismograph industry. Because of the very conditions under which seismograph parties work and because of their peculiar requirements (compared to the more normal industrial requirements of explosives) many other improvements have been made in a seismic explosives especially within the last decade. A few of these are: special cartridge sleeves for the assembly of explosives sticks into rigid columns; special static resistant electric blasting caps to minimize the hazard of accidental detonation by static electricity; and, special packaging of blasting agents for offshore work.

Other innovations and improvements have made modern commercial explosives much more reliable and much safer to use. But, nevertheless, dynamite and other commercial explosives are dangerous, both to manufacture and use; and it's doubtful that they will ever be anything but dangerous because their very utility lies in the controlled release of huge concentrations of energy.

DANGER HARNESSED

Each pound of dynamite is said to have the power to lift a 3,000 pound automobile 300 feet into the air. The energy to do this work is released with a violent, potentially dangerous suddenness. It is a tribute to the ingenuity of man—to the explosive manufacturer, but even more to the explosives' user that this concentrated energy has been harnessed for use with such comparative safety.

Commerical high explosives have been built to explode, and unless they do, they have no utility. The trick is to make them explode upon command, after insuring that their detonation will do the job required without causing injury or damage.

Actually, the use of dynamite is much less dangerous than its manufacture. This is indeed fortunate because the conditions under which dynamite is made can be closely controlled, whereas the field conditions under which it must be used cannot be controlled beyond a certain degree.

SAFE MANUFACTURE

One would expect that the manufacture of commercial explosives would be an accident prone business. This is not the case. Actually, it is one of the safer industries. In 1956 American industry had 6.38 lost-time accidents for every million hours worked; the high explosives industry had 1.59—one-fourth of the overall average. For each hour on the job, workers in the explosives industry have only a sixth as many accidents as bakers, and only one-thirteenth as many as workers engaged in manufacturing dairy products.

Perhaps the inherent danger of the process, the daily exposure to violence is one reason for this astonishing safety record. Certainly no one engaged in this business would tolerate carelessness.

The safety problem facing the user may not be as acute, but, we must remember it is faced under much more adverse conditions and usually by people, who—although they are experienced—lack the many years of experience of the producing companies.

The manufacturers of explosives are aware of this fact. And although the explosives industry is a highly competitive one, there is one point at which nearly all the manufacturers cooperate. This is in the promotion of good practice in the use and handling of explosives. Through the industry association, the Institute of Makers of Explosives, they report to each other and investigate every accident and near accident to determine causes and corrective precautionary measures.

ISSUE SAFETY MATERIAL

This same body formulates the safety literature which is distributed by the explosives industry. Chief among these instructions is the "Do's and Don'ts," the pamphlet which is entitled "Prevention of Accidents in the Use of Explosives." This pamphlet is found in each case of explosives. Of course this little pamphlet can't hope to cover every possible hazardous situation. But, neither could an encyclopedia, and these are as comprehensive as the combined experience of the country's leading powder manufacturers can make them at this time.

Of particular interest in the seismic industry is another Institute pamphlet entitled "Radio Frequency Energy—A Potential Hazard in Electric Blasting." This little booklet details the results of years of study of this problem—which seems to have been vastly over-rated in recent years, probably out of ignorance more than anything—and describes specific precautions to be taken when blasting in the vicinity of radio transmitters, including two comprehensive tables of recommended safe minimum distances.

Last, but certainly not least—if I may say so without appearing immodest—we, at Atlas, have recently completed a short safety movie entitled "How to Handle Women and Explosives." As you might guess from the title it is a humorous treatment of a serious subject. It's not a technical film, and intellectual managers of the business may not be impressed by it. But, our experience is that it is well received in the field by the members of the shooting parties.

It doesn't go into detail about safety procedures; it's designed to stress the importance of handling explosives with care and respect. It won't teach any of the finer points but we think it is useful for kicking off a safety program which can delve into the subject after the movie has stimulated a little interest.

Seismic exploration is an unusual industry as far as the use of explosives is concerned. Probably no other industry using explosives requires its crews to handle such large quantities of powder so often, so fast. Quarrymen and miners may fire larger shots, but they seldom load so much powder in so many holes in such short periods, so constantly.

Seismic shooting is a day in day out proposition, not a once a day once a week or even once a month proposition as it is in so many other industries. This speed and constancy of operation is a constant invitation to carelessness.

Handling high explosives and even less sensitive blasting agents—after all, they require high explosive boosters—must always be classed as a potentially dangerous occupation. Powder men can't afford to be careless. There just "ain't no" such thing as good odds on a human life—especially your own. Any odds less than a sure thing are in favor of the house.

USEFUL AND USEABLE SAFETY MEETING TECHNIQUES

(A Demonstration—5 minutes)

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PRESENTING THE DEMONSTRATION

Purpose

The demonstration is designed to illustrate by actual discussion the practical methods and steps in conducting on-the-job safety meetings. It requires 35-40 minutes for presentation.

Participants

In so far as is possible, participants should be selected with their particular parts in mind as this tends toward a more natural presentation. However, a little coaching and assistance during practice sessions will work wonders in adjustment of participants to their parts. Spontaneity can be developed even though the nature of the demonstration requires close adherence to the script.

Practice Sessions

Advance practice is vital to a smooth, natural presentation. The first step should be a purely "reading through" session with each participant merely reading his part with no attempt at dramatization since the purpose is to gain familiarity with the script and cue phrases. Following the "read through" session an average of six to eight actual practice sessions will give sufficient "carry" to the demonstration without attempting to memorize the parts. After the third or fourth practice, attention can be given to developing spontaneity, naturalness and dramatization.

An important point is to make certain that participants speak at a level and volume so as to be heard and understood by the listening group.. This is of particular importance in small groups where a public address system is not used. Also of importance is using a rate of speech that is neither too fast for the audience to follow nor too slow to maintain interest.

Setting and Arrangements

The participants should be seated at the table with the open or unoccupied end facing the audience and the demonstration

leader at the end of the table farthest from the audience. This permits a view of the faces of all participants. Where possible it is suggested that two small tables be used to form an open "V" with the opening facing the audience, with a small reading table for the demonstration leader at the point of the V. This permits a better audience view than with a single table. A lectern can be provided to one side for the use of the leader while he is presenting the material which is not actual group discussion, as this aids in separating the two in the minds of the audience.

Each participant should have an individual "flip over" ring type binder approximately 7½"x4" in size, with the rings at the narrow end. All of the script should appear in each binder; however, the binder for each participant should have his own part typed in capital letters and underlined in red. Since the other parts are typed in lower case each participant can identify his part quickly and at a glance. Only one side of each page should be used and typing should be double spaced for each participant's part.

Display cards should be prepared as required in the text, with lettering large enough so that the cards can be easily read by the audience. An easel and newsprint, together with crayons should be available for the leader. However, the diagrams and items which he refers to in the lecture part of the demonstration should be prepared in advance so that it is merely necessary to turn to required sheet.

It is best to have two assistants, one who displays the cards in accordance with the directions of the other who is equipped with a script and signals for each card by number. The numbers are placed on the back of the cards in accordance with the numbers placed on the script used by the leading assistant. The leading assistant can use hand signals to indicate the length of time each card is to be displayed. These two assistants should participate in the practice sessions in order to insure proper coordination.

For large audiences or unusual room arrangements, two sets of display cards and three assistants may be necessary. In addition, individual table microphones should be supplied for the participants with a harness or lapel microphone for the leader.

Alternates

In order to avoid difficulty due to sickness or unavoidable absence of a participant, it is recommended that the leading assistant in displaying the cards be trained as a replacement. This can be done by selecting the assistant with it in mind and having the assistant actually act as a participant in a couple of practice sessions. In addition, the alternate should read all parts thoroughly since it is best to have regular participants take only their own parts, leaving all "fill in" duties to the alternate including substitution for the demonstration leader.

INTRODUCTION

Safety meetings are a time honored way of selling safety to individual employees. In recent years many people have been saying, are they worthwhile?—Do we really sell safety?—What are the things that make safety meetings click?

All too often safety meetings develop into a "telling them" with the group playing a passive rather than an active part in the meeting. We who hold the meetings are talking when we should be listening. Once the problem has been clearly stated there must be participation by those in the meeting. Without it there isn't much chance of convincing anyone. And yet, time is of the essence also. On-the-job safety meetings just shouldn't take forever.

This morning we will demonstrate for you some of the useful and useable safety meeting techniques. These techniques have been developed and learned the hard way through actual experience. We are not going to smother you with a lot of words and technicalities. We are going to tell you briefly what we are going to demonstrate and then do it right here before you.

Only the most important key ideas necessary to a good safety meeting will be demonstrated. There will be two 10-minute demonstrations with a few supplementary items being shown between the two demonstrations. Before each one we will tell you briefly just what techniques are being demonstrated and the subject which will be discussed while demonstrating them.

During each discussion large placards will be displayed, pointing out just what technique is being demonstrated at the moment. (HOLD UP A PLACARD.) In addition, on the easel to the left of the platform, a large card will show the subject under discussion during the duration of each discussion.

In all of our demonstrations we will assume that the necessary preparation has been made by the leader—which I assure you is the case. Thus, the safety meeting techniques we will demonstrate deal solely with the conduct of the meeting itself. I would like to introduce those who will participate. (Each group member will rise as his name is called.)

Our first demonstration is designed to show the following things:

1. The value of group participation and how to get it—in other words, getting the gang in on the act.
2. The use of illustrative personal experiences of the group members—helping them sell themselves.
3. Getting reasoned voluntary group acceptance—checking to make sure they have bought the bill of goods.

The subject which will be discussed as a means of demonstrating these three things is —"Are On-the-Job Safety Meetings by the Supervisor Worthwhile." (Card with subject on it should be set up on easel at this time.)

The demonstration will be in two parts: First we will discuss the subject without using any of the three items to be demonstrated. Then we will discuss the subject again using them. During the course of the second discussion, placards will be displayed as each of the three items: group participation, group acceptance, and illustrative personal experiences, is used.

We will now proceed with the first part of Demonstration No. 1. The three items necessary to good meeting techniques will not be used and the subject under discussion is (pointing at the card) "Are On-the-Job Safety Meetings by the Supervisor Worthwhile." This part of Demonstration No. 1 will last approximately three minutes.

DEMONSTRATION NO. 1

(3 minute demonstration without using the three techniques mentioned; display card saying "WITHOUT.")

LEADER: Fellas, I'd like to find out what you think about these on-the-job safety meetings. Are they worthwhile? We've been holding them every week for a long time now; personally I think they are pretty good. It gives us a chance to have things lined up about safety. What do you think about it, Ed?

DALTON: Yeah, boss, it certainly lines things up all right.

LEADER: None of us wants to get hurt. I know that and I know you fellas are all with me when it comes to safety. It's important that we talk over new safety rules and get them straight before we start using them. Don't you find these meetings OK, Bill?

HRDLICKA: Swell, boss, just swell. Ken asked me about a new safety rule just the other day. I told him—"Take it easy, boy, the boss will explain the new safety rule when we have our next safety meeting. For now, just watch how I do it." Yep, these meetings are OK all right; just couldn't get along without them.

MALLE: Being a new man on the gang is sort of tough. Now about that new safety rule—just how do I use . . .

LEADER: I'll get to that in a while, Ken—let's decide about these meetings, whether they are good or not.

MALLE: Well, this is my first one. Guess they must be good or you wouldn't be holding them.

LEADER: Earle, we haven't heard from you yet, how about it?

CADWELL: Er er, what! How about what?

LEADER: What we are talking about, safety meetings.

CADWELL: Sure, they are fine. Just as you spoke I was wondering whether I had turned off the electric furnace before I came over here. Maybe I better go look just to make sure.

LEADER: Gone this long, might as well let it run another minute or two. We'll be through soon.

LEADER: I guess we are all agreed that these safety meetings on the job are pretty good for us—how about it?

EVERYBODY IN CHORUS: They sure are, they are just fine.

LEADER: OK boys, let's get back on the job. I will let you know when we will get together again.

We will now discuss the same subject: "Are On-the-Job Safety Meetings by the Supervisor Worthwhile" using group participation, illustrative personal experiences of the group members and voluntary reasoned group acceptance. (Have assistants show placard using the three techniques.) (During the course of this demonstration the assistants will hold up card on each side of the stage with the appropriate item on it as that item is being demonstrated in the discussion.)

LEADER: I've just been making out the time schedule for the next month. Since we've been holding these weekly safety get-togethers on the job for quite a while now, I want to get your ideas about them. Should we keep on with them or lay off of them for *a while? What do you think?*

HRDLICKA: You mean you want us to tell you, boss—that's a switch.

GROUP PARTICIPATES

LEADER: Yeah, Bill, I'd like to find out what you fellas really think about these safety meetings. Are they doing you any good?

(Group Participation card displayed.)

DALTON: Doing us any good? What do you mean GOOD?

CADWELL: Aw, Ed, I know what the boss means and you do too. He means, does it help us to work safely to kick these things around now and then.

LEADER: Yeah, that's it, Earl, that's just what I mean. Work at it fellas.

MALLE: Of course, I'm new around here and can only say how it looks to a young sprout, but I think it has helped me a lot.

LEADER: Just why do you think that, Ken?

HRDLICKA: Yeah, Ken, what's so hot about it? Right now I've got that rush service order waiting for me to get at it.

LEADER: Ease off a bit, Bill, let's give Ken a chance to have his say.

MALLE: Well now, let me see.

(Illustrative Personal Experience card displayed.)

LEADER: Ken, have you got anything particular in mind where it helps you. Tell us about it.

TELLS PERSONAL EXPERIENCE

MALLE: Yeah, I remember something. You probably don't remember it yourself but we had one of these safety get togethers just after I came on the job. I was helping Ed here. You remember it, Ed?

DALTON: Yeah, I remember your helping me, but what are you talking about?

MALLE: You remember Ed. At that meeting we discussed wearing safety goggles when soldering. Seeing as how I don't wear glasses I thought it would look kind of silly. I left them off one day and the gang jumped me about it, and just a short time after I put them on there was a little flash of hot metal and it lit on the goggles instead of my eye.

HRDLICKA: Yeah, but it wasn't the meeting that did it. We jumped *you about it.* We always jump a guy who breaks a safety rule.

CADWELL AND DALTON TOGETHER: Now wait a minute, Bill, wait a minute.

CADWELL TO DALTON: You tell him Ed, I think we both are going to say the same thing anyway.

DALTON: Maybe we'd jump him and maybe we wouldn't. Having these safety get-togethers sort of refreshes our mind and keeps us on the ball.

(Gross; Participation card displayed.)

LEADER: Anything you want to add to that, Earle?

CADWELL: Sure, just this. At these meetings we've been making it our plan to talk about the safety angles of the job at hand. I've been around here a long time; sometimes I think too long, but I've never seen the day when taking time to talk over the safety angles of the job didn't help me.

HRDLICKA: Yeah, in the meantime I still got that service order staring me in the face.

LEADER: That's right, Bill, but let's go on and make sure about how we feel about these safety meetings.

DALTON: Wait a minute fellas, I've been thinking maybe Bill has something there about our not needing these safety meetings.

LEADER: What do you mean by that, Ed?

DALTON: Well, just figure it out. After all we are a pretty small crew and we work together all the time and you are right here with us most of *the time.* Why do we need special meetings anyway? We can keep up with what is going on.

(Illustrative Personal Experience card displayed.)

MALLE: Maybe you old hands can, but I sure can't.

MORE PERSONAL EXPERIENCES

CADWELL: Well, Ed, there may be something to what you say but I was just thinking about the times when getting the job done seems so important we forget some of the safety angles. It gets to be a habit with us, so much so that the wrong way seems like the right way. If we discuss the safety angles now and then it gets us back on the track.

HRDLICKA: You are right, Earle, about the job being important. Now I got that service order—

LEADER: Wait a minute, Bill, wait a minute. Let's see just what Earle has in mind. Have you any particular cases in mind, Earle?

CADWELL: Well now, yes. I remember one and you were mixed up in it too, Bill.

HRDLICKA: Yeah, that so, what was it?

CADWELL: You remember when we had that emergency call about the exchange cable being out and tests showed it was in the manhole at the corner of Washington and Lincoln streets.

HRDLICKA: Yeah, I remember it. It was about six months ago. The boss had been called into the office. You, Ed and me rushed out there.

CADWELL: Yeah, that's right.

DALTON: Yeah, I remember it, Earle, now that you mention it.

CADWELL: Remember, Bill, you rushed out and we got the cover off and in our hurry we sort of forgot to make tests for gas before entering the manhole?

DALTON: Bill should remember it. We sure had to get him out fast. Lucky he wasn't done in.

HRDLICKA: Yeah, I guess you fellas sort of got me. We did forget to make those tests.

(Reasoned Voluntary Acceptance card.)

LEADER: Well, we can all be glad that it worked out OK. What about these safety meetings though—do we want to continue them or not?

VOLUNTARY ACCEPTANCE

DALTON: Well, I guess we do all right. I take back my crack about being together on the job every day taking the place of these meetings.

CADWELL: Yeah, that's the way I feel about it, too. Having been around here a long time I have seen these things come and go and we have always done a better job when we had these safety meetings.

LEADER: Ken, how do you feel about it?

MALLE: Well, there's no question that I'm new and need all the help I can get, and I'm aiming to be around here a long time like Earle.

LEADER: Well, Bill, you got anything to say?

HRDLICKA: Yes. I'll go along with these meetings, I guess. Maybe we do *need to* stand off and look at what we are doing now and then, just to make sure we are doing it safely. But I still got that service order staring me in the face.

LEADER: Well, fellas, are we all pretty much agreed now that we want to continue with these safety meetings on the job each week?

CADWELL: Yeah, let's go ahead with them.

DALTON: I'm for it.

MALLE: I sure want them.

HRDLICKA: OK, OK, count me in.

LEADER: All right, next week let's talk about wiping joints the safe way. Ed, supposing you be ready to talk about it and show us some of the angles and have Ken help you.

DALTON: All right, we'll be ready, won't we, Ken?

MALLE: Sure will.

LEADER: Well, I guess that just about wraps it up for the day. Maybe we better let Bill get at that service order.

HRDLICKA: OK, boss, I'm on my way now.

I doubt if anyone in the audience missed the way the group participation made the safety meeting really click, as compared to the first discussion in which the leader tried to carry the ball himself; also obtaining reasoned voluntary group acceptance really sells the ideas under discussion. People like

to "get in on the act" and the selling power of being in on it yourself is tremendous when compared to just listening to someone else's logical presentation.

In our second discussion use was also made of illustrative personal experiences told by the group members. I guess we are all built about the same when it comes to hearing the sound of our own voices. From the standpoint of getting safety ideas across, it is certainly a powerful tool.

DISCUSSION TECHNIQUES

Before we present our second demonstration we would like to cover three practical work-a-day discussion techniques which were used in the first presentation and will also appear in the second one. These are:

1. The use of the question
2. Shaped or controlled discussion
3. Overhead or uncontrolled discussion

It is hard to believe that such a simple thing as a spoken question is one of the keys to influencing human conduct. With it we can obtain an expression of the thoughts and reactions of other people setting up channels for mutual exchange of ideas and getting reasoned voluntary acceptance. The power of the question lies in its requirement of an answer. It should be phrased in such a manner as to require more than a mere *yes*, or *no*, for we must know the *why's* and *wherefore's* if we are to influence people's decisions or help them form their conclusions. Questions are the main operating device of the discussion leader.

There are four basic types of questions:

1. Overhead, in which the leader asks the question without indicating a particular person to reply.
2. Directed, in which the leader asks the question and then names the individual who is to reply.
3. Reverse, in which the individual asking the question had a question directed back to him by the leader in order to have him develop the answer himself or to gain more information.
4. Relay, in which the leader relays the question to someone else or to the group at large to get group participation.

CONTROLLED DISCUSSION

Every discussion or meeting is made up of one or both of the two basic operating procedures. The first is the shaped or controlled discussion, in which the leader keeps direct control by asking the questions, designating specific individuals to reply without permitting uncontrolled discussion between the group members themselves.

Overhead or uncontrolled discussions take place between the group members with each participating at will after the leader presents the item for discussion.

Actually, all discussions are composed of both types of operation. However, the nature of the discussion is determined by that which predominates. Each type has its place depending upon whether the leader is trying to sell his idea or to allow the group to develop its own ideas. I would like to demonstrate the types of questions and the shaped and overhead discussions before undertaking the second safety meeting demonstration.

As each of the types of question is being demonstrated a display card will be shown, showing its name. The same will be done while the brief demonstrations of shaped and overhead discussions are in progress. The subject material which we will use will center around this item—"How Can We Slow Down the 5 O'clock Stampede," even though we will not pursue it to its final conclusion.

(Display Overhead Discussion card.)

LEADER: We've been having quite a few accidents as a result of the 5 o'clock rush to get off the job. Isn't there something we can do about it?

HRDLICKA: Sure, we can let them all out at 4:30.

LEADER: That's one answer, Bill, but people would miss that last half hour's pay. Any other good ideas?

DALTON: I think we've got a problem. Maybe we could stagger the time for different departments, so we wouldn't gang up.

(Display Directed Discussion card.)

LEADER: Are there any other things we can do, Earle?

CADWELL: There must be but they don't occur to me right now.

LEADER: Any ideas on this, Ken?

MALLE: Yes, one thing I think we can do is to get people educated as to the dangers of rushing out.

LEADER: That's good. You got any other ideas, Bill?

HRDLICKA: Couldn't we put this up to the safety committee and let them worry about it?

(Display Reverse Discussion card.)

LEADER: Well, just what would you do, Bill, if you were on the safety committee?

HRDLICKA: Well, I'd get off the committee.

LEADER: No, we wouldn't let you off that easily, Bill. Seriously, what would you do if you were on the committee?

HRDLICKA: Well, I guess I'd find out just where the worst accident spots were and work on them.

LEADER: That sounds good.

CADWELL: Sounds OK, but just how would we do it?

(Display Relay Discussion card.)

LEADER: Ed, you've been on the safety committee. Got any suggestions?

DALTON: Let's look over all our accidents and find out from the record just where they are happening.

MALLE: That sounds like a good approach, Ed. Who's going to do it? Where will we get the information?

LEADER: Well, I'll get the information from the industrial relations group and see what we can do about it.

SHAPED OR CONTROLLED DISCUSSIONS

(Shaped Discussion card displayed.)

LEADER: In the 5 o'clock rush last night one of the fellows was jostled, lost his footing and fell, breaking his ankle. Isn't there something we can do about this? What do you think, Ed?

DALTON: Yes, we could get these folks educated about the dangers and quiet them down a bit.

LEADER: How would you go about it, Earle?

CADWELL: We could use some posters.

LEADER: Have you got any suggestions, Bill?

HRDLICKA: Well, we could put in a public address system and have some nice sounding gals talk over it to caution people.

LEADER: Aw, guess we'll pass that one up, Bill. Got any ideas, Ken?

MALLE: Seems to me we should just talk it over in our on-the-job safety meetings.

UNCONTROLLED DISCUSSION

(Display card.)

LEADER: We are having too many injuries in this 5 o'clock stampede. Isn't there some way we can control it?

HRDLICKA: Sure, let everyone out at 4:30.

DALTON: Aw, pipe down, Bill. This is a serious matter. If we go over the records maybe we can find out just what is happening and where it is happening.

CADWELL: Yes, that's a good idea, Ed. Isn't there something we can do right away in the meantime?

MALLE: Well, it seems to me that we could make it a subject for discussion in all our on-the-job safety meetings.

DALTON AND CADWELL: That sounds like a good approach, Ken.

LEADER: I think that's swell and I will pass it on up the line.

To summarize, so far we have demonstrated for you the following things:

—The value of group participation
—The use of illustrative personal experiences by group members
—The need for voluntary group acceptance.
—The four types of questions and their uses
—Shaped or controlled discussion
—Overhead or uncontrolled discussion

For our final demonstration, we will put on a discussion in which the four steps in a successful safety meeting will be portrayed. The four steps are:

1. Subject definition
2. Getting everyone's ideas and reactions
3. Voluntary group acceptance
4. Developing a plan of action

For those familiar with conference leadership and the five step conference leadership process, I would like to point out that these four safety meeting steps are based upon and tie in directly with those of the

conference process. The fundamental principles to all meetings underlie both procedures.

SUBJECT DEFINITION

Step 1, Subject Definition, is where we present the subject for discussion to the group, making sure that they understand it. This would include such things as presenting a planned program or anything else that you want the group to accept.

In the second step everyone in the group should have a chance to express his ideas and reactions so that the magic of group participation will lay the groundwork for the third step, voluntary group acceptance. In the fourth step we develop a plan of action wherever it is indicated and then summarize what we have worked out in the meeting.

In our demonstration we will use and apply all of the techniques which we have just demonstrated for you—watch for them, see if you can identify them and be sure to check on their effectiveness. If you have any questions we will be glad to discuss them following this demonstration.

We will now proceed with our second demonstration. It will portray for you the four steps in a safety meeting and we will use as our subject "How Can We Sell Taking Safety Home."
(Display Subject Definition card.)

LEADER: It surprised me, personally, to find out that we are having almost eight times as many lost time accidents off the job as on the job in our company. It looks as though we are not doing too well in getting people to take safety home with them. Just how can we get people to be as safe off the job as on the job?

CADWELL: Would you say that again, boss. Did you say, eight times as many lost time cases off the job as on the job?

LEADER: That's right, Earle, pretty close to eight times as many.

CADWELL: I didn't think it was that bad.

MALLE: Neither did I.

DALTON: Seems to me we should do something about it.
(Ideas and Reactions card held up.)

LEADER: That's just the point. How can we get people to take safety home with them? What do you think, Bill?

HRDLICKA: I'll tell you what I think—I think what I do off the job is my business. The company can tell me what to do on the job but after 5 o'clock, oh no! that's something else.

LEADER: How do the rest of you fellows feel about this?

MALLE: 'course I'm new around here, but just the same eight times as many accidents off the job is something to think about all right.

LEADER: Earle, you've been through the mill—how does it strike you? Do you think we should do something about it?

CADWELL: Yes, I do.

LEADER: Well why, Earle?

CADWELL: Well OK, it's this way. Some years ago I thought like Bill here, but when the Misses fell over that bucket I left on the cellar stairs and broke her leg, something happened to my viewpoint. You know, if I had been on the job I would never have left that bucket there in the first place.

DALTON: That brings to mind something that happened to me once. It sure convinced me.

HRDLICKA: Yes, that's all OK, but nevertheless—

LEADER: Wait a minute, Bill, wait a minute. Let's see what Ed has on his mind. What was it that convinced you, Ed?

DALTON: It's a near miss I had a couple of years ago when I was putting up the storm windows. It seemed pretty far to go clear around the house to get the ladder and the wheelbarrow was right there so I used it. When it tilted I dropped the window and busted it, but luckily I was able to hop clear and didn't get hurt. If I had sprained my ankle I wouldn't have been able to have gone on that hunting trip I enjoyed so much.

MALLE: What you fellows say sort of has me sold, but just how are we going to get it across to other folks if everyone feels the way Bill does, that the company can't tell him what to do after 5 o'clock?

HRDLICKA: You got me right, kid, that's just what I mean.
(Display Voluntary Acceptance card.)

LEADER: I just wonder, does everybody feel the way Bill does about it?

CADWELL: I certainly don't and I doubt if those who say it really believe it.

LEADER: How does it strike you, Ed?

DALTON: Oh, I'll go along with Earle—I don't care how it's done just so long as I don't get hurt or my folks don't get hurt. If it works for me on the job, it should work off the job, too.

MALLE: As far as I'm concerned, I don't think a hospital bed would be any softer just because it happened off the job.

LEADER: I have heard it said that if you really believe in safety and work at it on the job it doesn't take too much effort to make it work off the job, if you try. What do you think about that, Bill?

HRDLICKA: As I said, no one's going to tell me—

LEADER: No one's trying to tell you, Bill. Just suppose you had a ladder with a broken rung on the job, would you use it?

HRDLICKA: No, it's up to the company to furnish me with good tools.

DALTON: You mean, Bill, that the company should furnish you with the stuff you use at home.

HRDLICKA: No, I didn't say any such thing.

CADWELL: Would you use a ladder with a busted rung at home, Bill? Deliberately that is. Don't you think as much of your own neck as the company does?

HRDLICKA: Of course I do, it's my neck.

LEADER: Just a minute fellas, I think Bill doesn't want to get hurt off the job any more than he does on the job, do you?

HRDLICKA: You're darn tooten I don't.

LEADER: I guess we can all agree on that point. No one wants to get hurt off the job.

ALL AT ONCE: That's right.
(Action and Summary card displayed.)

LEADER: Well let's look at some of the things that we can do to keep from getting hurt off the job; in other words, some of the things that sell people on taking safety home with them. Got any ideas fellas?

MALLE: It's done me a lot of good just to talk about it here. Why not make it a subject for discussion in on-the-job safety meetings?

DALTON: I'll go along with that, Ken.

CADWELL: So will I, because we can think out the problems better that way and line up things to do.

LEADER: Bill—

HRDLICKA: Uh, Uh!

LEADER: I'm going to put some of these things down, fellas. (Writes on easel—"How Can We Sell Taking Safety Home.")
(1. Discuss off-the-job safety in on-the-job safety meetings.)

LEADER: Some companies mail stuff home. What do you think about that?

CADWELL: Yeah, my brother's company does that. I have read some of the stuff, it's pretty good on off-the-job safety. What do you think about it, Ken?

MALLE: I think it would help.

DALTON: Yeah, if it didn't get in the waste basket too soon.

CADWELL: Aw, I don't think many people would throw it away without reading it.

LEADER: Well, let's add it to our list anyway as one of the things we can do.
(Adds this item to list on easel—Mail off-the-job safety material to home.)

LEADER: Any other ideas?

DALTON: Boss, you said at the beginning of this meeting that off-the-job accidents are eight times the number of on-the-job accidents and it impressed me. I think we should keep good records on off-the-job cases and make comparisons of them with on-the-job accidents from time to time. It may sell other people, too.

LEADER: What do the rest of you think about it?

MALLE: I think that's right.

CADWELL: So do I.

LEADER: Well, Bill, what do you think?

HRDLICKA: Ya, ya, it's OK.

LEADER: Bill, you remember a few years ago you spent a couple of weeks in the construction office to help make some hazard check lists for use on the job?

HRDLICKA: I sure do—that was a good list, even if I say so myself. In fact, I will say so.

LEADER: I agree with you, Bill—we've gotten a lot of use out of it all over the company. You know, Bill, you could do an awfully good job on this off-the-job hazard deal, too, if you would.

MALLE: If it's even half as good as that on-the-job hazard list I would take one home tonight.

LEADER: What do you think of the idea, Earle?

CADWELL: I like it. If I had looked at something like that once in a while and checked the hazards around the house, I would never have left that bucket on the stairs.

DALTON: I agree with that idea of a hazard check list. If I had something to keep safety on my mind at home, I would probably never have used that wheelbarrow as a ladder.

HRDLICKA: What I think these guys need is for someone to make up a list for them.

DALTON: It looks to me like more than a one man job.

MALLE: Well, we could all make our own lists, couldn't we?

LEADER: Earle, what's your reaction to this?

CADWELL: Listening to the gang here, it seems to me it would be a good idea if we all made a list and brought it in and discussed it in one of these on-the-job meetings where we talk about off-the-job safety.

LEADER: Now I think we've got something here. Let's do that. Let's each bring in a list, talk it over, and I'll send it in to the office and have some copies made. Let me put it down here with the other things. (Adds this item to those on the easel.)

LEADER: It seems to me these four things we've come up with for selling safety at home are pretty good. I am going to write them up and send them into the office. Maybe the safety committee or the safety supervisor can work out something that will help everyone in the outfit.

CADWELL: Boss, why don't you wait until after we have discussed this ourselves?

HRDLICKA: I think Earle's right. When I was making that on-the-job hazard list, the other fellas and I kicked it around before we came out with one.

LEADER: OK, fellas, let's do it that way. Let's take a couple of weeks to make our lists and then we will discuss them. Does that suit everybody?

ALL IN CHORUS: Yeah, that's fine.

That concludes our second and final demonstration. I am sure that you were all able to discern the four steps in a successful safety meeting as the placards were displayed. In addition, an experienced group of safety people like yourselves were probably away ahead of us all the way with respect to the techniques we have been demonstrating.

SAFETY THROUGH THE EYES OF A CAMERA

by J. L. MUIR

personnel manager & chief safety supervisor, General Petroleum of Canada, Ltd., Calgary, Alb., Canada

How many times can you remember that you have had to describe in great detail some unsafe practice or condition to a person or a group of persons and wished that you had some other visual aid to help you? You knew that your full description was not going over, not being fully grasped because the necessary description was too big, too confusing, too mixed up for your listeners to grasp the whole landscape.

How many times have you addressed a group of workers on safety or a related matter, and even had as assistance, posters and the like? But you knew that you would not have the full interest of the group in front of you, and that a part of the group at least, was not absorbing your message. But, when you mentioned a matter that touched one of them personally, or an individual or crew of the same company, interest was immediately noticeable.

How many times have you heard and perhaps yourself said, that you wished you could take some of the reckless drivers we find on our highways to the scenes of vehicle accidents and thus, by seeing the picture or by visual aid, if you care to call it so, show them the damage, injury and death caused by careless, forgetful, or reckless driving?

I could go on for hours telling you of the various difficulties many others have had in trying to impress, educate, and teach, one or a group of persons some matter, or matters of safety. I have been in the same situation before this time.

PICTURES TELL STORY

But let us never forget a small but true saying, a saying that is not used enough, "every picture tells a story," and if the picture is, what I would like to call a "real" one, your story is told easily, quickly, and fully, and it is registered and recorded for a much longer time in your audience's mind, than by just talking.

How, therefore, can we achieve the goal we are striving for in this matter? I submit for your consideration that you gain that objective through the eyes of a camera, and so the heading of my talk to you, "Safety Through the Eyes of a Camera."

I have photographs in groups and will describe each as it is presented. All of them were not taken in connection with either my own company, my previous occupation before being with General Petroleum of Canada Limited, or even connected with myself. Several safety engineers from Canada provided me with certain photographs which went to complete my talk.

My first group of pictures covers problems that all safety directors have in connection with the transport phase of our work, that being the accidents that take place with our transport and drivers. In the first picture, we see an accident as a result of icy conditions of the highway, and you will readily agree that to try and describe those conditions without a picture would be nearly impossible. In the second is a close up of the vehicle in the same accident, which by the way, resulted in a fatality.

The tracks show the power of a vehicle when the driver or the vehicle goes out of control. The next group of four pictures resulted in a fatality, which I am sorry to say, took place within my own company, when the driver, without reason ran off the highway. Without pictures, to try and describe the results of just running off the edge and rolling over, again would be nearly impossible.

SAFETY BELT—LIFESAVER

In another picture, we firmly believe that had the driver had a safety belt on, it might not have resulted in a fatality. In the picture, I can point out the cab, the condition of which makes us say that. In the next two pictures, the first one resulted in a railroad crossing fatality. At the far side of the railroad tracks, you can clearly see the skid marks of the car, plus the 100 per cent visibility of the railroad crossing on the highway. Again that picture tells a story, which could not be easily described.

In the second, which again resulted in a highway fatality, the skid marks of the vehicle are plainly seen and definitely, without having to explain by word of mouth, will show everyone who sees the picture, the result of extensive speed on a curve. The last of this whole group was the result of a head-on collision, cause being a center line accident. Here again to try to describe would be nearly impossible. To visualize the point of impact we must show the debris by the right front wheel.

Another set of pictures was the result of a wild well in the far northern part of British Columbia, when gas escaped through the blow-out preventor and caused an explosion resulting in a fire. As to the arguments about how the fire started or otherwise, we will not discuss, but the point I would like to make is that it would be impossible to describe the conflagration and damage done, the danger to workmen when such a catastrophe takes place, and the need for education, training and supervisory control if something should go wrong during drilling—impossible without pictures.

In the next group of three pictures again I would ask you, how would you describe the results of this accident? This was a derrick being raised in the northern part of Alberta, with the temperature around 40 below zero. When the derrick reached about half way up, it literally fell apart. What would have happened had the men on the rig not been taught to stay clear when the derrick is being raised, and how many times do we find just that situation existing? But, again try and describe why they should be clear. I think you will agree with me that the pictures educate.

SHOW RIG EQUIPMENT

The next group of pictures are "good" pictures, but they show clearly and definitely without much description how our rig equipment should be at all times if rigging up, and until tearing out. The first picture shows the closed hook on the tong evener and the second picture shows the electric wiring clear of the ground and all machinery.

No short or spark can take place when wire is kept in that condition. The next shows a rotary table with the guard properly installed; the next, derrick cages in proper order and, by preventing the derrickman or other crewman running up and down the ladder without pausing to get his breath, eliminating the danger of a falling accident. The next illustrates a place for everything and everything in its place, no tripping; the next, a cathead and cathead guard, and catline in safe condition; the next, cleanliness, cleanliness is next to godliness, and no accidents can happen when cleanliness is practised; the next, an educational picture—the proper way to place tongs on the pipe when making up or braking out. Try and describe that without a picture.

Next, how many men have been clobbered by pieces of fingers falling from the monkey board? One picture shows it can be prevented. Next is the proper way to fasten a tong safety line. Isn't it much better than trying to describe it? However, there are other ties besides the three clamps, as for example, my company uses the nesco clamp, which we find just as effective, if not more so, than the three clamps.

Another set of pictures show crew men at work. Some of them show faulty, unsafe practise, while others show a good safe crew carrying out work safely.

It is tough, but let us go to another catastrophe, the first picture of the group, although not connected with the remaining six, could be the cause of the catastrophe.

WILD GAS WELL SCENE

Picture #1 was a gas well being brought in and the crew, although they had two flare pits, failed to stop and think for a few minutes, with the result that they fed the gas into the pit into the wind and this picture shows this situation. The set of six pictures are of a wild well in the northern part of our province in the middle of the winter, with the temperature well below zero. The pictures tell their own story.

The next six pictures show bad rig up, and again to describe the unsafe conditions without visual aid would be a considerable chore, if not entirely impossible. There are several faults to be found in each picture, which, if you were using them, you would naturally point out. In the first picture, the blow out remote control unit being placed as it is, is as useless as a snowball in hades to protect the operator if the rig caught fire; there is also a suicide ladder.

We also have a number of 35 milometer slides which show accident picture. The first and second is a derrick being raised, and let us recall the accidents we saw previously with derricks.

Three slides are photos taken from a helicopter going into one of our rigs in the far northern part of Alberta and show the terrain that we have to work in on many occasions. I might point out that for miles around, this is nothing but muskeg. The drinking water and supplies had to be hauled in by stone boat and caterpillar and took one day on each trip.

Three other slides cover a railroad accident caused by an unsafe condition. Five slides show the skidding of one of our rigs in the Saskatchewan area. A successful skid job can only be carried out when all operations are made safe before the job is commenced. Indeed, in this actual incident, the mud conditions were so bad that the two wheels on each of the buggies were hub deep, and it took considerable mobile power to carry out the operation. Remember the tight, heavily strained cables being used in this operation.

GOOD PUBLIC RELATIONS

A safe crew is a happy crew. One picture of one of our crews shows the smiles on their faces. Such a picture goes a long way towards good public relations, good employee-employer relations, and a good no accident record.

Now—what type, style and make of camera will give the best results? Today, there are many, many makes and styles of cameras on the market and in my years of travels, I have used several styles, sizes and makes, but have now settled for three styles of still cameras, namely a 35 milometer, a

polaroid, and a minox. However, to the safety men who are traveling at all times with their car, I would suggest that they have a 35 milometer, so that they might take colored pictures, and a polaroid, so that when an incident takes place, the safety man can be sure that he has a picture before leaving the scene.

There is also one other camera that can be useful, but not to the same extent as a still camera. That is the movie. One can get good results with a movie camera of a crew in operation. But owing to the speed that a movie flashes past an audience, many important points are missed. Although a movie film can be used on several occasions, I, myself do not think that the top results can be obtained by the use of a movie. However, please do not think that I am pushing the use of movie film completely aside. It can be useful.

As to the price of the cameras, we know that they vary from a cheap type box camera to an expensive, all equipped unit. However, I find that the medium priced cameras do a perfect job and therefore, I will not go into that subject.

I hope that I have been able to give you some guidance in the matter of direct visual aid in this matter of safety.

RESTRICTIVE REGULATIONS AT SERVICE STATIONS

by M. E. WOODWORTH

Flammable Liquids engineer, National Fire Protection association, Boston

All regulations are restrictive to some degree. However, there is a major difference between regulations based on reasonable safe standards of good practice and regulations based on securing economic advantages.

There is no more reason—from a fire protection point of view—to limit service station locations within 750 feet or any other distance of each other, than to limit barber shops, restaurants, hotels, food stores and similar occupancies. Neither is there any good reason for limiting the size of tanks or quantity of gasoline stored at service stations.

On the other hand there is every reason to insist that the storage and handling of flammable liquids be in accordance with nationally recognized standards of fire protection. The most widely adopted standards are those of the National Fire Protection Association which have been in existence since 1913. They have been changed many times to recognize new developments and particularly to recognize the first experience of service stations.

Examples of changes to keep abreast of new methods of gasoline delivery can be exemplified by a complete new section added this year on remote pumping systems. The advent of automatic nozzles with latch open devices also required a performance requirement addition to the standards.

UNDERGROUND TANK EXPLOSIONS

To expand on restrictive legislation, let's analyze the problems of storing and dispensing gasoline at service stations.

In 1913 when the standards on flammable liquids were first developed and the storage of gasoline in underground tanks was comparatively new, there was concern over the hazard of an explosion in an underground tank. However, after many years of experience with all types of conditions, it was found that except for a few unusual cases, explosions did not occur in underground tanks. Nevertheless there are still many people who have an inherent fear of an underground tank's exploding.

The real problem and hazard is the removal or abandonment of underground gasoline tanks.

The second phase of the problem of underground tank storage is the hazard cre-

ated by a leaking tank. This problem has not been solved as yet, although a NFPA committee has been working on it for four years. Underground tank leakage is becoming more common and in my opinion is the number one public relations problem for the oil industry and particularly for service stations.

HAZARD OF LEAKS

To answer the potential hazard of an explosion and to minimize the hazard of leaking tanks, for many years the rule was to relate the size of the tank to the distance permitted to a building or property line. But after a study of dozens of cases of underground tank leakage, spacing was not the answer.

For example, once some gasoline from a leaking 1,000 gallon tank showed up in the basement of a multi-storied building over one mile and a half away. Since there wasn't any relationship between the size of the tank and its location to the building, NFPA Standards were changed.

The only distance limitation for underground tanks now is a three foot distance to property lines that can be built upon and a one foot distance to buildings on the same property. These distances are predicated to protect building foundations and to protect the tanks from pressures from the building foundations.

However, for many years to come there will probably be people who will insist there should be a limitation on tank size and a distance factor to buildings based upon tank size. This thinking, of course, is based upon previous NFPA Standards which influenced many laws. The only answer to this problem is for industry and enforcement officials to understand the reasons for these changes.

As stated previously, the problem of underground tank leakage is becoming an increasing one and is of major concern to many people. The NFPA committee studying this problem is convinced that at least a major portion of leaking underground tanks is caused by the failure to install tanks in clean earth or sand as required by the standards. In addition, the committee is confident that failure to install the piping and the tank carefully serves as a contributing factor.

FAULTY INSTALLATION HAZARD

An example of careless installation is the practice of rolling tanks into a hole and possibly damaging the protective coating causing corrosion at the break in the coating. Tanks should be carefully lowered into the hole. Piping not made up tight or broken by heavy trucks when paving a service station yard is a principal cause of gasoline leakage underground.

Unfortunately service station operators are notorious in failing to maintain an inventory control or to suspect leakage when a discrepancy does occur. As a result the industry will be faced with more restrictions. The public has the right to be protected from gasoline leaking into their homes and buildings. Since steps have not been taken by the industry to prevent such incidents, *enforcement officials will be forced to take* preventive steps.

To answer the statement that filling stations are a fire hazard, let's look at the fire record. The NFPA Fire record department estimates there are approximately 4,000 filling station fires a year involving an annual loss of more than $5,000,000. These fires are considerable in number when taken by themselves. In comparison, however, with other occupancies this record is good.

For example, churches and schools are not considered a fire hazard. Yet, there are twice as many fires in schools per hundred schools than in filling stations. There are only 10 per cent less fires per hundred churches than per hundred filling stations. Despite this excellent comparative fire record, people still maintain that service stations should be limited in number.

Probably one of the reasons for the excellent fire record is that all major cities have excellent observance of proper installation which includes tanks, piping, vents, pumps, heating and all electrical installations. Add to this the knowledge and training in fire prevention which service station personnel receive and you can appreciate why filling stations have comparatively few fires.

MUST OBSERVE RULES

The NFPA has published an Occupancy Fire Record on Service Stations. This is one of many such occupancy fire records including such occupancies as supermarkets, farm property, food canneries, restaurants, motor boats and many others. In the analysis of

100 service station fires the failure to observe simple rules of fire prevention results in fires.

Why anyone working at a service station would clean floors with gasoline is incomprehensible. Still the fact remains that such cleaning practice is the number one cause of service station fires. Careless handling of gasoline during vehicle repair and while fueling a vehicle also rank high in the causes of service station fires. Eleven out of the 100 fires analyzed were caused by leaking underground tanks.

Improper sized vents on underground tanks as well as overfilling the underground tank are major contributors to the fire record of service stations. This analysis of service station fires shows the need for a continuing educational program with service station personnel as well as the need for strict adherence to service station design and maintenance.

The fire record of service stations is excellent in comparison with other businesses; but there are still service station fires which could be prevented. A study of the fire record of service stations discloses nothing which could substantiate the need for restricting their location in respect to other service stations or any other occupancy including places of public assembly.

However, the fire record does disclose the need for the continued awareness that service stations should be designed in strict accordance with nationally recognized standards, and that service station personnel should be continually alert to the potential dangers of gasoline.▲

TRAFFIC PATTERNS AND SAFETY PROBLEMS AT SERVICE STATIONS

by W. E. SPLAIN
assistant division engineer, Socony Mobile Oil co., Detroit, Mich.

Each year in the United States, about 40,000 people lose their lives in motor-vehicle accidents and two million receive injuries ranging from minor to totally disabling. These traffic accidents are undoubtedly the major problem that confronts the National Safety Council. Untold hours of study are devoted to determine basic causes and seek methods to reduce this human slaughter. Progress has been made but the problem is far from being solved.

The problem is a huge one. Data must be accumulated from all sources by competent traffic and safety engineers. The basic problem is motorist behavior. Better highways, more rigid law enforcement and better motor cars will reduce accidents. But accidents will still occur until ways are found to improve the driver's skill and his willingness to control his car.

Changing the behavior habits of a motorist is difficult. If this were not so, drunken driving and speeding would have been eliminated by the constant barrage of publicity that has urged drivers to drive at safe speed and to stay away from a steering wheel after drinking.

The petroleum industry, supplying gasoline and essential services to the motorist, is vitally concerned with the problem of traffic safety. Of special concern are the movement of our product trucks over the public highways, and the movement of millions of vehicles into and out of gasoline service stations.

The petroleum industry has spent a lot of money and time to determine how motorists behave when entering and leaving gasoline stations and to determine if these traffic movements contribute to the national traffic problem.

In the mind of most of the people, a gasoline service station is a dangerous traffic hazard. Vehicles crossing sidewalks to enter and leave a station are regarded as a serious threat to the life and limb of pedestrians. Cars entering and leaving the main flow of highway traffic are regarded as important

causes of vehicle-to-vehicle accidents. These beliefs result in ever increasing restrictions being placed on the design and operation of stations. If these beliefs are true, the industry should accept in good grace any code limitation that is practical and that will reduce accidents. If they are not true, the industry is being unduly penalized. It is the purpose of this paper to present factual data obtained in Ohio and Michigan in an attempt to evaluate the traffic hazards that are found at service stations.

Behavior habits of the motoring public are directly related to traffic accidents. A study of driver conduct when entering and leaving stations will therefore be discussed first.

STUDIED OHIO, MICH., GAS STATIONS

Several years ago, the technical subcommittee of the Petroleum Industries committee of Ohio with the Ohio State Highway Department made tests on motorist behavior. The tests were made at service stations selling various brands of products in Ohio and Michigan to resolve differences of opinion between the highway department and the Oil Industry of Ohio. Both were trying to work out a satisfactory code for ingress and egress.

Accurate traffic counts were made, paths of cars entering and leaving the stations were recorded, and accident records investigated. When the data was tabulated, placed on slides for group viewing, and analyzed, it was found that both groups were in error. The data was accepted as fact and a state code was written. Three simple findings in the tests formed the basis for agreement:

1. "The percentage of motorists entering a gasoline station that will "buck" across oncoming traffic to enter a station is much higher than commonly believed."

   Any vehicle that crosses the flow of oncoming traffic to enter a service station is construed to be "bucking" traffic. Experience in Ohio and Michigan shows that an average of 38 per cent of the cars entering a service station "buck" traffic to enter.

   DRIVER SELECTS SAFE PATH

2. The motoring public will unconsciously regiment themselves to the safest possible pattern when leaving a station."

Regardless of how approaches are arranged in the stations, the motorist leaves on the easiest and safest path. We recently checked a four approach station, built at a heavy traffic intersection, and found that six and one-half per cent of the cars in the station, left by the same approach as they entered. In general, the traffic pattern governs the safest exit path and the motorist will select that path.

3. "Pedestrian safety reached its highest order at a gasoline station built at an intersection of two streets. This is probably due to the excellent visibility that is inherent with station design."

Our safety investigations were conducted jointly with the Accident Prevention Bureau of Detroit. Records for the first seven months of 1947 showed that of 32,121 highway accidents in Detroit, six were on approaches and sidewalks at service stations. The record looked so good that we were accused of selecting an ideal time to make the test.

We made another investigation in 1950. During the year, 71,618 accidents occurred —nine on service station approaches and sidewalks none fatal; nine minor accidents at 2,091 service stations and one minor accident on approaches and sidewalks in each 232 years of station operation.

Mr. Fred McLean, who heads our division safety, Insurance & Claims department continued these investigations. His later investigations reveal that our earlier investigations are on the conservative side.

Bucking Traffic

More cars "buck" traffic to enter a station than is commonly believed. Our studies show about 38 per cent of cars entering stations cross the flow of oncoming traffic to do so.

Why do motorists buck traffic? When a traffic light turns there is an open space in the oncoming lane. If a motorist intends to turn at the corner, the easy, safe path is through the station and the motorist takes this path. Bucking traffic is directly related to the second general principle namely, that the motorist will select the easiest and safest path.

Pedestrian Safety

All of the data assembled indicates that a high order of safety exists for pedestrians at service stations. Four accidents—none fatal—out of 75,500 reported accidents are a record that can make the industry justly proud. The belief of some councils and legislative bodies that it is necessary for reasons of safety to impose further restrictions on service station approach design is unrealistic and not supported by fact.

Vehicle-to-Vehicle Accidents

If, in a city where driving conditions are quite difficult, where traffic volume is high and moves quite rapidly, a vehicle-to-vehicle accident occurs only once in 8.4 years of station operation and a vehicle-to-vehicle accident that causes personal injury occurs only once in 119 years of average station operation, the finger of guilt can not be pointed at the gasoline service station.

We believe our findings will be supported by research conducted elsewhere, and hope that our studies will contribute in some small measure to a better understanding of the traffic safety problem that exists at gasoline stations.

THE PETROLEUM INDUSTRY'S STAKE IN THE PUBLIC SUPPORT EFFORT

by A. ROSS ROMMEL

chief safety engineer, Humble Oil & Refining co., Houston, Tex.

To initiate a discussion pertinent to public support, it would probably be well to define and consider what we mean by public support and in what specific endeavor or in what phase of our way of life do we refer to public support on this program. As you might imagine, the public support reference in this discussion is applicable to the broad subject of traffic safety—a problem of magnitude and sometimes seemingly unsolvable facets.

First, I want to say that I feel strongly in my identity as a professional safety engineer and as a citizen. The traffic safety challenge is becoming larger by the day, more demanding in the answers needed for a solution, and more exasperating with its increasing complexity.

Hence, the need for this matter of public support—whatever you and I might do or attempt to accomplish with our good intentions, we can expect little without full public support. Leading law enforcement personnel, representatives of municipal, county, state, and federal governments, traffic engineers, and safety engineers try to develop answers to this problem but they realize that little can be done unless we generate the needed community attack on traffic accidents throughout the nation.

So, public support to me by definition means nothing other than the marshalling of all phases of community life and activity toward the solution of this malignant, cancerous problem about which we talk so much and concern ourselves.

INDUSTRY IDENTITY

We find ourselves in this particular production group of the Petroleum Section—safety engineers, supervisors, staff people, and management personnel—identified, individually and corporately, with traffic safety. As the operator of a piece of motor vehicle equipment which may belong to your company—and which is one of your biggest company safety problems—or which may belong to you, your identity goes even further.

Do you stop to consider that your corporate affiliation may put you even closer to the problem? You are different from the public utilities employee, the supervisor in the air craft industry, the safety engineer of the pulp and paper industry, or any others because that the industry you represent is irrevocably identified with the power end of motor vehicles in the form of gasoline and its allied products.

So isn't it logical to feel we have a responsibility as individuals because of our industrial association to serve well in community safety activity which may be devoted to the battle against traffic accidents? I feel strongly that we do and that because of this identity and association, we have a particular responsibility in the generation of public support.

It would be helpful to review some areas in which public support must be developed to a maximum if we are to realize improved traffic safety conditions in all phases of community activity. First, let's look at who needs public support. Let's consider law enforcement agencies.

LAW-ENFORCEMENT SUPPORT

The program of any law-enforcement agency depends upon the public for its effectiveness. Irrespective of how dedicated, how competent or qualified a law enforcement organization may be, it cannot function effectively without the support of all community representation—namely, public support. In our democracy and way of life the people have the final say-so regarding any governmental activity through the jury service, the ballot system, the referendum and other means of expressing public preferences.

With the avenue of enforcement being recognized as a strong control factor in traffic safety, the agencies which provide this control can only be effective in number, competence and program with the full participating support and encouragement of the public. In the legislative area, we find an equal need for public support.

The public elects our city councils, our legislatures and our commissions. Can our ordinance-making and law-making groups be expected to realize and appreciate all the facets of a community, county, state or even national problems without hearing the voice of the people and without their support?

The public official finds himself in an almost untenable position in the pursuit of good government and in the expression of his convictions without the support and voice of the public. In reference to the public official and the traffic safety, we cannot expect him to take the initiative and provide the leadership in the battle against traffic accidents without the will, support, and energy of the public.

ACTION PROGRAM

The pattern for traffic accident control has been established within the past 10 years through the Action Program of the President's Highway Safety Conferences pertinent to laws and ordinances, public information, accident records, enforcement, education, motor vehicle administration, and engineering. This program states that there is no royal road to highway safety and that only through a balanced program supported by the public can we produce the desired result in the control of traffic accidents.

The entire Action Program is dedicated toward the development of a complete understanding of the traffic safety problem, its requisites, necessary programs, and how these programs can be applied. The Action Program cannot possibly be successful unless every phase of it is utilized in every community.

It is not my intention at this time to review the Action Program. If you are other than a safety engineer, I suggest that you approach your company's safety engineer, your public officials, or your safety council to procure a copy of this program. It represents the best thinking of competent law enforcement public officials, safety people, highway engineers, educators, and a complete cross section of specialists throughout our nation.

There is no phase of the traffic safety problem which is not covered by the Action Program. There is only one thing from which it suffers, and that is lack of understanding on the part of the public—and just plain apathy.

CAN SOLVE PROBLEM

I do not consider myself a sage or one who, because of his years on this earth, is in the position to have such infinite wisdom that he can say through experience and trial and error that he knows the answers to the traffic safety problem, or any other for that matter. But I do set this out as a conscientious wholehearted belief that the American people can solve any program placed before them, that is, if first, they know what the problem is, and secondly, if the problem needs a solution.

You and I in our concern over the safety problem recognize it for what it is, devote our efforts to it, and are frequently critical of the inertia, the passiveness, the apathy

which surround even the groups immediately identified with the problem who actually need the public support. But primarily we feel that we observe these failings on the part of the public itself.

Who is in a better position to tell the public the story and to serve as a spearhead for public support than the safety people of American industry and the safety and management people of the petroleum industry. These people are so closely identified with the energy which coupled with the mechanical device known as the automobile motivates and powers this equipment which in the hands of the careless, the naive, the untrained or the apathetic can make a untrained or the apathetic can turn a mechanical servant of man into a ruthless master and destroyer of man.

"What Is the Petroleum Industry's Stake in the Public Support Effort?" The stake is high—like that of any other fundamental segment of our way of life. The solution to this problem is up to the petroleum industry and to every industry. It is up to every business, every organization, every citizen, every law enforcement agency, and every public official; up to every educator, to every mother, every housewife, and to every child because the problem represents a community, a state, and a national problem.

NEED PUBLIC SUPPORT

And how is such a problem solved? It is solved by the public mindedness of industry and business and the cooperation of citizens in every phase of community life. You and I have seen great community undertakings in the form of fund appeals to operate agencies which are vital to our communities, which help the indigent, and help develop a better society in which we and our children can live. Traffic safety needs the same support, but in all too few communities does it have the cohesive community backing and public support as do many other community problems.

Traffic safety like industrial safety depends upon the fostering and developing of attitudes. In my thinking there is little difference between the two. The average individual driving a modern-day vehicle, who may be a housewife with a loaded station wagon of children or a businessman driving home, hardly realizes that he or she is a potential killer.

These fine American people whom you and I would dare not address as a criminal, a murderess, or a menace to society, but who through their actions behind the wheels of American automobiles killed 40,200 people last year and contributed to the mayhem, bloodshed, tragedy, heartbreak, and excruciating expense which marks this terrible problem confronting every citizen of this nation.

In answer to this question, "What Is the Petroleum Industry's Stake in the Public Support Effort?" you and I represent this great industry and we are tremendously proud of it and our employers. We should appreciate the traffic safety problem and raise our voices in the form of public support. Let us join together with the informed in our communities and let our public know that there is a problem, that it can be solved but that it cannot be solved without a complete and solid community effort toward the preservation of human life which is today being cheapened by the accident by-product of a vital phase of our way of life.

THE USE OF CHECKLISTS IN SAFETY INSPECTIONS

by S. V. ASBURY
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When making a visual inspection a man too often looks and sees the most obvious points of interest, while other points of equal importance go unnoticed. This natural reaction takes place when an "on the job" inspection is made. When inspecting a drilling rig, the safety engineer may observe an acetylene hose scattered on the derrick floor and call this hazard to the driller's attention.

Yet, he will fail to notice whether the dead line of the traveling block was anchored properly. This inspector saw the most prominent hazard on the job scene, but because his inspection was casual and not scientifically planned, many other important hazards were not noticed.

An individual making an inspection must use a checklist previously designed for the task.

To illustrate this point further, let's look at a blowout preventer hookup on a barge type drilling rig located in south Louisiana. A safety inspection of this location was made to determine hazards on this job scene.

After viewing this work area the most obvious hazards were:

- The coating of drilling mud on the blowout preventers.
- The height at which employees must work without proper scaffolding.
- Poor housekeeping.

There are additional points, though not as obvious, but equally important. For example:

- Are rams in good condition?
- Do blowout preventers operate properly?
- Do blowout preventer connections meet with company specifications?
- Do drilling crews know how to operate blowout preventers?
- Are closing wheels installed a proper distance from blowout preventers?

Specifically and scientifically designed checklists can guide the inspector. Casual inspections without a checklist, with the findings mentally recorded are a poor excuse for the real thing. Many accidents, some fatal, could have been prevented had a planned checklist inspection been made and action taken as a result of these findings.

DETERMINING THE NEED FOR CHECKLIST

Whenever specific information is needed —information best obtained by personal observations such as the condition of field equipment—the inspection should be systematically planned and a checklist developed afterward.

Some inspections are conducted to cite a specific problem, for example, the condition of working surfaces that have caused numerous accidents. Other inspections are general, planned to detect unsafe acts and conditions. In any case, the reason for the inspection should be firmly fixed, the manner it will be conducted decided upon, and serious thinking done before the inspection begins. After this, developing a checklist is a natural followup to make the inspection complete.

The possibilities for using inspection checklists are unlimited. They are used for simple inspections, such as determining the condition of first aid kits and for more complex inspections of checking an offshore drilling platform for both unsafe practices and unsafe conditions.

SELLING A CHECKLIST PROJECT

Management refers to supervisory personnel, from the top level of the president to the lower level of the roustabout foreman. Line management refers to supervisors of the operating departments, and operating personnel refers to all employees in the line organization.

When the need arises for a checklist, the safety engineer must decide which management should develop the needed checklist. The safety engineer should act only in an advisory capacity to management, lending guidance and assistance. Only in rare cases should the safety engineer develop and use the safety checklist solely on his own.

To decide what level of management should develop the checklist depends on its purpose. A checklist for inspecting a field for a local safety meeting report, should be developed by the field foreman. The specific selling tactics would take the same course as any other recommendations made by the safety engineer.

If the problem is more extensive, for example, if a number of drilling rigs are involved or the problem covers many phases of a company's operation, it might be necessary to make a recommendation to the top level supervisor of the concerned department. A simple rule is to do the selling job at the lowest level of supervision that has the authority to take action.

The problem of who develops the checklist depends on the purpose for which it is intended. The ideal situation is for members of the line organization to develop it with the assistance and guidance of the safety department. In some rare cases, the safety department might develop a checklist to assist them on an accident prevention problem. However, a checklist designed exclusively by the safety department and used to check conditions and practices of the line organization is going to die a slow, but sure death, because it will be looked upon as a brainchild of the safety department and a stepchild of the line organization.

Therefore, the safety department should suggest, guide and advise, but the actual checklist should come from the line organization.

USING THE CHECKLIST MOST EFFECTIVELY

The checklist should not only be developed by operating people, but it can be most effectively used by operating people. The safety record of a company is not the responsibility of the safety department, but a responsibility of management. By the same token, safety inspections should be made by qualified operating people, assisted by the safety engineer. It is sheer folly if the safety engineer thinks he is an expert in every phase of the operations.

No safety engineer has a first hand working knowledge of pilot and temperature controls of gas regulators, weight lever valves on separators, christmas tree valves, heater treaters, pop-over regulators, or many of the other complex pieces of equipment operating in the oil patch. A safety inspection should be a cooperative effort with the safety engineer assuming his rightful position of advisor. When he oversteps these bounds, then he is assuming responsibilities delegated to operating personnel.

One of the major problems confronting the safety engineer is to get management to assume the accident prevention responsibilities which are rightfully its. Unfortunately, too many employers think when they hire a safety engineer they can relinquish their accident prevention responsibilities.

For a successful accident prevention program, management must assume its rightful safety responsibilities. To illustrate how a checklist can be either a useful accident prevention tool, or a crutch, let's review the personal experience of "John Doe," safety engineer.

Mr. Doe used to inspect drilling rigs by observing the most obvious hazards. Had he been asked about the rams or turnbuckles on the blowout preventers, he could not have reported their condition there.

Realizing that little could be gained by this method, Mr. Doe gave birth to his first checklist. It helped but at the same time it created resentment among the field people and soon died. The cause of death was as follows:

- Management had not been shown the need for such inspections.
- Management was not shown the need of a checklist for making these inspections.
- Line management should have made the inspections with the assistance of the safety engineer.

Mr. Doe's initial checklist inspections were not completely successful. But now he has a drilling rig checklist based on his original brainchild that his company is using successfully. Why did the company's checklist work? Simply because the safety department only originated the idea and rendered advice. The actual development work was done by the line organization. The checklist inspection is actually made by qualified operating personnel. Mr. Doe's checklist failed because he assumed responsibilities which rightfully belonged to line management.

Here's how a checklist works in actual practice. Assume that the Spindletop Oil

Company contracts all its drilling. Company employees such as tool pushers, engineers and field foreman perform supervisory duties on this rig. The company is concerned with accidents that might injure these employees or delay production. Therefore, it is the company's policy to inspect all contract rigs to insure that equipment and practices meet Spindletop's requirements.

At irregular intervals the company drilling engineer or drilling supervisor inspects the rig. Inspections are made at irregular intervals because a truer picture is obtained than if the crews are anticipating the inspection. Another reason for irregular inspections is that it is virtually impossible to make an inspection such as this when running a string of casing or when a well is kicking.

In any event, the inspection is made by the company drilling engineer and usually with a representative of the contractor.

After the inspection, the findings are discussed with the contract tool pusher, and corrections and changes within authority of the tool pusher are agreed upon. If changes recommended are beyond his authority, the top level drilling supervisor of the company must discuss the matter with the top level supervisor of the contractor.

This plan of action works smoothly. The contractor benefits as much from the inspection as the operator. On these inspections the Spindletop safety engineer occasionally accompanies the company drilling engineer and renders advice as needed.

The reason this plan works successfully can be illustrated by the comment of the drilling engineer, when asked his opinion of the checklist: "We think that the mechanics are fine and the checklist plan works good. *After all, we helped develop it.*"

Safety inspections should be systematically planned, and a checklist used to guide the inspector on a complete coverage of the equipment or practices. Unless this is done, the inspection may not be of any real value.

The possibilities for using checklists when making inspections are unlimited. They can be used for the simplest inspections or the most complex ones in the oil field.

Selling the checklist to management is an important matter. The safety engineer, after determining the need for the checklist, should make his recommendation to the lowest level of supervision with the authority to take action. The actual proposal should not be any different than any other recommendation made by the safety engineer to management.

Who develops the checklist depends upon the purpose for which it is intended. The ideal situation is for members of the line organization to develop it with the assistance and guidance of the safety department. Only in rare cases is the safety department justified in developing the inspection checklist.

The checklist can be most effectively used by line management and not the safety department. This thinking is based on actual experience with checklists and is in keeping with progressive thinking regarding accident prevention responsibilities.

If "on the job" inspections are to be successful, the safety department should plan the plays, but the line organization should lead the interference, and carry the ball. If this is done, all concerned should achieve their goal of valuable safety inspections. This in turn will lead to safer working conditions, safer working practices and, without a doubt, fewer accidents and injuries.

BETTER SAFETY MEETINGS THROUGH TRAINING COURSES FOR CHAIRMEN AND SECRETARIES

by W. A. MALLOY

safety engineer, The Texas co., Chicago

Meetings occupy a very important place in our present day business world. Meetings are also an important part of our community life. In fact, they aid in conducting much of the world's business.

If meetings are so important to our way of life, then it is necessary to spend whatever time, effort and man-power it takes to make these meetings successful.

Training, in the matter of handling meetings, is the logical approach toward more successful meetings. Meeting leaders of all stations of life and endeavour, should have basic training in the fundamentals of conducting meetings. This type of effort will produce better and more fruitful meetings.

TRAINING CHAIRMEN AND SECRETARIES

Safety meetings are to a safety program, what church services are to religion. Safety meetings are a "shot in the arm" of faith and education in safety. These meetings are held for the purpose of better acquainting those in attendance with the comprehensive safety program.

Safety meetings provide for an exchange of ideas, acquaint the men with the hazards of the job they are doing, familiarize them with personal protective equipment, offer a place for discussion of safe working practices, a place for impressing the importance of the use of safeguards, promote safety consciousness and certainly prevent accidents. The value of safety meetings cannot be over emphasized.

In my company, approximately 7,000 safety meetings are held each year. Minutes of these meetings are prepared and submitted to the safety division. The chairman and the secretary are the key figures in a meeting, therefore a training program for these keys was needed so they could perform their tasks with the greatest possible results.

The safety division developed a program for training safety meeting chairmen and secretaries. The safety division also developed and prepared a manual of basic, fundamental training material for chairmen and secretaries called "Manual for Safety Meeting Chairmen."

In the early stages, monthly safety material was prepared by the safety division and distributed to safety meeting chairmen. Although use of this material was not mandatory, many chairmen took advantage of this aid.

The zone safety engineers were charged with the responsibility of conducting these chairmen schools. In conducting these schools, the engineer uses the safety chairmen manual as a text book. He ad libs and illustrates each phase of the manual to be certain the group understands the points presented.

Next, a cooperative management within my company's producing department, accepted the program and provided the initial personnel for the first safety meeting chairmen school. Men were selected from each safety meeting group and sent to a central location for a full day's attendance.

Since that first school, the manual has been revised several times and is still used as a text for the present chairmen school. Success of this program was instantaneous. Word soon spread to other departments and today each department has the chairmen school as part of its safety program. The zone safety engineer conducts the safety meeting chairmen schools held in his zone.

DISCUSS PUBLIC SPEAKING

During this eight hour course, we cover the most basic fundamentals of public speaking. The chapter on public speaking explains some of our fears in speaking to a group and we explain why these fears are a natural thing. Can any of you say you have never experienced the quaking of the knees, the moist perspiring of the forehead, the dryness of the throat before you address an audience?

A discussion includes voice modulation, vocabulary, gestures, enthusiasm, personality and the preparation of the speech itself. A finished public speaker is not expected to emerge from this short discussion, but the *open, frank, down to earth approach* of what makes a good public speaker helps each man understand how he can become a better public speaker.

The planning of a meeting is fully covered. The zone engineer modifies his discussion to suit the group requirements using his intimate knowledge of those problems represented to present useful assistance for arrangement of the meeting place, discussing ventilation, lighting and seating.

Hints are given on where and how to obtain guest speakers and seeking the participation of fellow employees so they will present papers and talks. Suggestions for the placement of the secretary and chairman for maximum results are also discussed.

Conducting the safety meeting is another chapter. In this chapter the step by step conducting of a safety meeting is outlined, complete with suggestions on how to conduct this meeting. The zone safety engineer illustrates this chapter drawing on his experience, to inform the group on the proper method to conduct safety meetings.

Another chapter is on safety meeting procedure. Suggestions are incorporated to make a business-like attitude at the meetings. Procedure of the meeting is discussed step by step. Gimmicks and ideas to stimulate group participation are presented and explained.

For example—accident analysis can be made a group discussion by these steps. Read all the facts available concerning an accident or injury to the group. Have the group give you the causes—you list the causes on a blackboard. Then ask for preventive measures, and the group has analyzed an injury or accident. This successfully stimulates group discussion.

AIDS TO SECRETARIES

Suggestions to the secretary is still another chapter of the manual. In this, we point out the value and importance of good safety meeting minutes. We offer suggestions on how to accomplish this and how to arrange and caption the proceedings.

We don't try to make a polished chairman in the time allocated. We try to reduce the fears for the job, to install confidence in him, give him the basic fundamentals he needs for the job and encourage his participation in community function so more experience in the task of chairmanship can be gained.

We explain the aid and assistance available from the safety division in the form of Monthly Safety Material, use of Safety Digest (Co. Safety Magazine) and of course, reference to the Manual which becomes the permanent possession of the chairman. A pocket sized card is also presented to the chairman to refer to if he wishes.

The safety division has done a good selling job on the importance of safety as well as safety training and education. Persistent effort was required. The glaring failures in some of our safety meetings were again and again pointed up to management and finally the need for chairmanship training was recognized by departmental management.

Results are always demanded to justify the expenditure of effort and manpower, to say nothing of money.

Pointing out results from this type of program is relatively simple. Attendance, especially if voluntary will be increased. The quality of material presented at meetings will be improved, with corresponding improvement in the attitude and safety consciousness of the employee.

Safety meeting minutes will become more than just a note indicating that the meeting was held. The minutes will become interesting reading matter for all safety personnel and impart many hazards to investigate and correct which will help prevent accidents. These are some of the benefits derived.

If you wish to improve the calibre of your safety meetings I recommend the development and institution of a chairmanship training program for your organization. Personalize the program to fit your needs and favorable results are inevitable.

SOHIO SERIOUS INJURY INDEX

by O. C. HAIER

manager of safety, Standard Oil co., Cleveland, Ohio

For many years our company paid attention to disabling injuries. To be sure, we asked our employees to report all injuries, no matter how slight—but we really never gave much thought to cases if they didn't become disabling. There is a good reason for this type of thinking.

1. The American Standard Method of Recording and Measuring Work Injury Experience, Code Z16.1, has emphasized disabling injury frequency rates for years.

2. *National Safety Council Sectional* Safety Contests and Awards are based on disabling injury frequency rate, as are most other contests.

3. A.P.I. members' records of Accident Statistics are compiled on the basis of disabling injuries.

4. There is something dramatic and real about disabling injuries which everyone can understand and feel. Therefore, they become logical things upon which to base all-out efforts for accident prevention activities. In addition, for many years the number of disabling injuries was large enough to warrant spending most of our time on them.

We have watched the frequency rate of Sohio's manufacturing department go down year after year. From a high rate of about 14.00 in 1945 it decreased to 3.25 in 1953. The number of disabling cases dropped *from 65 in 1945 to 13 in 1953.*

We had reasons to be happy with such performances. Our largest refinery, working about one and a half million man hours per year, operated two years without a disabling injury. This was a remarkable performance for a plant which only seven years before had 27 disabling cases in one year.

In 1946 we instituted our Safest Sohio refinery contest in which the refinery with the lowest frequency rate for each six-month period is named Sohio's Safest. This honor entitled them to fly the Safest Sohio refinery flag, display plaques, and participate in ceremonies and celebrations which often include a dinner or a buffet lunch and presentation of awards and congratulatory speeches by the manufacturing department vice president.

When more than one refinery had a perfect record for the six-month period, each shared the honor. To date, there have been 22 contest periods and 37 winners. In only two or three instances has a refinery received the Safest Refinery Honor without having a perfect record for that period!

FREQUENCY RATE ROSE

In spite of performances like these, we safety engineers were not satisfied with the job we were doing. There was a constant battle to beat down feelings of complacency and smugness. We couldn't do any valid predicting on a long-term or short-term basis. As a result, we used the same tools *on the premise they were still doing* an effective job, when in reality they had begun to lose their effectiveness.

Late in 1953, after our frequency rate increased about 15 per cent, the first such increase in several years, I prepared a review of plant safety performance for the vice president of manufacturing, his refinery managers, and staff. The chart indicated we would wait until a disabling injury or a series of them occurring in a short interval of time showed us that something had to be done—that our methods needed revision.

At about this same time, the operations research group looked into the problem of injury occurrence, and the predictability of disabling injuries.

The statisticians, applying control chart techniques to annual frequency rates for 1949 to 1953, concluded that the small number of injuries did not lend to short term predictability. Some more sensitive measure than disabling injuries would have to be used to measure safety program effectiveness.

In searching for this more sensitive measure we first considered using all injuries. This would give us sufficient numbers to work with and would be easy to compile

from current dispensary reports. But several objections seemed inherent. Employees might not feel free to report minor injuries if all first-aid cases were used. In addition, certain minor injuries were bound to occur, and it was not economically sound to employ all the preventives necessary to avoid them.

Take a pump mechanic, for instance, who cannot wear gloves and do his job properly. Even the most careful man may receive small scratches, abrasions, or even punctures on his hands while handling materials and tools.

CAN'T USE ALL INJURIES

The removal of wind-borne bodies in the eye comprises a large percentage of first-aid cases. The number of cases depend on many variables such as location of the plant, operating conditions in surrounding plants and wind. Under these conditions comparisons between plants or even between periods in one plant are not true reflections of accident prevention effectiveness. For these reasons, we discarded the "all injury" method and selected certain injury types stipulating that the injuries should be:

1. Easily identified.
2. Free from individual judgment or personal bias in determining ones to use.
3. A type that employees cannot fail to report.
4. Occurring often enough to give us sufficient numbers to work with.

The following types of injuries were selected to comprise the Sohio Serious Injury Index:

1. All disabling injuries.
2. All non-disabling eye injuries from work-produced objects or corrosive liquids, requiring treatment by a physician. (Wind-blown objects are not included).
3. All non-disabling lacerations requiring sutures.
4. All non-disabling fractures.
5. All other non-disabling injuries for which the physician prescribes work restrictions or motion limitations.

They were selected also because they fitted into a pattern of easily recognizable types with no differences of opinion on reportability.

For example, in eye injuries our medical director's orders to plant nurses (each refinery has a nurse) states if a foreign object in the eye cannot be removed with two or three passes of a sterile swab, the injured employee must be referred to an eye specialist. Thus, all such cases will be reported.

There will be no particular questions about non-disabling fractures since these are usually determined by X-rays as ordered by the attending physician. Since only attending physicians suture lacerations, the only problem is a nurse deciding which cases should be referred to the physician. This is a very minor problem since there are frequent visits to the dispensary by the doctors.

Admittedly, there may be some discrepancies in determining that motion limitations or work restrictions are necessary. Doctors' attitudes and knowledge of the injured man's work vary, and influence their decisions. However, these injuries include many sprains, strains and back injuries, which are rather universally recognized as requiring such measures. Disabling injuries are, of course, judged according to the nationally accepted American Standard Method of Recording and Measuring Work Injury Experience, Z16.1. The number of these injuries, expressed on a "per million employee-hour" basis, gives us our Index number.

CONTROL CHART TECHNIQUE

Our research operations group, working with the safety group, had fresh ideas and techniques to interpret and evaluate our statistics in a scientific manner. The statisticians suggested that we too, apply "control chart" techniques and the concepts of random or chance variations to make the Index or frequency rate of serious injuries a more meaningful measure.

The control chart is based on the concept that any measure of performance will be subject to random or chance variation with no easily discernible cause. When some specific influence, either very effective or very ineffective, is brought to bear on the problem, the variation will no longer be due to chance. The influence will show up as very low or very high levels of performance.

In our case, the number of serious injuries per million employee-hours is plotted monthly on a control chart for each individual refinery. A mean or average monthly figure calculated from the previous three-year period is shown as a solid horizontal line on the chart. Control limits also are calculated. These are shown on the chart as horizontal dotted or dashed lines above and below the mean. These control limits are the estimated amount of random variation expected to occur without any change in the kind or intensity of injury prevention activities.

As with any quality control chart, when our Serious Injury Index stays within these control limits, it is under control.

Another way to look at the index variations within the control limits is that the effectiveness of injury prevention is about the same if the index is within the control limits. If the index, however, goes above the upper control limit something has probably gone wrong in our prevention activities, and we should find out so corrective measures can be instituted.

Likewise, if the index goes below the lower control limit something special took place to give us such a good performance and we should find out what it was to continue and expand its use.

Through these control charts then, we should be able to detect when effective or ineffective accident prevention activities are in use. We could not detect this with a disabling injury frequency rate alone. When plants operate with one or two disabling injuries in a year, the statistics are just too meager to interpret.

In actual practice, the refinery managers recognizing that elimination of all injuries is the ultimate objective, have chosen to regard the mean as their upper control limit. When their index exceeds this average, they show concern that is passed on to the supervisors.

Has the use of the index been effective—is a natural question. It has now been in use for two years. The refinery managers have discussed its continued use and have decided that it is a more complete measure of effectiveness. We have shown a 14 per cent reduction in the number of injuries included in the index. One refinery has reduced the number by 33 per cent in this two-year period.

Other departments are using the index also. The pipe line department uses it as the basis for its divisional safety contest. The marketing department is reporting weekly to the vice president the number of such injuries.

Our operation research involves thinking, reflection and analysis. They think about the problem of injuries, how they occur and what might influence them.

INJURIED EMPLOYEES INTERVIEWED

Injuries, they thought, involved people, work and hazards, either physical or personal. If a man recognized a hazard he might avoid it or overcome it. To find out if people are able to recognize hazards and take actions to avoid or overcome them, an interviewing program was set up. Approximately 100 employees at one refinery were interviewed after they were injured. Among the questions asked were these:

1. Did you actually give safety any conscious thought before or during the job?
2. Did you do any specific thing (not habit) to eliminate a hazard or make job safer?
3. Did you think about the hazard that caused your injury?
4. Did you do something specific about the hazard that actually caused the injury?

Of the answers, 82 per cent said they gave conscious thought to safety before or during the job. This could be overwhelming proof that our safety promotional program was very effective.

54 per cent said they took some specific action to make the job safer.

30 per cent said they thought about the hazard that caused their injury.

And, 11 per cent said they took some action to overcome it but still were injured.

Thus, we have several very important points to consider:

1. Most people interviewed seem to think about safety on the job.
2. Relatively few analyzed the job completely.
3. Very few took action to overcome or avoid the specific hazard involved.

Does this mean supervisors must improve employees' ability to analyze jobs for possible hazards or must we build up their real-

ization of the necessity to analyze more completely?

Does this mean that employees don't take specific action because they don't analyze properly or because their evaluation of the hazard leads them to believe that nothing much serious can happen to them or because they think they might be censured for being too cautious or taking too long to do a job?

These are some of the questions for which we are now seeking some answers. We don't have them yet, but we are working on them.

In conclusion, we feel that our serious injury index is a step forward in accident prevention activities. It has helped us reset our sights on the goal of preventing injuries rather than solely on the prevention of loss of time from work. It may not be the ultimate solution to the injury prevention problem, but it is a step in the right direction. In addition, the use of the Operations Research group adding its time, efforts and talents to the safety problem has been productive and will be more so in the future. ▲

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where 'er we go
Regardless of amounts,
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

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PRINTING AND PUBLISHING INDUSTRY

Transactions o

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council

THE PRINTING & PUBLISHING SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Printing and Publishing Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Printing and Publishing Section carries on in behalf of its members, and for the benefit of accident prevention work in the printing and publishing industry generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of printing and publishing companies.

The activities of the Section are under the direction of its executive committee, the members of which are listed at the close of this volume.

OPENING REMARKS BY RETIRING GENERAL CHAIRMAN—

EUGENE P. ERNEST
safety officer, U. S. Government Printing Office, Washington, D. C.

This is incidently the 10th anniversary of the birth of the Printing and Publishing Section. We have accomplished much, and yet so little, in these 10 years and there remains much to be done before we can claim a job well done.

Ours is a giant industry of small businesses and our major problem, seemingly an impossible one, is finding means to reach the many thousands of small printing plants in which organized accident prevention effort just does not exist. The section has for many years recognized this as its major problem, and its efforts have been directed primarily towards finding and developing means to reach these people.

We have been particularly fortunate in having the full co-operation of the Printing Industry of America, the Education Council of the Graphic Arts Industries, the Lithographic Technical Foundation and other associations in this effort.

ACCIDENT RATE DOWN

National Safety Council's statistics indicate that the frequency rate for the printing and publishing industry is considerably less than it was for the year of the founding of this section, and the severity rate shows a greater reduction; however these reductions are no greater than those shown for all industry. Considering the fact that these are statistics furnished by safety-conscious printing plants that are members of the National Safety Council and actively participating in the safety movement, the record is not too good.

The personal satisfaction derived from a job is considerably affected by the extent to which accomplishment can be measured. The engineer who designs or builds a bridge has a lifetime reminder of the results of his efforts; the salesman is constantly reminded of the extent of his success by the size of his commission checks; the printer, the platemaker, the pressman, and the bookbinder has the end product of his labor in a permanent form that can be used as a measure of his skills.

The safety engineer has to deal in intangibles; the only record of his success available to him is the accident frequency and severity rates which are essentially measurements of what didn't happen. On the other hand the accidents that do happen furnish the indication of his failures.

FATAL INJURY AVERTED

Once in a great while positive indication of success happens along. About three weeks ago one of our employees was injured while hand-feeding a Seibold continuous trimmer. This employee was hand-feeding 24-page pamphlets that had been saddle-stitched on a web press. The employee's left thumb, first and second fingers were caught in the clamp and the employee struck at the shut-off pedal with his right foot and missed it.

His head and shoulders were pulled into the shield of the safety device and the machine was automatically shut off with the cutting blade approximately ½ inch above his wrist.

We have five of these trimmers in the Government Printing Office and in the last 10 years we have had approximately six similar accidents. Although all of these accidents resulted in injuries to fleshy tissue only, we have nevertheless considered this exposure as unusually serious.

Several years ago we saw in operation in another printing plant an electric safety device manufactured by Seibold to use on these trimmers. The units were purchased and arrangements were made to install these devices at such time as the machines were down for major overhaul. Two of the devices still have not been installed. In this particular case, the operator noticed earlier that the brake was not properly adjusted and a mechanic was called to correct this condition. Fifteen minutes after the brake was adjusted the accident occurred.

It is highly probable that the operator would not have noticed the poorly adjusted brake had it not been for the electric safety which is normally used in stopping the machine. And, had it not been for the electric safety the employee would have been unable to strike the old mechanical safety release in time to stop the knife stroke.

This accident has provided us with a positive indication of both failure and success. Unfortunately, the employee lost the terminal phalanx of his left thumb and some bone repair was necessary for the first and second fingers. However there is absolutely no doubt but that the employee would have lost his left hand at the wrist had the trimmer not been equipped with the electric device. Needless to say the two remaining safety devices will be promptly installed on the machines not so equipped.

As a further result of this accident our planning and production people have made arrangements to trim this type of pamphlet on other equipment and it is hoped that we will never again have such an accident.▲

NEW IDEAS IN SAFETY SWITCHES

by FRANK N. BURT

manager, Trip Control Dept., Micro-Switch div., Minneapolis-Honeywell Regulator co., Freeport, Ill.

Micro Switch once made three switches. Customers asked for different actuators, different enclosures, different seals, different capacities, different characteristics—both electrical and mechanical, and Micro's policy was always "If we don't have what you need, we'll make it." The result is that we now make more than 9,000 switch products and a line of electric controls for dangerous machines like punch presses, brakes, and guillotine cutters.

Many different requirements were needed by engineers and safety men for electric systems to prevent damage to machines or injury to the operators. We're grateful for the opportunity to participate in these contributions to safety. The Micro Switch trip control was developed from our need for a safer way to protect our punch press operators.

The most common use of electric switches for safeguarding machines and operators is as an interlock. Interlocks tie one action to another, such as the interlock on a new car which prevents starting the motor unless the transmission is in neutral. Another common interlock is a switch which prevents a machine from damaging itself. Interlocks can feel position, sense the reading of a pressure gauge, or a temperature measuring device, or prevent our forgetting something more accurately than we ourselves can do these things.

HIGH VOLTAGE SWITCH

One of the new interlocks that Micro Switch developed is for use on high voltage electronic equipment enclosures. An electronic register control is a good example in the printing and publishing industry. When someone not qualified opens a high voltage electric cabinet, he could be electrocuted. This door interlock switch shuts off the high voltage power whenever the door is opened. The door must be closed securely before the circuit is re-established.

However, this kind of equipment occasionally requires servicing while the circuit is live. The common way to do this is to tape or wedge the interlock switch so that it does not interrupt the power. Unfortunately, the service man could finish his job, close the door, and go away leaving the interlock taped or plugged. When the door was next opened, the power stayed on and someone could be exposed to the high voltage hazard. By the use of this door interlock, the service man can work on a live circuit by pulling the plunger which the door usually pushed. Closing the door automatically resets the door interlock. When the door is next opened, it is sure to kill the circuit and afford protection.

LIGHTED PUSHBUTTON SWITCHES

Another new line of Micro Switch products are the colorful lighted pushbuttons. This is a brand new idea in safety switches. Lighted pushbuttons were developed to save panel space by eliminating the need for a pushbutton and also a light. The early ones had momentary action, and later a choice of momentary or alternate action was made available. Then, two-level buttons were introduced so the operator could see that a button stayed depressed until it was actuated again.

From here the development led to putting a "feel" into the button so that the operator would know if he had pushed it or even if he had pushed it sufficiently to do the job. Then a control for the light from somewhere else was developed so that an operator would push a lighted pushbutton but would never push an unlighted one.

A still newer idea in lighted pushbuttons is to have several colors show on the same pushbutton denoting several conditions which can be either locally or remotely controlled. The color of the light could be changed by another condition anywhere else; for example, at the other end of a huge printing press, and not until the color of the light changed would anyone push the master starter button. This second color could be an intermediate condition, and the third and possibly even the fourth color would have to appear before the operator started the press. These lighted pushbuttons offer many combinations.

The newest development is a magnetically held pushbutton. When the pushbutton is depressed, a circuit is not only closed but held closed electrically. It remains closed until it is broken electrically, either by the same pushbutton or elsewhere. This "bailing" action can be either manual or electrical, and arranged so all hazard points must indicate an all-clear signal before a master starting switch receives the proper all-clear light, or even is able to start the machine.

Micro Switch field engineers and design engineers are already working to incorporate these new lighted pushbutton systems to prevent accidents on large presses.

OUT-THINK CARELESS EMPLOYEES

To out-think careless workers, or to prevent accidents by eliminating the breeding place of accidents, management can incorporate the new science of human engineering into the everyday operation of machines. Micro Switch has developed new products, including the trip control system, which are *"human engineered." They are designed so* their use is in the safest, most logical manner, so that the desired action or sequence of action is followed quite naturally by the worker.

In the development of pushbuttons, the human engineering principles have been followed when the choice of colors was made. The operators are not forced to watch a hypnotic color for long periods of time, and the stimulating colors provoke fast action when an emergency arises. In the case of *the tri-lighted pushbutton, there is never a* choice to be made as to whether a bulb is burned out, because one light should always be lighted. If no light appears, it is time to call the maintenance department.

Another new product is the Honeywell proximity switch . . . our name for a static switch. A static switch is a switchless switch—one that permits current to flow or prevents current from flowing without the use of contacts or any moving parts. In fact, it is actuated by any magnetic material passing within a short distance of a sensing head. This device enables counting rotations of rollers without contacting the roller, working with metal plates, specifically tin plates as used in the printing industry, and counting and registering many other devices which are impossible to contact physically. Needless to say, the long life of such a device without moving parts will some day make this new system more common than mechanical-type switching devices.

TRIP CONTROLS FOR GUILLOTINE CUTTERS

Of the new Micro Switch products for the printing and publishing industry's safety, the Micro Switch trip control for guillotine cutters is probably the most directly adaptable. The use of Micro Switch trip control for guillotine cutters was an accidental but fortunate adaptation to paper cutters of a control originally designed for the metal working industry. Micro Switch trip con-

trols have worked out very nicely on flatbed cutters, affording an uncheatable control that is easier to operate and because of its electric flexibility, allows the operators to safely hold labels, tickets, or other narrow work.

Micro Switch is now offering a special Micro Switch trip control designed especially for use on paper cutters. This control differs from its metal-working machine counterpart in that it does not have a "Single Stroke" and "Repeat" selector. Other trip controls have either "Single Stroke" or "Repeat," although this selector is tightly locked in the control box, its presence was distasteful to safety men in the printing and publishing industry because a repeat operation is entirely unnecessary on a paper cutter.

LIMIT SWITCHES GIVE AUTOMATIC UPSTROKE

Micro Switch trip control offers automatic upstroke, that is, the operator could release his hand switches once the knife had hit the stick and took over and caused the machine to go back to the top of the cycle, automatically, and stop there automatically. This automatic portion of the cycle and the automatic stopping was accomplished by means of limit switches actuated by the drive-shaft of the machine.

When a knife was changed, it was possible to "inch" the machine to stop it holding one of the limit switches actuated. To start the machine again it was necessary to change the setting on the control from "Single Stroke" to "Repeat." For this reason it required considerable research to eliminate the "Repeat" selector and proceed if the machine should stop holding one of the switches actuated.

The new trip control for paper cutters does all of these things. When used in conjunction with an angle bracket it either requires the operator to hold both hands on switches safely located beneath the front table of the cutter or allows him to hold labels, tickets, or other narrow stock with the angle bracket and control the machine by a two-hand control with one switch located on the angle bracket and the other in the normal under-the-front-table location.

Any time either of the switches on a Micro Switch trip control is released during the downstroke, the cutter stops immediately. Any attempt to cheat the control, or any failure of the control, such as a short circuit or power failure, or an airline failure or a damaged component, will not endanger the operator because the machine can not run until the damaged or cheated components are restored to normal.

These more recent developments by Micro Switch are the results of normal progress and constant cooperation by our engineering department to meet progressive requirements of safety engineers engaged in a continuous effort to out-think the unthinking worker.

SAFETY 'ROUND THE CLOCK—AN EXTENDED HEALTH AND SAFETY PROGRAM FOR INDUSTRY

by DAVID T. SHUTE

assistant vice-president, Loss Prevention Dept., Liberty Mutual Insurance co., Boston, Mass.

Why should industry establish a health and safety program that extends beyond the work place? From the public health point of view, health services offered by industry benefit a large segment of the population. From management's point of view, when the influences on an employee outside the plant are good, the results of lower cost and higher, better quality production likewise are good. The more a company provides for employees the more it is regarded as a good company for which to work and one which exerts a favorable influence on the entire community.

There is a definite need for home accident control since accidents are the number one

cause of death among children and young people up to 24 years of age. The chief reason is that the accident problem has been stressed sufficiently for parents to realize that preventing injuries to their children is just as important as preventing the communicable diseases of childhood. However, there is no reason why the laissez faire attitude toward accident prevention within the family group can not be changed. There could be increasing awareness with correspondingly beneficial results if everyone in a position to do something about the situation joins in the crusade.

MORE WORKERS HURT AT HOME

Initial attempts at controlling home accidents were made by local health departments. Results of surveys, statistical studies and early preventive measures revealed that a severe problem existed, but in a short time serious efforts might bring results.

In addition to the high accident rate among children, more employees have been injured at home than on the job. Many states are placing more financial responsibility for off-the-job accidents on employers, which is a good reason why industry can and should get into the picture.

Illness and injury mean suffering, sorrow, and added burdens—mental, physical, financial—for the employee and his family. Illness and injury mean absenteeism for management. Establishing a health and safety program that extends into the home should help to control these conditions by:

1. Reducing employee absenteeism from injuries due to home, highway and recreational accidents and employee and dependent injuries and illnesses.
2. Increasing employee efficiency and improving morale through the prevention of illnesses and injuries and improved employer-employee relations.
3. Reducing group disability insurance costs through better accident and illness experience.
4. Increasing community acceptance of the industry as a good place to work.

Any industry with an effective on-the-job accident prevention program can achieve satisfactory results by including activities aimed at preventing non-occupational injuries and illnesses. It must be acknowledged at the start that this is a more difficult goal since the home atmosphere, unlike the industrial environment, is not controlled. However, most companies that have off-the-job or home safety activities believe it is well worth the time, effort and money expended, if only from the aspect of employer-employee relations.

A group of industrialists meeting in New York city in 1955 to discuss home accident prevention agreed that a workable program for reducing home accidents would win employees, their families and community good will. This group concluded that "heads of families and school teachers, like industrial plant supervisors can be taught responsibility for safety of individuals. But safety principles and attitudes rather than safety specifics must be taught to employee families and then to entire communities."

To help a family live with better health and greater safety is a matter of education —developing in the worker and his family a safety-consciousness that will apply regardless of where they are or what they are doing. This family safety program should be a broad, long-term venture, carefully planned from year to year.

FAMILY SAFETY PROGRAM

It should cover not only home, highway and recreational safety but any situation which may adversely influence the health of a family, and it must be adapted to the specific plant. In some cases home safety activities should be a separate project. But they are usually more successful as an extension of an effective on-the-job program.

Primary efforts are usually concerned with getting information into the home. There are various ways of doing this:

1. Provision of wall racks in the medical department, first-aid room or other accessible location to display pamphlets for employees to take.
2. Distribution of health and safety pamphlets to the health service for the nurse to give employees when they come for care or counseling.
3. Periodic distribution of health and safety information in an envelope with the pay check.
4. A health and safety column in the employee publication.

5. Monthly, bi-monthly or quarterly mailings to the home.

Every possible effort should be made to stimulate interest. Whenever possible an introductory letter should be sent to the home of each employee, emphasizing the value of health and safety activities in a family and encouraging their participation.

USE HOUSE ORGANS

If the plant has a house organ, an introductory article could announce the initiation of the program, with suitable follow-ups in succeeding issues outlining the progress and success of the project. From time to time, appropriate posters on plant bulletin boards could tie in with the particular phase of health or safety being stressed at that time.

When the company is the main industry in a community the program might be launched with an open house, at which time off-the-job, family safety, and on-the-job safety features would be stressed. Stimulation of and cooperation with community organizations, use of local health facilities and resources, educational programs in the schools, demonstrations and exhibits for PTA meetings and other activities might be developed as the program progresses.

Either a committee or an individual may head up the program. Ideally a special committee or the health committee might be responsible for activities. Few plants have organized health committees to carry out family safety activities. However, many plants have safety committees and since the activities of the employee both on and off the job are interrelated in health and safety, the safety committee or a sub-committee could extend its efforts to include family health and safety. This also gives employees some part in program planning. If there is no safety committee or it is not feasible for the committee to handle activities, the personnel director, safety director or some other person with a keen interest in employee welfare might be appointed to head up the program.

Liberty Mutual's extended health and safety program for industry provides group disability policyholders with a service directed toward controlling injuries and illnesses of employees and their families. There are various ways of approaching the situation. The method we presently emphasize is the home mailing program, which enlists the aid and support of the woman in the home.

She is a force in her family and is an extremely important person in preventing injuries and illnesses to the whole family. Given the knowledge, she can also reach into the plant to protect the man of the house from work injuries.

HOME MAILING PROGRAM

The mailing program starts out with an introductory letter from management sent to each employee's home. The letter is addressed to the wife, mother or homemaker and explains the nature of the program, why it is being undertaken, how it will be handled, what it will accomplish for her and her family, and her part in the program. Along with this letter is a postcard to be signed and returned if she and her family wish to receive the health and safety material monthly.

After replies are in, a second letter is sent to all families consisting of two pamphlets—one on health and one on safety. Appropriate material is sent monthly thereafter.

It is the responsibility of our health consultants to help management individualize its program and work out other methods of distribution when a plant can not handle the mechanics of a mailing program.

With the coming of automation and less work for more people, an increasing number of employees will spend less time on the job and more time at home, on the highway or in recreational pursuits with their families. It has been said that "The individual effort of an informed person will do more for his health and that of his family than all the things which can be done for them."

Industry can set its sights on no higher goal for the future than to create in the worker an awareness of his health needs and a willingness to cooperate in all measures designed to promote and protect his health and that of his family.

PRACTICAL SAFETY DEVICES INCLUDED IN HARRIS-SEYBOLD PRODUCTS

by JOSEPH McCONNAUGHEY, JR.

Western District Manager, Harris-Seybold Co., Division of Harris Intertype Corp., Chicago

We at Harris-Seybold have always been safety minded in design and manufacture of printing machinery—presses and cutters. These machines require close operator contact and by their nature, though well guarded, can, through a mishap, cause a severe injury.

Safety consciousness in cutter design was demonstrated as far back as 1899 when a two hand throw-in (operating control) was put on the old Seybold Holyoke model paper cutter, and in 1913, the two hand safety device was supplemented by a positive locking steel safety bolt, making a dreaded uncontrolled repeat cycle impossible.

PRESS SAFETY FEATURES

Since those early days, many improvements in printing machine safety have been made by Harris-Seybold engineers. Several years ago, our engineers were invited to assist in writing a Graphic Arts Safety Manual. The information supplied to our group by the committee, plus some additional studies on their part, forcibly proved facts about safety requirements which had always been supposed to be true. This created an even greater desire on our part to build increased safety into our machine. Let's consider briefly presses—Harris and Cottrell presses today incorporate such standard design *safety* features as:

1. *The "Two-finger Start" safety push buttons.* This is now being furnished as standard equipment at no extra charge on new presses. This new safety device has won astounding acceptance by both operators and owners and is now considered a standard of the industry. This feature was introduced two years ago at the National Safety Congress.

2. Also safe-lock control station buttons are supplied on all presses: plus limit switches on load raising and lowering power lifts with fail safe brake and warning devices, being standard on multicolor presses.

3. As much and as comprehensive safety guarding as possible to guard critical mechanisms is supplied which will still allow efficient operation of the machine with maximum operator safety. In areas where a man must work on dangerous mechanisms, guards are electrically triggered so as to make the machine inoperative when guard is removed.

4. Safety hand rails, grips and cat walks with grip treads are also furnished to assist in operator safety, when moving around on the press.

LIGHT REFLECTING PAINT

5. And something new—experiments are also being conducted through cooperation of Western Printing & Lithographing Company in using an off-white light reflecting paint on presses. A paint developed cooperatively by Harris-Seybold and Pittsburg Plate Glass engineers. Western Printing safety engineers and press operators are quite enthusiastic and this change to lighter colors for printing machinery for improved visibility and safety purposes may presage a new trend.

6. Operator Manuals are furnished in the belief the more the operator knows about the machine, the safer he will be. Safety was one of our prerequisites in the original concept of the design of our Seybold "Saber" cutters and of the Full Hydraulic large size commercial and mill trimmers. Safer "Saber" meets safety requirements for all six major hazards as outlined in National Safety Council Data Sheet #D-298 titled "Power Guillotine Cutters."

a. Danger of operator getting hand under descending knife.

b. Fingers being crushed under pressure clamp.

c. Contact by hand with cutting edge of knife when at rest.

d. Injuries from handling and changing cutting knife.

e. Accidents due to repeat cycle of knife.

f. Injuries due to contacting moving parts of the machine.

Examples of how the Saber meets N.S.C. requirements are:

REQUIRED HAND-POSITIONS

1. A positive approach to safety is demonstrated by establishing a required safe position for the operator's hands during the cutting cycle—in other words, both hands are necessary to operate the two hand start, two hand hold cycling control. This approach can be compared to the negative approach of attempting to stop the machine during a cycle after the operator's hands or arms are in the danger area. An example of this would be the light beam—electric eye safety device such as furnished on imported cutting machines.

2. Again, a positive approach has been used in safety design by use of the highly reflective off-white color on knife bar, coupled with adequate flood lighting—a feature which reduces operator eye fatigue and insures safer operation throughout the shift.

3. The present day Seybold hydraulic paper cutter clamp is capable of producing eight tons or more of pressure which can do as much damage to the operator's hands or arms as the knife. Harris-Seybold pioneered the necessity of making the operator unlatch the clamp before it can be lowered by the foot treadle, thus preventing the possibility of the operator (or some buddy) accidentally stepping on the foot treadle and bringing down the clamp while his hands or arms are in the danger area.

4. The dreaded repeat cycle of a paper cutter has been met head on by our engineers—the result is "The Double Safety Bolt." This can be described as a safety to protect safety to protect safety. In other words, the sequence of operation, in case required, would be: if the electric fail safe brake fails, if the #1 safety bolt fails, the #2 safety bolt will stop the machine—and prevent further operation until cause of these failures is corrected.

5. The knife changing operation on cutters—always a procedure requiring extreme caution—has been made much safer by the introduction of knife changing knobs. And through cooperation with Eastman Kodak safety engineers an electrical circuit that interlocks the knife changing knobs is incorporated so that when knobs are removed from their storage position—as is the case when the knife is being changed—the machine can not be cycled. This prevents any possibility of an unexpected cycle while the operator is working in the danger area.

6. There are numerous safety features designed into our Safer "Saber" paper cutting machines—features not as dramatic perhaps as those already mentioned but important. They are:

a. Strength and stability of basic machine.

b. Thorough guarding of all points such as pulley, flywheel, gears, belts, and levers.

c. Correct table height so that operator is not off balance when placing heavy lifts of stock. Also air film available on larger machines lessening possibility of operator strain in positioning lifts of stock.

d. Electrical voltage reduced to 110 volts from line operating voltage in control panel, reducing danger of severe shocks.

e. In event of power failure, everything on cutting machine stops instantly and is either electrically or hydraulically locked in position.

f. Knife in rest or non-cutting position guarded so operator cannot come in contact with cutting edge.▲

SAFETY AND SEMANTICS

by KARL F. SIMPSON, JR.

director, safety & industrial relations, Folding Paper Box Assn., Chicago

An institution is "collective action in control of individual action." Following this train of thought, institutional economics is the study of business ethics which deals with the rules of conduct arising from a conflict of interest. These rules are enforced by the *moral* sanctions of collective opinion. At times this concept of an institution seems analogous to a building, a sort of framework of laws and regulations, within which individuals act as inmates. It seems to mean the "behavior" of the inmates in our social organizations which results from the conflict of interest.

The application of "institutionalism" to industrial safety can be appreciated if we apply the "conflict of interest" concept to the conflicting attitudes of the general public. On one side, we have the pressure of competition which stems from the public's desire for more production and higher quality at lower cost. On the other side, we have a "moral" pressure from the same general public who feel the greater production and higher quality should not be achieved at the price of an unduly high cost in industrial injuries.

In this "conflict of interest" the "moral conscience" of the public has been translated into economic pressure on industry in the form of workmen's compensation. This shifts the burden of administering this moral sanction to the business community. By altering basic rules of the business community and taking full advantage of a basic characteristic of human nature, the altered flow of business activity should decrease injury rates.

Thus, workmen's compensation is based on the idea that the "institutional" or persistent behavior patterns of the businessman will reduce and eliminate cost items (injuries) which are subject to his control. That portion of the injury "cost" which cannot be eliminated should be part of the product cost and reflected in the purchase price.

In this definition of institutional economics we find a significant contribution to understanding industrial safety. In a safety program there are two problems which must be considered: (1) effectively presenting the program to get management's full cooperation and (2) presenting the program to employees to secure their acceptance. Lack of understanding on the part of management prevents effective action, while a lack of rapport with the employees reduces the program to a sterile exercise in theory with no effective use.

TWO PROBLEMS OF SAFETY PROGRAMS

The way to present a safety program to top management, is not the same as presenting it to employees. The facts are the same for both groups. The problem is selecting pertinent information which will be understood and appreciated by each group. Since the conditioning and training of the businessman differ from that of the employee, he will be responsive to different arguments.

For a safety program to be really effective it must be "sold" to top management, so they are induced to put their full weight behind the project and drive it through to completion as they would in marketing a new product or installing new machines and techniques. The reason top management supports a new product is because if the program is successful, the organization will profit. The reason management supports installing new machines is because it will lower cost, increase production and, in the end, should mean greater profit.

One basic mental institutional characteristic of the businessman is his unbounded optimism and faith in the future. One valuable instrument for measuring his activity and his estimates of the future, is the "profit and loss" statement. He thinks, eats, breathes and lives "profit and loss." We must recognize this characteristic. However, there is a great difference between recognizing this characteristic and effectively using it to activate a safety program.

You can tell a businessman that a good safety program will alleviate suffering, be good for his employees, be good publicity (this may have some monetary significance to him), is needed to keep the union quiet, will get him into Heaven, or stress all the humanitarian and revival arguments, and if lucky, you will get an indifferent acquiescence to your program. You might as well bury and forget about the activity right there because you will never really get the program off the ground. The only thing you are sure of is the disaffection of your co-workers and laryngitis from shouting into closed ears.

GIVE MANAGEMENT FACTS

This complete indifference is the situation faced by many practitioners in industrial safety. They are fighting a one man battle for a program which requires the complete support of the whole organization.

Many industrial safety men are not taking full advantage of their power. This power or force consists of an aroused management or business organization in search of profit. The catalytic agent necessary to activate this element is proof of decreased costs through the reduction of accidents. This proof must be more than a pious affirmation of faith that a cost reduction will result. The monetary nerve of the businessman is quite well developed and extremely sensitive, therefore it is logical to present arguments to activate this sensitive sensory organ. If you want to see top management sit up and act, just tell them a good safety program will save them money. *Be prepared to back up this statement with a factual presentation worthy of their consideration.*

Does this mean that businessmen are heartless monsters to whom welfare arguments mean nothing? No, but it means by telling them a safety program saves money, you have said something their analytical mind understands. You are getting through to them; you are talking in a language they appreciate and evaluate.

To approach this task of "cost" analysis intelligently, reduce the problem to its basic elements. Webster defines the word *accident* as "an event that takes place without one's foresight or expectation, especially one of an afflictive or unfortunate character . . ." On the other hand, Webster defines an *injury* as "damage or hurt done or suffered . . ." If we assume that an injured person was not trying to maim himself, then every injury is an accident, but every accident will not result in a personal injury. We reduce these classifications into sub-groups on the basis of damage to plant, machinery or equipment:

1. Accident—no injury to an employee and no damage to plant, machinery or equipment.
2. Accident—no injury to an employee but the destruction or damage to plant, machinery or equipment.
3. Accident—an injury to an employee but no appreciable damage to plant, machinery or equipment.
4. Accident—an injury to an employee, as well as the destruction or damage to plant, machinery or equipment.

Since all injuries result from accidents, the fertile field for exploration involves the area of accident reduction. Because of the controversial nature of the data on the "total" cost of injuries, let us ignore this aspect of the problem and explore the other economically significant area of "cost," replacing or repairing of plant, machinery or equipment damaged or destroyed by an accident. Webster defines the word *maintenance* as "the upkeep of property, equipment, etc." This upkeep is necessary by normal wear and tear on equipment.

CHECK MAINTENANCE COSTS

This idea has become somewhat adulterated and *maintenance* in many instances now means all outlay to maintain plant and equipment, including the cost of restoration or replacement after an accident. When this new definition is followed, the maintenance budget often is so large that top management reduces the size of the maintenance crew or delays expenditures for needed repairs. Seldom is an effort made to determine *why* maintenance costs have become unduly high.

If your maintenance costs are too high, you should investigate to determine why each expenditure was made. Ask these questions:

1. Was the expenditure from the actual wear and tear normally expected?
2. If not, was it due to an accident?
3. If it was, why did the accident occur?

Separating out these "accident" expenditures is not as easy as it seems. People who have *wasted* the company's money are seldom willing to admit it. Despite the difficulties inherent in such a project one company in the paper industry has made a preliminary investigation of the subject and unearthed the following facts:

1. 15 per cent of the maintenance work was unquestionably made necessary by circumstances which could be classified as "accidents."
2. An additional 15 per cent of the work was made necessary through employee negligence — (some people, however, might question the use of the word "accident" in these cases.)
3. There is another area beyond this basic 30 per cent which could not properly be classified as "fair wear and tear"—damages which might have been prevented by the type of systematic job analysis which is called for in an effective program of accident prevention.

These results are based on an analysis of 1,251 work orders. If "accidents" and "negligence" had been eliminated the total would have been reduced by 375.

If your operation is anything like the organization which made this study, you might apply this 30 per cent figure to your maintenance expenditure for last year and see if you can stimulate any interest in your top management in a program which offers the reasonable expectation of this dollar saving.

This obviously is not a complete picture of the benefits of good safety program. However, if our thesis is correct—that you must translate the value of a safety program into terms top management can evaluate and appreciate—then it offers a fruitful area for exploration and possible exploitation. Turn your safety plan into a program designed to eliminate the basic ingredient in each personal injury—the accident—and use factual material to back up your assertions that accidents and injuries cost money.

Although you may not be able to determine the "total cost" of injuries, you should be able to substantiate your offer of savings in maintenance expenditures which by itself should be sufficient to "sell" any top management on your program.

Behind the Scenes—

THE INSURANCE COMPANY'S ROLE IN INDUSTRIAL SAFETY

by FREDERICK J. DODSON, JR.
assistant manager, Loss Prevention Dept., Liberty Mutual Insurance co., Boston, Mass.

Cooperation between representatives of the insurance company and the policyholder, which may sound like an obvious necessity, deserves to be examined.

This is an area of the accident prevention scene in industry where there is substantial room for improvement—the zone of inter-relationship between the insurance carrier loss prevention representative and those in industry responsible for the administration of the in-plant safety program.

Real misunderstanding exists in only a small percentage of cases, but there is room for improvement in the vast majority. Admitting that we must always live with the personality conflicts existing in any human contact, let us see if there is any other basic reason for difficulty.

The plant safety director is engaged as a management representative charged with the prevention of accidents or production interruptions in the broad sense and he generally

acts with the delegated authority of top management. He is trained and experienced in the problems of his organization, and he knows its limitations and economic restrictions. He can draw on the skills of his own organization's staff and he can consult with numerous agencies for advice.

ENGINEERS AID POLICYHOLDERS

The insurance company safety engineer although engaged by a different employer is expected to contribute a service to the policyholder which will achieve the same goal as that of the plant safety man—an improved accident experience. Every insurance company safety engineer is not a top-flight operator and the same observation could be made of industry's safety engineers.

In the early years when industrial safety was in its infancy we probably had many cases where the insurance company safety man's activity was too greatly concerned with "replacing rungs in ladders," or "patching holes in the floor." However, a lot of water has gone over the dam and the broad exposure of information and education now available to insurance company safety engineers has changed the picture greatly,—yet I feel that in many places industry doesn't really understand this.

The insurance engineer is trained in the same basic principles as the plant man. He has, however, access to a vast experience accumulated by his employer which far exceeds that of the individual plant. He has close contact with specialists in the more technical fields of engineering and can draw on such help as he needs it. In our rapidly advancing technological system these skills, in depth, are essential to keeping our loss prevention activity in tune with the times.

I can see no basic reason for misunderstanding between the carrier and the insured. There is unity of purpose. Safety representatives of both are members of the same profession working toward the same objective.

INSURANCE MAN IS CONSULTANT

In the ideal situation the plant safety man accepts the fact that the insurance man cannot know all of his and his plant's problems and that he must acquaint the insurance man with background information so he can make a maximum contribution to their joint undertakings. The plant safety man must also recognize that the insurance representative is not in competition with him but is, in effect, a consultant for his assistance.

The insurance safety engineer, in the ideal situation, recognizes that the plant man must live with his plant problems every day of the year. When the insurance engineer visits the plant he must carefully evaluate any examine the plant's activities before attempting to offer advice or suggestions. When he encounters new situations not within the scope of his own experience he must take time for necessary research and study of the industry's experience as compiled and documented by his own company. He may need to call upon specialists for further assistance.

I believe it is the accumulated experience of the insurance carriers, many of whom have acquired and developed special knowledge of particular industries, that puts the insurance engineer in a position to be of maximum aid to the plant man. Various insurance companies, over the years, have acquired extensive coverage in certain geographical areas where particular industries tend to center, making it possible to develop special services for such industries. Such services can frequently be extended to other less concentrated areas through the carrier's training and supervision of its field representatives.

CARRIERS EDUCATE PLANTS

The carriers are also called upon by trade associations and organizations such as the graphic arts industry to assist in the development of educational material and the research of special problems. Through these contacts the carrier can often bring to the individual plant knowledge of new developments that have not yet filtered down to the operating levels.

The plant safety man has much to gain from the insurance carrier by learning to make use of its safety services to best advantage. He can do this by endeavoring to establish the best possible personal relationship with the carrier's servicing engineer so that there will be a constant free exchange of problems and information. Through this local contact he has access to the full facilities of the insurance company.

assuming that sufficient rapport or understanding has been established between plant and insurance safety men let's examine some of the specific activities to which the carrier services can contribute.

ACCIDENT PREVENTION

As industrial organizations grow large, two significant factors emerge that seriously affect the accident prevention effort—one helps, the other sometimes hinders.

First, the larger organization recognizes and accepts a broader responsibility for its human and community relationships. This leads to more vital interest in the loss prevention effort and a demand for positive results. I know of no large, successful business concern that does not face up to this obligation and acknowledges its importance from both legal, social and economic points of view.

This recognition also leads logically to management's demand that the insurance carrier be equipped and staffed to render every practical consultative aid on loss control. This imposes a powerful incentive on the carrier to develop a service geared to the changing requirements of industry.

The second significant factor to arise from the growth of the industrial organization is the development of the staff function and the delegation of authority. In dealing with the smaller policyholder we usually achieve results more quickly by establishing effective contacts with the owner-manager or the shop superintendent. In the case of the larger organization we, as relative outsiders, frequently encounter impassable channels of authority, delegation and decentralization.

It is not unusual to discover in the course of attempting to render effective service that we must deal with an insurance manager, a safety director, an industrial relations manager, a standards department, an engineering department, a medical director, a factory superintendent, an architect, a chemist or process engineer, a purchasing agent and a government security officer—to mention a few.

To get decisions, to activate necessary changes and to organize necessary follow-up under these circumstances pose no simple problem. In many cases we achive simple, effective communications with the proper authority. In others, we find ourselves dealing with ineffective subordinates and fail in our purpose.

Therefore, it seems appropriate to conclude that the insurance buyer can assist the carrier to render effective service by establishing good lines of communications with appropriate management representatives.

NEW SKILLS NEEDED

Since World War II the technological developments of industry have advanced so rapidly that a whole series of specialized fields of science invaded the scene. This new complexity extended to the field of accident prevention. New skills were needed, research into new hazards was urgently required, new training was necessary and new techniques had to be developed. Obviously, no single firm could assume or afford the full responsibility for these new problems—but, the insurance carriers have been able to bridge much of the gap.

We believe the insurance company loss prevention specialist makes an important contribution in this situation because successful accident prevention activities in today's complex industrial atmosphere are no longer simple ABC's. A truly comprehensive loss control program must draw on many skills and no manufacturer, merchant or contractor can afford to staff his organization with all the professional know-how that may be required to do a total job. Through the insurance company, however, it is possible for the policyholder to avail himself of many skills because they can be made available to so many policyholders that the expense can be justified by the carrier.

LOSS PREVENTION DEPT.

I think you may be surprised to learn the multitude of the specialties that it has been necessary to develop in order to make available a complete modern loss prevention service. Here are the talents that we employ in our Loss Prevention Department and some of the services these people render. (Note that these are in addition to the field servicing engineers and elevator inspectors who make regularly scheduled visits).

INDUSTRIAL MEDICAL CONSULTANTS

Planning in-plant medical facilities
Assisting in selection of personnel

Establishing health counselling programs
Setting up job placement programs
Investigating special health problems.

INDUSTRIAL HYGIENISTS

Field instrument testing—air sampling
Design of ventilation systems
Developing control measures—dusts and gases
Evaluation of waste disposal problems
Determination and control of explosion and fire hazards.

ACOUSTICAL ENGINEERS

Measuring sound levels
Designing noise control devices
Setting up audiometric programs.

TRANSPORTATION ENGINEERS

Designing industrial power truck programs
Analyzing parking lot and traffic systems
Controlling peak traffic hazards
Laying out shipping and receiving traffic patterns.

CONSTRUCTION ENGINEERS

Analyzing floor loading and building design problems
Measuring and correcting building vibrations
Studying and controlling blasting operations
Analyzing strength of temporary structures.

ELECTRICAL ENGINEERS

Controlling hazards of power generation and distribution
Study of high and low voltage exposures.

HEALTH PHYSICISTS

Measurement of radiation exposures
Analysis of radioactive material handling
Establishing radiation health control programs.

INDUSTRIAL ENGINEERS

Designing effective machine safeguards
Reviewing and assisting in plant lay-out
Analysis of material handling programs
Preparation of job and operation studies.

PUBLIC LIABILITY SPECIALISTS

Analysis of catastrophe possibilities
Study and control of public assemblies
Application of building codes and standards
Evaluation and control of product liability exposures
Design of controls to provide legal defenses.

FLEET ENGINEERS

Establishing driver selection and training programs
Developing vehicle maintenance programs
Training of fleet supervisors and driver trainers.

In addition to these skills we have also found it necessary to develop facilities to examine new or previously unsolved technical problems. Various companies have approached this situation in different ways. Our company has built a Research Center at Hopkinton, Massachusetts, dedicated and devoted exclusively to the solution of real or potential accident problems arising from the activities of our policyholders.

This is not a profitable operation if measured in terms of direct gain to Liberty Mutual. In terms of future profit to American workmen, it has already given promise of justifying itself. We believe that ours is a service organization and must contribute to the general welfare to justify confidence in its purpose and to this end we are proud to have pioneered in this phase of loss prevention activity.

TECHNICAL SERVICES

Now these special services are delivered by home office and staff people—available to support and assist the field servicing engineers responsible for first line contacts with the policyholders. Clearly, these skills are too numerous and too highly developed to fall within the scope of even the most versatile safety engineer.

In listing the special consultative technical services I do not mean to detract, in any way, from the ability or importance of the servicing engineer. His is the basic responsibility for the carrier's Loss Prevention Service. Most field representatives are graduate engineers, who have completed an intensive training program. They are capable of dealing effectively with 95 per cent of the problems they encounter but of major importance is their ability to recognize and evaluate the unusual situations and to obtain the assistance of specialists when required.

My second recommendation is that the policyholder acquaint himself with the specialized insurance services available to him and that he make known his need to his carrier's local loss prevention representative. This is a problem of timing. It is common for us to detect new problems in the plants of our policyholders that we might have earlier resolved at less cost and inconvenience if we have been consulted. In fact, in the designing stage of new processes we have often submitted proposals that were easily adopted but which might have been prohibitive after the operation was started.

NOTIFY SAFETY MEN

This situation leads logically to my third recommendation. The policyholder should alert his engineering and construction departments to notify the safety department and his carrier's loss prevention representative of new plans, new layout, new machinery, new materials, new processes, new products and extensive alterations while these changes are in the planning stage. In this way we can frequently forestall hazardous situations and avoid expensive changes that might result if the conditions are detected "after the fact."

I have made several inquiries of industrial safety directors and personnel managers to determine their view of an insurance company's role in industrial safety. I certainly got a mixed reaction. Replies ran all the way from "an unnecessary evil" through "too little and too late" up to the complimentary "principal force behind our program" and the one I like best—"They (the insurance company representatives) are like a staff of experts on our own payroll."

We all know that no two insurance companies are alike and the extent and calibre of loss prevention service rendered by these companies cover a broad gamut. These services are geared to reflect three forces—(1) the demands of the policyholders, (2) the cost of such services and (3) the insurer's philosophy or belief in the effectiveness of the loss prevention effort.

ACCIDENT PREVENTION BENEFITS

Modern industrial management knows the economic advantage of effective loss prevention but, in addition, has accepted more and more a broader responsibility for its human and community relationships. The desire to develop a solid community reputation for providing a safe and healthy working environment, to attract the highest calibre employees, to reduce turnover and absenteeism and to establish general goodwill has motivated industrial management to re-examine its accident prevention activities.

This examination sometimes indicates that there is much more that can and should be done. On many such occasions the insurance carrier is called upon to supply additional special services in keeping with the broader concept of managements' responsibility—and this demand motivates the insurance carrier to improve the scope and calibre of its services to meet the challenge.

Loss prevention service is exactly that—a service—and what the policyholder gets out of it will be in direct proportion to his willingness to make use of it. Many companies seem interested only in the immediate direct cost of insurance, failing to realize that in the final analysis the cost of losses is the greatest single factor in the determination of rates. In the long run, an individual concern will do well or poorly in direct ratio to its ability to reduce losses.

The cost of loss prevention service is about the same in any company—the important thing is what the company does with this expense money and what use the policyholder makes of the service. Since the indirect or uninsured cost of industrial accidents far exceed the direct or insured loss, the policyholder stands to gain much more than the carrier from effective loss control activities.

HIGHER CLAIMS COSTS

In today's expanding economy we are confronted with much higher claims costs because of liberalization of benefits and higher medical expense. It is a credit to the efforts of both policyholders and carriers that there has been no severe increase in Workmen's Compensation insurance costs. As a result of improved experience in industry the higher cost of cases has been partially offset by a reduced frequency and basic rates have increased only slightly in comparison to the cost of cases.

The attitude of the insurance carrier itself is an important factor. My company has been dedicated, since its founding, to the belief that it must contribute substantially to the prevention of loss and suffering so that our American insurance system will be more than a system of reimbursement for damages done.

The important points that I have tried to make are:

- There is room for improved understanding between insurance loss prevention engineers and industrial safety men in the policyholder's plants. Much can be gained by a re-examination of the two points of view because such an examination will reveal that there is a common objective which can be best achieved by close cooperation.
- Good communications between the insurance carriers and the policyholder are essential at management level. The policyholder can do much to be sure that proper working contacts are maintained.
- The insurance buyer should acquaint himself with the special services his carrier is equipped to render and should call upon these services when needed rather than waiting for the carrier to discover the need.
- The policyholder should promptly notify the insurance carrier of intended process, product or plant changes so that recommendations can be considered in the planning stage of such developments.

I am confident that the principles and suggestions I have made will have universal endorsement. If you are not well acquainted with your insurance carriers representatives, invite them to talk things over. You may be surprised to find that their thinking is little different from yours.▲

BUILDING SAFETY INTO THE PRINTING PRESS

The Latest Ideas

by ALBERT T. KUEHN

sales service engineer, Miehle Printing Press & Manufacturing co., Div. of Miehle-Goss-Dexter, Inc., Chicago

The latest ideas of safety built into printing presses are found in the presses designed and built after the last war. These are high speed Rotary Sheet Fed Presses. They are designed to print in one to five colors by both the letterpress and the offset lithograph process. They print anything from the size of a postage stamp to the size of a bed sheet (52"x76") at speeds up to 500 feet per minute.

Many safety devices are built into the presses, but the most important of all is the completely new design of the press itself. It is engineered for safe operation.

In the letterpress process we find that the design of large presses has changed from a flat bed reciprocating press to a streamlined Rotary Press.

In the offset lithograph process we find that the presses have changed from high, slow speed, cumbersome presses to low, high speed streamlined presses.

To appreciate fully the safety engineered into the new presses, let us take a backward look at one of the prewar presses. Here we see cams, gears and a maze of moving parts dangerously exposed on both sides of the press.

These hazardous areas are eliminated on the new presses. All cams, gears, and moving parts are enclosed in streamlined housings. Some of the parts operate in a bath of oil, others are automatically lubricated.

Now, it is perfectly safe to walk up to one of these presses, running at high speed, and pat the side of the press with your hand.

SAFETY IN PRESS OPERATION

The most amazing change in safety on the new presses is the simplicity of the press operation.

Just picture a flimsy sheet of paper, the size of a bed sheet (52"x76"), being printed.

First the sheet is separated from a pile in the feeder and is moved on tapes to a position where it is registered. It is then accelerated to the speed of the press and transferred to the printing cylinder. The sheet is then printed in one to four colors while it travels from 300 to 500 feet per minute. Next, it is decelerated, stopped and placed on a pile in the delivery. This goes on for hours with very little attention by the pressman.

The press is automatically tripped off, when damaged sheets are fed to the press, or when they are not accurately registered.

It is now possible to print the finest quality on the large sheets, at the fastest speeds, with complete safety to the operator. This is the most amazing change on the new presses.

SAFETY IN PRESS MAKEREADY

Press makeready includes placing ink, water, paper and printing plates on the press. Next, sheets are printed and adjustments are made to register colors on the printed sheet. After completing the press run, the printing plates and the ink are removed. The press is then "washed up" for the next printing job.

During the makeready operation one to four men work on different parts of the press at the same time. To prevent accidents, many safety devices and means are built into the presses. Electrical push-button safety stations and emergency stop stations are located at many convenient places on the press.

A safety bar is located where printing cylinders come together. It prevents the operator from placing his hand between printing cylinders. The slightest movement of this guard brings the press to an emergency stop.

Other safety measures include ink roller guards and perforated guards at the printing cylinders and at the delivery end of the press. Wide platforms and hand rails are other safety measures.

SAFETY IN PRESSROOMS

- How effective are the safety measures built into the latest presses?
- How do many accidents occur on presses?
- How can they be prevented?

To find the answer to these questions we visited a large Chicago printing plant, operating about 50 printing units. The pressrooms foreman told us that accidents occur on the presses at the rate of one per month. The causes are immediately investigated. In most cases, the causes are carelessness and disobeying orders pertaining to safety practices.

The foreman said that the number of accidents on the presses today are only a fraction of what they were previously. He could offer no suggestions for additional safety measures.

This brings out the fact that the latest ideas in safety are effective.

Our engineers are constantly on the alert for safety suggestions. They cooperate with safety committees.

The latest ideas in building safety into printing presses are:

Safety in the design of the press

The presses are lower, all outer gears, cams, and moving parts are enclosed in oil tight housings and streamlined guards.

Automatic lubrication eliminates the need to work in hazardous areas.

Safety in the operation of the press

Little attention to the press is required after printing production starts. Automatic detectors check the register and the transfer of each sheet.

The press is tripped automatically when a damaged sheet is fed to the press.

All operating controls are located in non-hazardous areas.

Safety during press makeready

Safety switches, tripping devices and emergency stop switches are located in convenient locations on the press.

Safety guards are placed over ink rollers, printing cylinders and at the delivery of the press.

Pressroom foremen experience few accidents on the Advanced Design Rotary Presses. This is truly a sign of progress in building safety into the printing press.▲

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CURRENT SAFETY TOPICS

Volume 24

GREEN CROSS FOR SAFETY ®

PULP AND PAPER INDUSTRY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11,

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE PULP AND PAPER SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Pulp and Paper Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Pulp and Paper Section carries on in behalf of its members, and for the benefit of accident prevention work in the pulp and paper industry generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of pulp and paper plants. The activities of the Section are under the direction of its executive committee, the members of which are listed at the close of this volume.

SAFETY IS A STATE OF MIND

by REX PAXTON

director, public relations, Sutherland Paper co., Kalamazoo, Mich.

In Public Relations we try to produce a state of mind for a product, an idea or a person. In the case of safety it's an idea. When we accomplish this the end result is agreement and acceptance of our safety programs. When our ideas are accepted our publics are "with us". And when people are with you they follow you because they understand and believe that their best interests are safe with you.

When untrained men are suddenly committed to full combat, this unskilled unit will lose approximately one-third of its men —*rapidly*. But, the remaining two-thirds will not only live—but will survive combat after combat.

Why? Because of a *state of mind*. Because of an attitude of mind that influences these men and convinces them beyond every possible doubt that they *must* do certain things—and avoid doing other things—so they may *stay alive* in combat.

Instinctively they conduct themselves to avoid becoming involved in any harmful situation. They survive because they no not panic when the unexpected occurs. They survive because they think *think safety*.

Someday in your own plant, you will go a full 365 days without a single disabling injury. This will occur when everyone in your employ lives up to what we know will create this ideal situation. This will happen when we get our people really *safety-conditioned*.

COMMUNICATIONS—ANSWER FOR SAFETY

Public relations is simply communicating *deserved respect*. All that we do and say is dedicated to the preservation and perpetuation of human life. What could possibly deserve more respect than this great humanitarian endeavor?

We do not necessarily have to work harder in our safety programs. But we must work smarter, more skillfully, and more professionally to communicate this state of mind toward safety. Here in the United States, we have the most efficient elaborate machinery in the world for communication. Yet, communication remains our greatest problem and the world's greatest problem.

We must deliver our impressions daily, like newspapers, to the mental doorsteps of our people. We can never accomplish this until our employees are on our *safety team*. This team-spirit is the answer to our safety problems.

Our problem is communicating the right ideas at the right time. You know the right thing at the wrong time becomes the wrong thing. Timing is just as important in our work as it is to a humorous speaker, or a television comedian. In our study and brilliant march of progress in America we have passed through four ages of communications:

1. The age of silence.
2. The age of half-way communication.
3. The age of one-way communication.
4. The age of two-way communication.

In the first age, business said absolutely nothing to its publics or its employees. Its business was its business and not the public's. In the second age they began to speak softly and to undertake a token, or half-way communication: Businessmen found that it paid handsome dividends to tell people a little something about its affairs.

Next, it tried the one-way communication. Business then found that the more people knew about its company, its employees, its products, and its policies, the more they wanted to do business with it.

Today we are in the fourth age—the two-way communication stage, when we not only speak but listen. If you want to know what your public is thinking it pays to listen. This two-way communication is not necessarily a new dimension for safety experts. But it is an area we can use to far greater advantage.

When we speak, is anybody listening? Are we getting through? Here is the *key to our success in safety work*. Our people

must not only hear what we say, they must *accept* what we say and *agree* with us.

What's the secret of influencing people? I believe it is from the standpoint of *what interests them.*

In 1956, 95,000 persons died *accidentally* in this country, and another 9,500,000 were injured. Total casualties? 9,595,000! The *state of mind* toward accidents in this country must change.

STATE OF MIND IS CHANGING

It is changing. There's positive proof in the steel mills, which have done a magnificent job. But conditions weren't always as safe in the steel industry. In the early days, the injury and death rates were appalling until Stewart Holbrook wrote that the best location for an undertaker's establishment was near the exit of the steel mill properties in Gary, Indiana. The steel industry then took safety to heart and *did something about it.* Now, steel enjoys a rate of only 3.83. This is most convincing compared with other industries. The fluid milk plant for example is six times more dangerous than a steel mill.

Perhaps the little lad from the south was thinking about safety when he got his first job in a big defense plant where hazards were numerous. He was quite confused and had to do something, so he painted a sign and pinned it to his shirt. The sign read "In case of accident dis *vas* Johnny Jones."

Accidents never just happen. *They are caused.* An accident not only affects the individuals involved, but the company, and many others involved in reclaiming merchandise.

In creating and perfecting our safety programs we can never operate a "closed mind" shop—anything we do now can and will be improved. There is always a better way. Our greatest need is *new ideas for safety.* Nothing is as powerful as an idea whose time has come. *Safety-consciousness* must be invested with sovereignty.

You recall when Caeser landed in North Africa, he ordered his troops to burn their ships. Then he told his warriors if they ever expected to return home and see their wives and children again it would be in the enemies ships. He created a *state of mind* so intense, so dynamic that the safety of their very lives depended upon accomplishing certain things, without failure. His communications were direct and his audience *listened* and were *determined* to do what he asked.

The airlines have taught all of us an impressive lesson in safety work. In the beginning their No. 1 problem was to overcome *fear* in passengers. Their job was to *communicate safety.* Fortunately, they recognized that this was their No. 1 problem. And they have solved it through the channel of communication. Good public relations and the science of communication intelligently applied by the airlines have solved this fear and created a state of mind in their passengers giving them a sense of security and safety.

"GET THROUGH" TO PEOPLE

We are striving toward a vital goal—influencing a state of mind—for SAFETY. We accomplish this only as we "get through" to our people. You know it doesn't matter how good our safety programs are if people do not think they are good. It is what people think that counts.

No company can survive without a good safety program and a capable safety executive. The people now expect this. Safety is a vital part of our code of ethics—a *must* in our obligation to our way of life here in America.

Management must be sold on the need for safety, to encourage employees to participate in sound safety practices. This is a continuing job. It cannot be turned on and off like water. Our job is to convince every individual in our employ that it is to *his best interest* to be careful, to think safety.

The time to *duck an accident* is before it happens. A good safety program goes to work *before* accidents happen. I don't know of a more effective highway safety sign for example than the one on the side of a Police Patrol Car. The state of mind produced by the patrol car is one of caution and alertness that makes one think and act *before* an accident happens. He slows down his speed and becomes thoughtfully cautious. I believe the day is nearer than we think when public sentiment itself will be so powerful that accidents on the highways, in the homes, and in the factories, will grow less and less. I came to this conclusion when I read the Safety Council's prediction that the second million would be killed in traffic accidents in about 12 years at the present rate.

Most accidents are caused by pre-occupation, wrong general attitudes, or ignorance of the basic safety rules

Often a man's mind is not on what he is doing. He's preoccupied by home troubles or other things and becomes careless. We cannot go into the homes of every one of our employees and see that peace and tranquility prevails. We can't hang on every wall the beautiful sentiment "Home Sweet Home." But we can and must conceive *new ways* of changing the thinking of our careless employees. And when you change the thinking of an individual you change everything. This can be done. It is being done.

Last year General Motors enjoyed its best safety record. Fully 99.8 per cent of its 500,000 employees in the United States and Canada lost not a single day—not a single hour—because of occupational illness or on the job injury. Accepting the award Harlow H. Curtice, President of General Motors said his organization spent $30,000,000 a year on accident prevention and health insurance.

Curtice said "the outstanding performance of G.M. in 1956 is a real tribute to the cooperative efforts of all G.M. employees, and the members of supervision who guide them in applying safe working habits in their daily jobs."

Top management is the *golden key* to the whole safety structure. Oddly enough they often have been the most difficult to convince of the need for *positive action* in safety work. Top management must not only finance but actively give their moral and oral support to this important segment of industries' responsibility.

A NEW DAY IN SAFETY IS DAWNING

Man's ambition to improve himself is the basic force which established our highly satisfactory way of life. This is the place where almost everyone in the world would come if he could. Here in America our freedom of thought and action has brought to light many useful wonders in this age of miracles. We must match these miracles of modern times with miracles of safety habits.

Think of the miracles in the engineering and construction field. One of the most dramatic buildings in America is the new Prudential building in Chicago. The Prudential had to purchase air rights from Illinois Central Railroad to build this modern structure.

The marvels of Univac and other ingenious creations of man stagger the imagination. These—and thousands of other reasons explain why we cannot be satisfied with safety standards, precautions and records that are outmoded. What is good enough today is not good enough for tomorrow.

You, as key men in safety programming, are the "radar." You must see what *could happen,* and then see that it *doesn't happen.* You guide the men under your command. You are the top echelon of safety in America. You are the leaders. And the hardest part of being a leader is to keep on being a leader. But as leaders you know that the price of safety—like the price of peace—is *eternal vigilance.*

A new day is dawning. There is much to encourage us that the state of mind for safety is changing. I was riding on a train one day to Detroit. It was broad daylight, the weather was perfect, but a man driving his car didn't see the engine and hit it squarely in the middle. Fortunately he was not killed. You say what's strange about this? There were about 200 to 300 people *on this train and no one felt sorry for that man.* Rather the feeling was one of impatience and even disgust.

I heard these remarks "I have no sympathy for anyone who will do this in broad daylight." Another person said "I can't feel sorry for him." This man through his carelessness had interrupted the plans of all of *these* people and *they didn't like it.* What he did was unnecessary. That's the key. There is the awakening attitude.

There is indeed power in this state of mind. Safety executives who really get things done know when they change the thinking, the attitude toward safety, they accomplish amazing results, like the steel industry.

Here's proof that a new day in safety is dawning. The accident rate in 1956 was nearly 40 per cent lower than the five year

period of 1908—1912—or 60,000 fewer persons died in 1956 than would have been killed at the old rate in the period just mentioned. *And the National Safety Council is responsible for this great contribution to the saving of human life.*

Once the whole known world was ruled by Caesar. Man lived but to please Caesar. Then came a light out of the East. A man came out of Galilee preaching the philosophy "do unto others."

When we can, in our safety crusade create this philosophy, this state of mind "do unto others as ye would that they should do unto you," we shall have reached that exalted state of mind when we think, not in terms of accident reduction, but in terms of NO ACCIDENTS AT ALL.▲

ACCIDENT INVESTIGATION

by HAROLD A. SEWARD

secretary-treasurer, Lehigh Valley safety council, Bethlehem, Pa.

In the safety movement there are people who know how to investigate accidents and those who don't. In fact, there are four classes of people in the safety movement as far as accident investigation is concerned:

1—Those who know how and who know that they know how—they generally use accident investigation to good advantage.

2—Those who do not know how and know that they do not know how—they are generally eager to learn, do learn, and do something about it.

3—Those who know how and do not know that they know how—they generally are not in a position to follow through with their knowledge.

4—Those who do not know how and do not even know that they don't know how—this is the group that is referred to as hopeless, although they still can be shown and can profit from the explanation.

Accident investigation can be used as a marvelous tool in the safety program—a real tool to help in the prevention of accidents. There are five parts to a complete accident investigation: the Facts (the investigation itself), the Report, the Analysis, the Recommendation, and the Follow-Through.

In the general safety program, before we can do anything, we must first find out what our problem is, then go on to solve it. We first find the Facts. Then we add the Analyses, then we make our Plans, then we put our plans into Execution. We should then get what we are trying to achieve: Accident Prevention. Here we have a formula:

Facts plus Analyses plus Plans plus

Execution equals Accident Prevention.

Sometimes we do not get true Accident Prevention. Sometimes we have done something wrong and the result does not reduce our accidents, does not cut down on the number of accidents, does not bring us true Accident Prevention. Then we must go back and start over, review our efforts, re-plan and execute again—then, we should get real accident prevention. Since the safety program is no good unless it is continuous, this must be done continuously; we must constantly check the results of our program.

We might say this is costly. But in an accident prevention program, if it really *does* prevent accidents, there is no cost, for *safety is an investment, not a cost. The safety program is insurance.* We never consider insurance a cost, but an investment which returns us handsome dividends.

The five parts of accident investigation agree with the main parts of the general safety program. Good accident investigation can aid the safety program and can help to produce accident prevention in a number of ways.

First, consider how we get the facts in the investigation: we must find the Who, What, When, Where, Why, and How. Then, we make the Report and here we find out the Scope and Degree of the accident.

Next we analyze the report. In the Analysis we should find the Remedy for this kind of accident. This leads us to set up ways and means of preventing the recurrence of this accident. Then we are doing Prevention work. Now, we come to the fourth part of our total accident investigation action: the Recommendations.

Recommendations come in the three well known E's of safety: Engineering, Education, Enforcement. The Recommendations may be just in Engineering, or just in one of the other two. They may be in a combination of any two, or they may be in all three. But, the important thing is to make the proper Recommendations to cover the possibility of recurrence.

Since safety has only one goal, our Recommendations must aim at accident prevention. Accident prevention is the one goal of any safety program. *Safety has only this one goal.*

Up to now everything is fine. We are making a very fine accident investigation and we have carried it through the report, analysis, and the recommendations. Everything should work out all right now. However, in actual practice, it will never work out unless the fifth and vitally important step is taken. This is the Follow-Through step. Without this we have nothing but a paper record, nothing but good investigation but we have no insurance against that accident's being caused again, no real accident prevention.

It is of utmost importance that top management be completely sold on this Follow-Through and that each echelon of management right on down to the last worker does Follow Through to insure real accident prevention. There is no point whatsoever in investigating accidents if we do not want to achieve accident prevention.

To investigate for its own sake is ridiculous. To accumulate a lot of information that we are not going to use is bad and costly business. If we want our safety program to be an investment and not a cost we will use our accident investigation procedures to bring about accident prevention and thus bring in the dividends which the investment should show.

There is no use in taking the four steps in the accident investigation procedure if we are not going to give the Follow-Through every ounce of energy it should get in order to carry out the Recommendations so that through good Engineering, Education, and Enforcement we arrive at good Accident Prevention.

If we go about our Accident Investigation in this manner, all the effort and money we put into it will not be a COST, but truly an INVESTMENT that will pay us handsome dividends and lead us to real ACCIDENT PREVENTION.▲

ACCIDENT INVESTIGATION

by PATRICK J. REILLY

labor relations representative, St. Regis Paper co., Pittsburgh, Pa.

I hope that what I have to say in this paper will contribute toward the solutions of the problems in accident prevention—solutions which involve the individual and the group which in effect includes all of us whether we be hourly or salaried, laborer or top management, union or non-union—for fundamentally accidents have no discrimination. They draw no boundary lines and hence they become the responsibility of all of us.

Your superiors and mine know that their investment in the National Safety Congress will in some way bring dividends to it and its employees by way of furthering the campaign of accident prevention. We must all realize that this is but another tool in the field of safety—granted, however, an important tool. For here we proclaim in spirit and in numbers the importance of collective participation in and the recognition of active safety programs and continued research in the field of accident prevention.

The Congress should be the culmination of our endeavors in the field of accident prevention, not the beginning but rather the

highlight of them. For the groundwork of safety should have been laid back in our individual plants. Just what is that groundwork and how is it put into effect? How is it motivated?

To answer these questions I feel that we must explore the meaning of a plant safety program—its, origination, its elements and its final objectives.

OBJECT OF SAFETY PROGRAM

The final objective of a good safety program is obviously the easiest to answer—to reach the point where we are free not only from immediate accidents but free in spirit that we have done all we can to prevent future accidents.

Probably the most important but yet the most difficult area to explore is the area of the elements of a good safety program. I think that the following elements are the most reasonably accepted:

1. Top management recognition and leadership.
2. Assignment of and acceptance of responsibility by the officials directly given the task of putting that program into effect.
3. Acceptance of individual, collective, and union responsibility for accident prevention.
4. Concentrated job training in so far as safety practices are concerned.
5. Maintenance of safe working conditions.
6. Adequate first-aid and medical conveniences.
7. Accident record systems.

These elements are certainly not all-inclusive but they comprise the hard core of any safety program whether it be in a plant of 100 or 1,000 employees.

TOP MANAGEMENT'S JOB

First and foremost—top management recognition and leadership; secondly, the assignment of and acceptance of responsibility by the officials directly responsible for putting a program into effect; and thirdly, the acceptance of individual, collective, and union responsibility.

A short time ago the quiet serenity of a small town paper mill community was disrupted tragically by the shocking news to its workers, their wives and children, that a death had occurred in the mill—an accidental death—but nevertheless, a death.

Jim Jones, a relatively new employee, was the victim. Upon investigation we find out the following:

Top management was shocked. Its chief official stated that only two months prior to the accident he had given permission for two hours a week to be spent on covering accident prevention. He added that he always suspected it was a waste of time and money and that he was talked into it against his better judgment.

The personnel manager admitted that Jim Jones had not been given the usual indoctrination which includes the safety checklist and that there had been no follow-up with the employee and his foreman due to the pressure of other activities. Safety had been postponed. The foreman didn't have any time to give job instruction to Jim Jones.

After all, he said, when the boys in the front office are putting production pressure on me, I just can't take time for job instruction—that has to wait until I can fit it in. If Jim Jones could give his excuse, he might say that he didn't realize the danger to which he exposed himself. This was the first time he had ever been around heavy machinery. He thought his particular action was a safe one.

In most of the foregoing comments we have indicative evidence of the lack of at least some of the major elements of a good safety program.

NO JOB INSTRUCTION

The foreman under whom Jim Jones worked hadn't given him job instruction which included safety instruction due to the pressure of production. He presumed that this could wait. This foreman, knowingly or not, violated the principle that instruction in the field of job knowledge and accident prevention must be a major part of the indoctrination of all new employees. He violated the principle that his was both an individual and collective responsibility in behalf of accident prevention.

The absence of this responsibility immediately ruled out any chance of success for the safety program existing in this mill for its success rests in the hands of those on the firing line. The most elaborate organization, the finest equipment, the best laid safety campaigns in the world, go down to ruin if supervision is unaware of its immediate responsibility in safeguarding those under its jurisdiction.

The acceptance of responsibility is elevated to an even higher position if your plant happens to be unionized. Through organized labor we can find a medium which is not in the least reluctant to help spearhead a good accident prevention program provided all of the other elements of that program are faithfully met—and those other elements rest in the hands of management whether it likes it or not.

You cannot blame organized labor in certain plants for its cynical attitude toward a safety program if that attitude is, as is so unfortunately true, based upon the indifference and lack of initiative of management. Don't let us necessarily take pride in the fact that we may reward our unions or our individual employees either monetarily or otherwise for good safety records. Do we offer a reward to an individual for protecting his own life? Rewards are gimmicks and gimmicks are sometimes necessary to keep the spark alive—but let us keep them in their own perspective.

BELIEVE IN PREVENTION

Top management told us upon our investigation that, in effect, it had allotted two hours a week toward safety conferences. It told us that it had the best, insofar as the elements of medical care, accident record systems and accident maintenance programs were concerned. It also told us that much of this had been done against its better judgment. Need I say that top management, by making that statement, failed where failure is worst of all—failed because it gave cognizance to, but apparently did not believe in, did not have faith in, the very thing it was endorsing.

It might have been better if management had remained silent on the whole subject of accident prevention because then those in lesser roles of top management, namely those directly responsible for the activation of the safety program, those responsible for training, job instruction, and employee participation might have done their jobs more conscientiously, if they were ignorant of the indifferent attitude on the part of their top superiors.

By giving piecemeal acceptance to the elements which we have outlined and thus to the whole system of accident prevention, the thinking of top management permeated through the logical channels usually followed. Indifference, voluntarily or involuntarily, was assumed right down the line, rightfully or wrongfully.

SAFETY PRODUCES EFFICIENCY

Is this a castigation of management insofar as the organization and effectiveness of a good safety program is concerned? Certainly not! Most of our companies in the Paper Industry are well aware of the sincere faith which they must put into the creation of a corps of specialists to deal with accident prevention and not merely to let it rest on pious wishes. Top management, as a whole, realizes that a good safety program not only produces efficiency, but also that that efficiency must include the safety program.

It realizes that unnecessary harm to human life can be of itself morally evil and that any indifference to that conception can only be accepted as moral guilt. I work for a company which has recognized its moral and practical responsibility for safeguarding its employees. And you, too, represent companies which uphold the same philosophy in respect to accident prevention. We cannot emphasize enough the importance of having this philosophy impregnated in the mind of the rank and file employees at our individual plants.

The three important spheres in our local plant safety program are its honest initiation by top management, its activation and organization by secondary management and its acceptance and workability by the rank and file. It is in this latter sphere of the rank and file that we may be committing sins of omission by not utilizing one of the greatest weapons we have to combat accidents—namely, our labor unions.

The unions want to participate actively because they, too, have the safety of their members sincerely at heart. We might go so far as to say that if management is content to rest on its laurels, the day may not be too far off when unionism, through its research and efforts, in the field of acci-

dent prevention, may well be the larger contributor to the cause. Both management and labor working hand in hand, reaching for the same objectives, can scale any pinnacles in the march toward an accidentless existence.

I feel certain that at best I have given you a rather vague conception of what exactly are the elements of a good safety program. In short, they include all of those things which go toward the initiation of, the administration of and the acceptance of the program itself. I have tried to emphasize the salient points, top management recognition and leadership, the responsibility of the individuals directly charged with carrying out the program, employee acceptance and responsibility, both individual and collective, and job instruction.

If we succeed, and succeed we will, in the field of accident prevention, let us thank God for it and compliment our own human resourcefulness. But if we fail, let us blame no one but ourselves.

THE ROLE OF THE TRADE ASSOCIATION IN INDUSTRIAL SAFETY

by THOMAS CLELAND
director of industrial relations, Fibre Box Assn. & Fibre Board Assn., Chicago

During the past 30 years the science, the economics, the culture of this country have been undergoing changes. These changes are coming so rapidly that we have become accustomed to change. Such rapid changes of necessity bring problems. Our methods of living, of producing, of distributing, our social and political lives are changing so rapidly that it becomes obvious to the individual that he can't handle all of this alone.

This is especially true of the manufacturers and business men. These men do not have the time nor the resources to cope with the problems brought about by these spinning forces that are bringing these changes and so a new function or entity comes into being. This function is the trade association. It's an attempt to stay alive to the problems, to find solutions for them. Trade associations come into existence to do the things for the group which the group cannot do properly or effectively as individuals.

SINGLE PURPOSE ASSOCIATION

Today, for the purpose of this discussion I would like to divide associations into two general areas. We have the single purpose association and the multi-purpose association.

In the single purpose association as the name implies, a group of men, manufacturers, companies, units, get together to effect one purpose—to develop action along one line. We have an outstanding example of this in the kraft paper industry in the South—a safety association.

Here a group of companies, represented by their safety men, is carrying along a program devoted to improving the safety record of their industry. They are doing an outstanding job, represent the function and achievement of associations as well as any that ever existed.

There is always a reason for an association. Some people get together to do group buying for the obvious advantage of volume purchase. Some groups are organized to bargain out a labor agreement with a union. Some groups form to do research on a project sharing the cost and the results equally. But there is always a reason, a purpose which can be better served by group action.

In the kraft paper mills safety association there was a problem of safety. Two or three safety men were alarmed about it. State and federal authorities were not happy. So these few had a meeting, agreed to meet again and an association was born. All that was a long time ago and today that association's work stands out as one of the finest contributions one group of men can make to another.

These single purpose associations are not strictly trade associations in the true sense of the word. The typical trade association is concerned with many things and safety might or might not be one of these activities.

SAFETY IN TRADE ASSOCIATIONS

Let's talk about what one of these typical trade associations might do if the directors of that association should decide to take on safety. This puts us into the every day problem of Al Baltzer who heads the small business and trade association department of the National Safety Council.

As safety men know most of industry's accidents occur in small companies. It is an obviously valuable notion to reach these small plants with a message on safety, through the medium of their trade association. Here these companies have a mutual problem. They have identical equipment and operations, they have the same hazards and most important there is in existence a whole mine, a large mountain of experience locked up in the mind of the members of that association.

This experience can be good, bad, or indifferent, but it can be exploited by the association which can bring it all together and focus it on the single problem of safety —the safety of that industry. The association can become the rallying place, the unitizer; these members are association minded, they are accustomed to the association. So there is the potential. Now, how best to exploit it?

WHAT ASSOCIATIONS DO

You gentlemen are safety directors and safety engineers interested in achieving a perfect safety record for the companies that employ you. And there is a most remarkable similarity between what you do for your companies and what an association man does for an industry. There is an even more remarkable similarity between how you do what you do for your company and how that association man does what he does for his industry. Let's look at that.

For all of you there was once a day when you were called in and asked to take over the safety work of your company. In the natural course of events you had to know how much there was to it. For all you knew, your firm might have been the safest place to work in the whole world. You didn't think so, but you couldn't prove it so you set out to discover the situation.

You surveyed the problems. You dug into the records, the reports to the insurance companies and the accident reports. You tried to find out the scope of the problem. You wanted to find a path to follow. So as you did for one plant or one company so does the association man. When he takes the job he wants to know what size, what obstacle to progress, what record in the past. And he finds this out by investigation, by survey. He doesn't know but what he might have the safest industry in the world. He would take odds that it wasn't but he doesn't know and so he finds out.

He does this for 200 or 300 companies. Not that his job is any bigger because of the number but because he has to know about an industry what you have to know about your company. Where is it good? Where is it weak? Where can we improve? What are the problems which need immediate attention? What kind of a program can we begin? What form shall that program take? All of this based on what he has learned about the industry.

RECORD KEEPING

First part of any successful safety program is keeping records. This is true in individual companies as well as associations. You have to know where you're been so you can go ahead in the future and see what progress you're making and avoid repeating mistakes. So after we have surveyed we start a program of keeping the record.

You do it by departments in your plants. We do it by plant in our association. You start competitions between departments based on the record. Associations start competition between plants in the industry. You give awards to the departments. We give awards to members.

So the association uses records in something of the same way that you do. Yours are a lot more particular and more valuable to you as a company but we use them to

get impetus, to get attention, to isolate the danger spots, to get the history of safety, to give it the kind of clinical attention a doctor gives a problem.

Another area where associations do about the same as you do is in safety meetings. You have safety meetings in your departments, in your plants—your committees, your five-minute, stand-up meetings conducted by your foremen, your meetings with your foremen. Why these safety meetings?

You say meetings engender interest in safety. They maintain a consciousness of safety. They develop the interest in safety that's necessary. They develop an atmosphere of safety, sharpen the instinct for safety. They show the employee that you're interested in safety. They give an opportunity to assess blame, to investigate suggestions, make improvements. It can be said that safety meetings are the best possible demonstration of an active safety program.

What you say about safety meetings in your plant I say about safety meetings in association work. We want to engender interest. You have had supervisors or superintendents who didn't care about safety. Who might even have said, "All that safety guy wants to do is build up his job." They have a negative attitude and somebody has to make a Christian of them before a savage accident teaches them the hard way.

So in a safety meeting this reluctant one gets a chance to talk to his own kind of people. Other superintendents or foremen and he hears from them. He gets their opinion based on their experience and the others help you make him a convert.

ASSOCIATION SAFETY GROUPS

So it is with association safety meetings. We have members who don't wish to be bothered, who are sure the safety man is trying to build up a large job for himself. But in a meeting he meets his own kind, he talks to them and soon he is coming round. Without meetings this is not going to happen. Meetings held at regularly spaced intervals on the part of the association engender the interest in safety in an industry as they do in a plant.

Here members are discussing how to improve their records, what programs are followed with regard to safety shoes, eye protection, responsibility and investigation. everyone speaks up. This shows the members that the association is interested in the problem and is willing to help. Just as safety meetings are the best possible demonstration of your interest in safety to your employees, so our safety meetings perform the same function for us as far as our members are concerned.

There is one angle of these safety meetings where you men holding meetings in your plants have something of an edge on the safety man who works for an association. Yours are usually fairly willing audiences. They work there and they've been in the habit for some time. And there is an obligation to go which can be backed up by authority if that becomes necessary.

DIFFICULTY PROMOTING INTEREST

Association meetings are not like this. We get the meeting set up, the agenda as interesting as we can make it. We call on volunteers until they are ready to hide when they see us coming; we get out notices for the meetings; we follow the notices with reminders; we plead and cajole and get as near to the line of being pests as we can and too often we don't get the size crowd we like. Size is not important. It's just that it is used as a measure of interest.

When you have an industry made up of a great number of small employers, they don't have full-time safety men. The safety man wears many hats. He's labor, personnel, purchasing, expediting, safety. For this man to leave that plant for a day or two devoted entirely to safety is sometimes a little bit of a problem. And it's one that contributes to the frustration of being a safety man for an association.

To this time I have mentioned the many areas where our jobs seem to be similar. We have surveys, records, and meetings. I mentioned earlier the gimmicks that safety men use to increase or retain safety consciousness on the part of the employees in a plant and, of course, we are always seeking the same thing.

In this area we are presently working on a program which we hope will accomplish this end—to improve the safety consciousness of the particular plants we serve and also to identify the association with the effort being put forth on behalf of safety in our particular industry. We hope to accomplish this with safety posters. Now everyone knows that posters are only a small part of an overall safety program. Someone once said about five per cent.

IDENTIFICATION IN POSTERS

But there is an area here for association activity that first can help accomplish that five per cent and second can show the members of the association that something is being done. Again we depend upon identification. We have series of posters which carry a general safety message backed up by pictures of our machinery. If we have a poster on falls we have the guy falling over something that you find in one of our plants.

On safety shoes we have his foot being injured by something which might injure his foot in our plants. On specific hazards we have our specific machinery. We also include on these posters some statistical information concerning our industry.

We tell how many accidents we have had of a particular type. We want the safety people in our plants and the employees in those plants to identify themselves with the effort we are making in the direction of industrial safety. We want their ideas for posters. There's another point about these posters.

We have many small employers who pay small attention to safety and we like the idea of this type of plant using posters. When they put a poster up on their wall they are declaring themselves as in favor of safety and their action had better suit the words or someone will be pointing a finger at the posters. Advertising is usually followed by action and action is what we are seeking.

ENCOURAGING SAFE ATMOSPHERE

We have hopes that these posters will bring about an identification. One of the wonders of human nature is this instinct for identification. The men in your plants identify you with safety efforts. You are the constant reminder to them of safety. You seek to engender an atmosphere of safety. And the efforts you put forth along this line are in the direction of getting the employees, the foremen, the superintendents to identify themselves with your efforts.

That's what we are trying to do with this poster program. It shows the safety men in our industry that we are trying to do a job and hope that they will identify themselves with our efforts and all to the end of achieving a safer industry.

There is another area of effort where we are both concerned. As safety men we know how hopeless our job is unless we have the interest and support of top management. And we have this job in common. Just as the top management of your company is your employer so this same top management is our employer.

NEED MANAGEMENT'S SUPPORT

There is a large difference in the actual employer—employee relationship. And this difference enables you to help the trade association safety man and it also enables the trade association man to be of assistance to you. You want his interest in the plant or company and we want it as a member of an association, as a dues-paying member of an association. If your top management is interested in seeing the trade associations have a safety program then the association will have a safety program and if the top management has no interest then the association safety program will never get off the ground.

The safety men of an industry have an obligation to tell their top management about the value of the association program, the ways in which this program enables you to do your job better. And if you think, or sincerely feel that you don't need an association activity then you should tell him that. No use having an association working away at something like safety if the safety men in the industry don't feel it has any value.

The "how" of getting top management's interest is a most fascinating topic. How is it done? As many top managements as there are, so there are ways of getting their interest. It is an individual thing. As an association we are using costs. This is not to imply that top management is a group of heartless inhuman people. But only that we are absolutely sure that they are interested in costs.

In these past two years many industries have been caught in something called the cost-price squeeze. Stated simply, the costs

of doing business have skyrocketed and the prices have staggered. And when this unhappy circumstance prevails for any length of time you have this squeeze.

COST-PRICE SQUEEZE

Since industry is operating in a sharply competitive atmosphere, not much is expected in the way of price relief and so eyes turn to costs, how to reduce costs. You know the savings possible in accident prevention. And so at this time, perhaps as at no other time we have a wonderful opportunity to pitch our message on behalf of safety.

Too many times leaders of industry are absolutely sure that they have gone as far as they could with cost reduction, that there are no more corners to be cut, that the reasons for these increasing costs are to be found in forces far removed from the everyday business life and that they can do little except shield themselves from the blows and buffets that are coming upon them from all directions.

CUT ACCIDENTS—CUT COSTS

There are many leaders of industry who overlook obvious matters when it comes to matters of cost. One of these is the money to be saved by a program of accident prevention. The tasks of an association man are to tell top management this story—to get them to look into their own operations with more scrutiny, to assess blame for these costs and to indict managers and superintendents where this is necessary. This placing the blame is a function of top management.

One of our company presidents had an idea for assessing blame. He had his safety man draw a bar chart showing on the right-hand side the location of the plants and then a line made of dollar signs going out to the right-hand side. There on the chart he had the cost of accidents assigned to each plant.

On the bottom of each chart there was a little note from the company president. "Isn't this an interesting chart." It was so interesting that in two years that company had the best safety record in our industry. Now that company president wasn't interested in achieving the best safety record in our industry. He was interested in dollars and cents of cost.

This is what a trade association can do for the safety men in his industry to keep this message before the top management. How well we do it depends on opportunity and timing, because if the boss is interested in safety, we're on our way to the ultimate goal we all seek. That goal is safety; factories, mines and plants where people are not hurt, where there are no accidents.

DO THE "IMPOSSIBLE"

This takes the imagination and challenges belief. Imagine a country where there are no industrial accidents! This is an age where the impossible things are being done. You could get a lot of people who would absolutely swear that no one would ever climb Mt. Everest. But some fellows didn't believe those people. They climbed it.

For those industries where the record has been good, where it started way up high in frequency rates and has come way down there is a worry. They are concerned with the thought that perhaps they can't get any safer, that the ultimate has been reached. For those industries I would leave this message.

The name Whirlaway is familiar to all of us, that wonderfully game thoroughbred that thrilled the racing fans of our nation some years ago. You remember his incredible runs in the stretch, how his jockey would take him way outside on the outer rail, and then head him for the wire. With his long golden tail flying out behind him he would pass the other horses as though they were standing still.

So when you think you are as safe as you're likely to be—as safe as possible—remember Whirlaway with his golden tail flying in the afternoon sun as he headed for home. This magnificent horse always ran that—long—last—quarter mile of the race faster than he ran the first.

CHEMICAL HAZARDS OF ALKALINE PULP LIQUOR MAKING

by BOOKER P. BUNCH

technical assistant to the Production manager, Chillicothe div., The Mead corp., Chillicothe, Ohio

Compared to many industries, the chemical industry has a most commendable safety record. It is not because of the inherent nature of the industry, for the manufacture of chemicals presents hazards comparable to any manufacturing process. Rather it is because, as an industry, the chemical group is extremely safety minded and goes to great lengths to acquaint its employees with the nature of the product they are processing and of the potential dangers involved in improper handling of materials.

Alkaline pulping is sort of a first cousin to the chemical industry, for it involves the processing and handling of a variety of chemicals. And the success of our industry, like that of the chemical industry, is certainly dependent on the awareness of our employees to the nature of the materials with which they are dealing.

The major chemical operation in any alkaline pulp mill is the preparation of the cooking chemical. This paper will deal only with the hazards in the re-causticizing area, and will not encompass the entire liquor cycle.

CAUSTIC SODA HAZARDS

In the liquor making plant we are reacting calcined lime with soda ash to produce caustic soda, known chemically as sodium hydroxide. Sodium hydroxide is a strong alkali and active chemically. The principal hazard that exists is contact of the skin or eyes with caustic soda. Other chemical hazards are lime burns due to lime dust slaking in perspiration on the skin, and dermatitis due to handling lime and/or soda ash.

Before we talk of safety precautions, protective clothing, and equipment in the re-causticizing area, let's take a closer look at the product we are making and become familiar with a few facts about it. In most re-causticizing plants, a solution of caustic soda has an amber color, a smooth soapy feeling, and a bitter taste. In all phases of the operation the temperature of the solution is close to the boiling point. In contact with the skin it can produce serious burns which usually heal slowly unless given prompt attention.

Caustic soda does not, however, give any warning by a burning or stinging sensation at the onset as one might expect. The portion of the skin in contact with caustic can be severely damaged or literally "eaten away" before one is aware of it. Caustic is particularly damaging to the eyes. The use of safety goggles, therefore, cannot be stressed too strongly when handling caustic.

Let's go over a little fundamental first aid for caustic burns:

1. Immediate attention is necessary. Even the smallest delay increases the severity of the burn.
2. The effected area should be flushed with large quantities of fresh water. This action is of prime importance—in case of eye injury it should be continued for 15 minutes. Due to the heat liberated when caustic solutions are diluted slightly, sponging or blotting the area with damp cloths or the like may actually increase the seriousness of the burn.
3. Never attempt to remove or pull away the injured tissue, especially around the eyes.
4. Report to the plant hospital—any burn can become serious.

USE OF NEUTRALIZERS

Many companies recommend the use of chemical neutralizing agents, which, in the case of alkalies, would be weak acid solutions, such as, acetic acid, vinegar or boric acid. At our plant we leave this phase of treatment to the discretion of the plant nurse or physician and perscribe that first aid in

the field be limited to irrigating the effected area with large amounts of water only.

All areas where caustic is handled should be equipped with safety showers. These showers should be fitted with a quick opening valve operated by a pull chain or foot pedal. The shower should be operated from time to time to make sure it is in working condition. At our plant at Chillicothe we have two such safety showers, one in the re-causticizing area near the slaker, the other on the charging floor of the digester room. Signs should designate the location of the safety shower, for while the operator certainly knows its location and purpose, newcomers in the area, such as maintenance and clean-up men, may not.

Lime is one of the raw materials used in producing caustic soda. It is usually fed into the reaction tank, called the slaker, in pebble form; however, dust to some degree is always present. The presence of lime dust can be discomforting and dangerous in several ways to the mill workers. When lime slakes in water it is an exothermic reaction, which is to say, the reaction creates heat as it progresses.

BEWARE LIME DUST

When lime dust comes in contact with those parts of the skin that are moist from perspiration or other causes, the slaking action occurs here just as it does in the reaction tank with water. Workers should thus wear tight fitting clothes, long sleeve shirts, gloves and a cap. Most lime unloaders at our plant wear the old fashioned red handkerchief around their neck for protection against the dust. A dust respirator is also standard equipment at our mill.

In the slaker, where the dissolved smelt from the recovery furnace is reacted with calcined lime to produce caustic soda, the temperature is maintained close to the boiling point. As mentioned before, considerable heat is liberated when the lime slakes in the green liquor solution, and almost simultaneously heat is generated when the reaction occurs between the green liquor (sodium carbonate) and the slaked lime (calcium hydroxide).

In chemical terms we refer to this as heat reaction. The temperature in the slaker is usually controlled by regulating the temperature of the green liquor solution going to the slaker. The slaker will boil over from anyone of the following:

1. Unbalanced lime and/or green liquor flow
2. Green liquor temperature too high, and a remote possibility is:
3. Having the slaker agitator stop and thus having a localized concentration of lime.

INTERLOCK TO STOP BOIL-OVERS

Because any unbalance between the green liquor flow and the lime feed can cause a serious boil-over of the slaker, it is important that these two be interlocked. We experienced a serious situation because this was not done at Chillicothe. The green liquor pump kicked out, but the lime feeder continued to pour lime into the slaker until the slaking action became so violent the mixture blew back up the feed slot spraying the surrounding area with hot calcium hydroxide.

Because the possibility of the slaker boiling over is ever present, the area around and under it should be posted to indicate the hazard. I consider this the most hazardous area in the re-causticizing plant.

From the slaker the mixture flows into causticizers, which are relatively small tanks that provide retention time for the causticizing reaction to reach equilibrium. Because of the scale forming tendency of the mixture at this point of the operation in closed pipe lines, open troughs or slotted pipes are usually used to convey the material from one causticizer to the other. Here the danger of spills or splatter is also ever present and guards and appropriate signs are recommended.

PROTECTION AGAINST CAUSTIC SODA

From the causticizers the chemical mixture is pumped into a clarifier, which is a large tank that separates the caustic solution from the calcium carbonate precipitate that is settled, concentrated, and pumped from the bottom of the unit. Operation of this unit is usually trouble free, with the major hazard being drips from leaks in the piping and tank connections.

Operators in the causticizing area soon become aware of the fact that caustic soda attacks wool and leather rather seriously. The recommended apparel is therefore rubber shoes and cotton clothing. A wide brim hat is also recommended to protect the neck and face from overhead leaks. Safety goggles and gloves are a must and should be worn by repairmen who work on equipment in the area.

Before repairmen start work in the causticizing area, the supervisor should make sure that all persons involved are aware of the hazard that caustic liquor presents. The foreman should never assume that everyone knows the danger involved. Tanks should be thoroughly flushed before workmen enter, and pipe connections should be broken with considerable caution, even though the lines have been drained.

When work has to be done in a tank, the main control device for any agitator should be tagged or locked out and tagged; and any employees going into the tank should wear a life line or rescue harness. Workers should be instructed to check their clothing for signs of caustic attack after they have completed their work. All extension cords used in tanks should have rubber insulation or some other material not subject to caustic attack.

LIQUOR SAMPLING HAZARD

The securing of liquor samples by the operator may present a constant hazard. Lines can become plugged and thus splash and spurt when they are purged. We have overcome this hazard to a large degree by piping all liquid sample lines into the control room and allowing them to run continuously. Green liquor, white liquor and weak liquor are each piped through insulated three-fourth inch lines into the control room.

The drain from the sample sink into which these lines discharge goes into the third causticizer and the flow is small enough that no measurable difference in the product liquor can be detected by returning the sample liquor to the system at this point. The sample sink is hooded, or rather enclosed, by a removable metal box affair with a small four inch by twelve inch opening in the front for securing a sample.

As all caustic plant operators know, it is a struggle to maintain a neat appearing plant. Caustic liquor, at most any measurable concentration, will attack paint. However unless some painting program is undertaken, new leaks cannot be told from old leaks that have been repaired. For that reason we have been most insistent that the caustic plant be kept well painted.

Causticizing plants should be surrounded by a concrete floor with an ample amount of drains. Caustic is extremely slippery and should be immediately hosed away when leaks occur. Good housekeeping in this area should receive top priority.

There is an old saying that states "familiarity breeds contempt"—I would like to recommend, however, that we all become familiar with caustic, with the hope that in this case familiarity will breed respect.

CHEMICAL HAZARDS OF PULP BLEACHING

by Chester Matzenger, Jr.
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Probably the most widely used and best known chemical in a paper mill bleach plant is chlorine. To say that this chemical alone creates numerous hazards is, I believe, a most factual statement. People in bleach plants will agree, I am sure.

In recent years our industry has added to this chemical hazard of bleach plants the ever increasing use of a chemical, chlorine dioxide, which brings on new problems. We shall discuss the chemical dangers of chlorine and chlorine dioxide bleaching. Since the dangers of each do create some problems that are different and some that are common, we shall endeavor to discuss them separately and then together.

Our most prevalent danger in the chlorine bleaching system is probably from the fumes of chlorine. This, predominently, comes from leaks in the lines. The gas is most irritating to the respiratory system, hence someone in it will generally start coughing

and leave if the concentration does not become too strong too fast. Watering eyes are also a warning sign.

These effects can be a blessing in that the man will leave the area before the concentration becomes too strong. One part per million has been suggested as an acceptable concentration for continuous exposure. An acid type gas mask can be secured to provide protection for concentrations of about two per cent. However, long periods at this concentration can cause serious irritation.

FINDING CHLORINE LEAKS

Bad leaks can be quickly found in any liquid line by the formation of a greenish yellow frost that forms around the leak. Smaller leaks (the most common) can be quickly found by shutting off the chlorine line, clearing the air in the building and then testing it, a section at a time by putting ammonia hydroxide on a rag and passing it over the section to be tested. When a leak is crossed by the rag a white smoke will develop.

Another precaution in working with chlorine lines is never to shut off both ends of a line carrying liquid chlorine at the same time. This will, at times, cause an expansion sufficient to rupture the line. Most modern plants have expansion chambers in the lines for just such emergencies.

When our liquid chlorine enters the mixing tank and caustic soda is added we then increase our problems. Caustic soda should never be handled without proper personal protective equipment, such as face shields, chemical goggles, gloves, aprons and boots. With proper ventilation no respiratory protection is necessary. However, in most cases this is hard to secure and a respirator is desirable.

Water alone will help remove caustic soda, but two per cent to five per cent solutions of acetic acid should be kept readily available for use should anyone get caustic soda on his skin or clothing. This solution should not be put in the eyes, however. Use only water without medical approval. There is a good article on precautions in handling caustic soda in the September issue of "Occupational Hazards."

At our plant the bleach plant foreman of 15 years claims he can tell what part of the system has developed a leak by the smell of the chlorine. Most of the time he is right, but I would not recommend that this be used as the safest method for locating chlorine leaks. Our foreman himself will not rely on his nose alone.

We now come to our chlorine dioxide system where we are faced with sodium chlorine, sulphuric acid, sulphur dioxide and air. Of these, the most dangerous is probably sodium chlorate. Most of our men will respect the other chemicals, but the delayed action of sodium chlorate creates a severe hazard.

This chemical in a liquid state is not as dangerous on a man's shoes or pants as it would be an hour or so later after it dries. The slightest spark, or, under most favorable conditions, extreme heat will set off a fire. Persons handling this material should wear rubber clothing that can be thoroughly washed after each use.

We have, for demonstration purposes, dripped, not soaked, a pair of pants and shoes in this solution and let them dry for two hours. A cigarette touched to them caused them to burn so fast it almost caused an explosion. They were gone without any ashes faster than we could time them with a stop watch.

DANGERS OF SODIUM CHLORATE

A pump used to pump this liquid was shut down for a couple of days. The packing had a slight leak and enough sodium chlorate dried on the outside to cause the pump practically to explode after starting it. This was from the heat generated by the shaft turning the stuffing box.

The most probable danger of sulphur dioxide is the inhaling of the fumes. However, its action is generally limited to the upper respiratory system, and if its concentrations are kept low enough there is no irritation of the nose or throat. Fortunately, for us, it is more toxic to vegetable than to animal life.

The most probable danger of sulphuric acid would be face and body burns. However, it is irritating to the mucus membranes and skin as a liquid, or its fumes, and proper protective equipment must be worn. If water or moisture get to this chemical that is in an iron drum, hydrogen gas is formed and a fire hazard develops. Proper ventilation is a must.

CHLORINE DIOXIDE—FLAMMABLE

Before being dissolved in water, chlorine dioxide is most flammable. A piece of wood or a wad of grease in it will cause a fire. Chlorine dioxide is most corrosive (much worse than chlorine) and the possibility of leaks because of this must be engineered for and watched for.

All chlorine dioxide generators must have a large hood and suitable exhaust fan, particularly if they are inside a building. All generators I know will let some gas escape at times.

In either type of chemical bleaching we have the danger of chemical burns to the skin or irritations to the respiratory system. Both types of bleaching create numerous chances for fire hazards.

We should all remember that chemicals *will not* always react the same way nine out of 10 times, in that the container in which they are handled or the other chemicals with which they may be mixed, on numerous occasions will create dangers entirely foreign to the dangers created by the chemical itself.

HAVE GAS MASKS AVAILABLE

Regardless of the type of system used in your plant, there should be a good distribution of gas masks that are checked at least once a month, and the canisters replaced after each use or at least once a year. A written report of these inspections is most desirable.

A self-contained air mask such as the Scott Air Pack will allow a person to enter certain areas at times that the best gas mask will now allow. Thought should be given in using these self-contained air masks that the gas or liquid in the area will not be dangerous to the skin.

At the danger points emergency showers that turn themselves on when you walk in are a must. At some points an eye wash station may be desirable.

Planned periodic drills for the possible dangers in your plant should be held so that each member of your bleach plant is familiar with the dangers of his particular operation and knows what precautions to take.

FIRST AID SUGGESTIONS

I would like to mention First Aid treatment that is generally known but often forgotten when we are dealing with chemicals in pulp bleaching. In gassings always remove the man from the gassy atmosphere. If you have oxygen breathing equipment, and all plants that have bleach plants should have one, then the equipment should be started at once. Remember it is always better to move the equipment to the man rather than to move the man to the equipment.

In chemical sprays you would, naturally, immediately put the man under a shower, but remember if the water is ice cold the shower should be brief and then hustle the man to some other place where he may continue his shower with warm water. While the man is under the shower he should have all his clothing removed even if it is necessary to cut it off. Chemicals stay in clothing long after they have been washed off the skin.

We must train our bleach plant operators to keep their eyes and mind on the operation of chemically bleaching pulp.

INSPECTIONS—RESPONSIBILITY—TRAINING

by SHERMAN T. MARKER

safety engineer, Marsh & McLennan, Inc., New York city

"One of the weaknesses in the accident prevention program of many industries is the feeling of management, or even the director of the accident prevention program, that the inspection as conducted by the insurance engineer or inspector, or the safety committee suffices. Nothing could be farther from the truth.

Basically, what I hope to cover in this paper is really nothing more than a part of

our overall philosophy that the key people *in our accident prevention work are the* supervisors and that we do everything that possibly can be done to direct our help to that level of people.

Before we get into that part of the discussion, let us first revert to some academics as respects accident prevention.

SOUND BASIC PHILOSOPHY

I would presume that all organizations have developed a policy statement issued by management of the need and importance of accident prevention as it effects the profitable operation of the company. The policy statement or the program itself, somewhere includes in so many words, the fundamental principles of accident prevention.

The first of these principles is of course management's interest and participation; second, determination of accident facts—the causes of accidents (unsafe personal performances and unsafe physical conditions) and third and last the necessary corrective action.

These three fundamental principles are *the backbone of our accident prevention* philosophy. Surprisingly, it is really remarkable how so few people in accident prevention work have that knowledge and, of course, are not familar with their existence and naturally, therefore, do not apply them.

ONLY INVESTIGATES ACCIDENTS

What we are concerned with in this discussion, however, applies to that second fundamental principle—determination of accident facts.

In too many cases we have found that in the application of this principle the safety man confines his activities to accident investigation. Actually, if you read the many text books on the subject you will find that the second principle implies that investigation is the way we determine accident facts. Right here and now, let us be frank and state that accident investigation, accident reporting and a lot of other details created because of accidents, are not accident prevention in itself.

Prevention is what we do before an accident occurs. Accident prevention could *be defined as a process of recognizing* causes, accidents in the making, unsafe conditions or unsafe practices and taking action to eliminate these conditions and practices before the accident occurs.

Again I repeat, this all important activity should not be limited to the inspection of an insurance safety engineer or inspector or the safety committee or other group. It should be a vital part of the activity of all persons in a supervisory capacity—plant management, department heads, superintendents, as well as other supervisors and foremen.

If a person knows what to look for and where to look, it should not be difficult to do an effective job. Past accident history has given to us a wealth of material that helps to focus attention on important items Let us take a few minutes to consider the general subject of inspection for the purpose of detecting probable accident causes.

WHAT INSPECTION MEANS

Universally it is recommended that the responsibility for making inspections should be delegated by the plant superintendent to responsible people especially safety committees or members. But this does not mean that the plant superintendent should not make inspections or that the department head and other supervisory personnel should not make inspections.

When responsibility is delegated, the manager should exercise control over the actions taken under the responsibility so delegated. This means that checking on the manager's part to assure satisfactory results is essential.

The art of inspection can be divided into four different phases:

1. The detection of what might be called obvious hazards—the actual unsafe conditions which have been created either by the action of people or physical deterioration. These are the conditions, such as a wet floor or hose on floor which because of their existence, will cause an accident.
2. The detection of conditions which of themselves might not be the direct cause of an accident but which would be a contributory factor. For example, cleaning sky lights, soapy water spilled on floor, not mopped up, created an unsafe condition on the floor.

3. The detection of employee performances which are deviations from standard practices or established policy and therefore, in themselves wrong and unsafe.
4. The detection of employee performances which of themselves are not hazardous but which create hazrads either directly or in a contributory manner.

Our past accident history will give us a great amount of information as to what to look for. But we do not necessarily have to rely on a history of accidents at a plant or department before doing a good job of inspection.

TYPES OF ACCIDENT

All accidents involving people can be classified by type into a relatively small number. There are 10 such classifications and by considering each one separately, we can do an effective job of anticipating probable accident causes.

As you review each area of activity or the performance on individuals, consider each type of accident and ask yourself, "Is there anything about the building, machinery, equipment, tools, or other things that would cause a person to fall, or is there anything that a person might do unless properly warned that would cause him to fall?"

If each type of accident is considered in this fashion, the majority of probable accident causes can be readily anticipated. The 10 accident types and typical examples for each are:

- Falls (same level)—covers all cases where a person actually slips or falls on floor, ramp or ground. Probable causes:
  - Slipped and fell on wet floor.
  - Tripped over hose to spray tank.
  - Stepped on broken floor board in truck and fell.
  - Cleaning skylights, stepped on soapy water and fell hitting mouth against wall.
  - Rope broke while lowering overhead door. Employee lost balance and fell.
  - Walking along railroad track and tripped on a railroad tie.
- Falls (different level)—covers all cases where a person falls to a lower level. Probable causes:
  - Fell from step ladder.
  - Heel caught on a backless step which was well covered with snow.
  - Fell off dock when he stepped back after closing box car door.
  - Standing on 42 inch platform ladder, over-reached and ladder overturned.
  - Fell into an open trench.
  - Working on a scaffold 10 feet high. Plank in scaffold broke and employee fell.
- Struck by—covers impact cases where the motion is primarily that of the object rather than that of the person. Probable causes:
  - Bundle fell off end of conveyor and struck him on right knee.
  - Was placing an empty pallet into position. It slipped from his grasp and fell on his foot.
  - Replacing rope and weights on fire door. Weight fell on right foot.
  - Hit on top of head by bucket which slipped from co-workers hands.
  - Glass from safety award frame came loose and fell hitting back of neck.
  - Using portable saw and it struck him on left leg.
  - Using rope block and tackle to move car. Rope broke and block struck him on right leg.
- Struck Against— covers impact cases when the motion is primarily that of the person rather than the object. Probable causes:
  - While cleaning machine struck head on vacuum line.
  - Struck elbow against door frame.
  - Hurrying out of office and collided with another employee.
  - Reached into locker and struck head against a new axe.
  - Used a 12 inch length of pipe as a lever. Pipe slipped and right hand struck slitter knife.
- Caught in or between—covers non-impact cases as squeezing, pinching or crushing between a moving and a stationary object. Probable causes:
  - Thumb was pinched between trip hammer and frame of bundling machine when thumb slipped.
  - Operator attempted to take a shingle off V belts on cutter. Thumb was caught between V belt and pulley.
  - Left hand caught in inking roll nip.

Removing scrap from doctor blade and thumb got caught between conveyor and blade.
Hand caught between roller and looper bar while guiding sheet into looper.

- Bodily reaction of person—covers only non-impact casts where sprains, strains, and ruptures result from over-exertion, unsafe posture, sudden noise, fright and efforts to recover from slips and loss of balance. Probable causes:
  Bending cartons on the scored line, a strained muscle in side.
  Stepped on a pipe laying on the floor and sprained knee.
  Lifting a 100 pound bag of fibre and strained side. (Hernia)
  Wrenched back cleaning fire boxes.
  Attempted to lift a heavy sump pump alone and strained back.
  Helping push a tow motor which was stuck in soft area and strained back.
- Rubbed, abraded and penetrated—covers non-impact cases from handling materials, stepping or kneeling on sharp objects, foreign matter in eyes, over a period of time. Probable causes:
  Stepped on a roofing nail that had been dropped on the floor.
  While moving a pallet a splinter entered palm of hand.
  Scraped arm against cut edge of bracing strap in box car.
  While walking down stairway with hand on wooden rail, received a large splinter under thumbnail.
  Feeding rags from bale and a needle stuck in finger.
- Contact with electric current—covers non-impact cases where shock or burn results from contact with live wires or conductors. Probable causes:
  Unplugging cable to electric welder. Plug shorted out, burns on both hands.
  Welding with wiring type goggles, received flash burn of eyes.
  Helping welders and did not wear welding goggles. Flash burn of eyes.
- Contact with extreme temperatures—covers non-impact cases where injury is due to contact with hot or cold surfaces, or liquids. Probable causes:
  Taking a plug out of screw conveyor to check for presence of asphalt, asphalt which was in conveyor splashed out on hand.
  Mixing bucket with steam, hose came loose causing burn.
  Helping unstrip #2 defibrator, steam backed up and blew out of #1 defibrator scalding left lower leg and foot.
  Cutting a piece of angle iron with a torch and a piece of hot metal went into his glove.
- Contact with caustics or toxic substances—covers non-impact cases where injury is due to inhalation, ingestion or absorption of substances. Probable causes:
  Mixing boiler compound. Solution boiled up into his face and eyes when steam was turned on.
  Filling tank with boiler water compound and a drop of caustic soda splashed into eye.
  Pulling paper through soda roll, paper tore causing soda to splash into eyes.

PAST ACCIDENT CAUSES

In addition to using accident types as a guide, we have the invaluable data that has been assembled from the investigation of past accidents in our plants. In this case there is no question of probability. These have been the causes of many past accidents of varying degrees of severity and will continue to produce accidents unless a more concerted effort is made to prevent their occurrence.

In such cases, therefore, when a potentially serious situation is involved, we must check sufficiently to satisfy ourselves that the instructions are being lived up to.

In all of our inspection work, there are certain causes that we consider more important than others. The liability potential is greater and, therefore, they deserve preferred attention. Such cases should get the benefit of many random observations. When specific items are selected, it requires little effort during the course of a visit to a plant to make numerous spontaneous checks on these special items.

A consideration of the past experience of your department or the experience of an individual operation will tell you which items are most important. If they can be controlled, the effect on the over-all picture will be substantial.

Making inspections and observations is important but unless we follow through on the results of inspections, we have gained very little. Our objective is to prevent accidents and to do this we must correct the conditions or eliminate the performances that are accidents in the making.

FOLLOW UP ACTION

It is not sufficient to correct the individual when a deviation from standard practice is observed. We want to prevent others from doing the same things. Observations and inspections at the best can be made only periodically and we must, therefore, try to cultivate safe working habits for every one.

Why do they do things wrong? An answer to that question may often give a clue as to what must be done from other angles. Insufficient instruction, or failure to correct the individual on many other occasions or failing to appreciate the seriousness of what is being done are some of the most common reasons given for taking unnecessary chances.

SPOT HAZARDS BEFORE ACCIDENTS

This we know is practical because of the truth in the axiom that accident causes, unsafe conditions and unsafe performances can be observed many times on the average before an accident actually occurs. It is practical, therefore, to integrate inspections for accident causes into our normal work of checking our operations.

This is not an unreasonable or impractical suggestion because the causes of accidents or the reasons for their existence are the same as the reasons for our operation difficulties. Primarily it is failure to control employee performance. Accidents mean waste, inefficiency and interference with planned operation. They breed complaints, dissatisfaction, poor morale and generally poor employer-employee relations.

In the process of considering each area of our plant from the gate, through plant, to our yards and back again we can check for existence of these unwanted conditions.

A single observation is not necessarily sufficient in all cases to be assured that unsafe practices have not developed. Evidence of deterioration, physical defects and many unsafe conditions can be determined each time an inspection is made. But as respects the performance of people, single observations are usually not sufficient.

NEED FOR MULTIPLE OBSERVATIONS

It is not safe to assume that instructions are being followed or that an established policy is being adhered to unless we actually witness the performance involved.

A single check is not always sufficient. In many cases, individuals deviate from standard practices only occasionally. Most of the time their performance is satisfactory but every once in a while they take chances and do the things that cause trouble.

If physical hazards are observed, the department head should have no difficulty getting the condition corrected. But why was the condition allowed to exist? Would such cases not be a clue as to the effectiveness of the job being done by the plant superintendent and/or the department head? In fact, if the plant superintendent, department head, foreman and employees are doing the job, the inspections made by outside engineers should not disclose many violations.

Check inspections and the follow through to correct the unsatisfactory situations constitute the heart of effective accident prevention. The plant superintendent, department heads and foremen are in the best position to achieve success because the methods of most value in getting results in accident prevention are analagous with the methods required for the control of all other phases of plant operation.

GUIDE FOR PLANT INSPECTIONS

ASPHALT ROOFING DEPARTMENT

1. Loose nails on floor.
2. Wet floor.
3. Failure to provide clearance for hands.
4. Poor grip on object.
5. Pipe railing used as a catwalk.
6. Not wearing proper clothing.
7. Carrying sharp knife in pocket.
8. Unnecessary haste.
9. Sharp edges on catch pans.
10. Defective ladder.
11. Wearing wrong type of safety glasses.
12. In running nip not guarded.

13. Using hand tool improperly.
14. Poor hose connection.
15. Putting belt on while machine was in motion.
16. Nails in old board not clinched.
17. Rolls not stacked properly.
18. Not looking where stepping.
19. Attempted to clean moving machinery.
20. Wearing ring while working.

ASBESTOS MANUFACTURING

1. Using inexperienced help.
2. Lack of attention.
3. Did not watch where walking.
4. Poor teamwork.
5. Moving a heavy object without help.
6. Hose lines on floor.
7. Guard missing from ink wells.
8. Inadequate guard over nip.
9. Using hand instead of wooden stick.
10. Poor judgment.
11. Not wearing protective equipment.

FELT MILL

1. Reached through guard.
2. Defective equipment.
3. Poor teamwork.
4. Did not have proper footing.
5. Unnecessary haste.
6. Poor grip on material.
7. Failure to use proper equipment.

MAINTENANCE

1. Not wearing welding goggles.
2. Improper position when lifting.
3. Improper type of goggles used.
4. Improper position on ladder.
5. Not wearing protective equipment.
6. Using lift truck for a working platform.
7. Over-reaching while on ladder.
8. Oil and grease spilled on floor.
9. Defective plug on welder.
10. Did not shut off power while working on switch.
11. Truck wheels not properly blocked.
12. Failure to watch where stepping.
13. Failure to provide clearance for fingers.
14. Using hammer with defective head.
15. Scaffold planking defective.
16. Rope sling not properly used.
17. Failure to use proper equipment.
18. Poor judgment.

SHIPPING AND WAREHOUSE

1. Skid standing on end.
2. Unnecessary haste.
3. Stacking too high and insecurely.
4. Failure to use proper equipment.
5. Poor housekeeping.
6. Not watching when driving lift truck.
7. Trailer not parked properly.
8. Improper position when lifting.
9. Defective flooring in trailer.
10. Failure to sand icy surface.

RECEIVING

1. Material not stacked properly.
2. Using improper equipment.
3. Adjusting rope while car puller was in motion.
4. Defective wooden rail on stairway.

MOTOR FREIGHT

1. Improper positions when lifting.
2. Not wearing protective equipment.
3. Not using available equipment.
4. Unnecessary haste.
5. Pouring gasoline into carburetor to start motor.▲

SAFETY AND THE FOREMAN

by ALEX Y. WILSON

general foreman, The Ruberoid co., Joliet, Ill.

The foreman is the key man in safety in any operating establishment, as he is in an important position to attain results in any accident prevention program. Therefore, the most important phases of safety the foreman has to deal with are PROCEDURES, HOUSEKEEPING and the INVESTIGATION OF ACCIDENTS.

The program at The Ruberoid co. Joliet plant under the direction of the plant safety director consists of participation of equal members of rank and file workers and foremen. These people rotate every two months to give everyone the opportunity to serve and participate in the safety program.

PROCEDURES AND ORGANIZATION

The number of people on the safety committee of each department is governed by the size of the department: ours being small, (less than one hundred people) has only four members, two rank and file people and two foremen. The union appoints its people and the safety director appoints the foremen.

This four man committee functions as the safety committee of the department for two months. The safety committees have a co-chairmen of foreman and workers who rotate each month, and are responsible for holding the meetings and keeping the minutes. In other words a worker will act as chairman one month and a foreman the following month.

This committee holds a safety meeting once a month to discuss and recommend the correction of 1. Housekeeping 2. Hazards 3. Unsafe Acts.

During the month at least two members of the committee (one worker and one foreman) make two complete inspections of the department to observe housekeeping, hazards and unsafe acts. If the inspection finds a guard is needed, or someone is doing something in an unsafe manner the situation is remedied immediately if possible.

This type of program is a great help to the foreman. All personnel are participating in the effort to prevent accidents, and the foreman is relieved to give more time to the productive functions of his group.

Setting up definite safety procedures as well as operating procedures is very helpful. As an illustration, we have posted at each machine the operating and safe procedures to be followed at all times. Doing the job the safe way is just as important as operating the equipment in a manner to produce the most material.

All foremen are interested in having their personnel follow safe procedures, as it is important in attaining production efficiency. This was brought to my attention two years ago when I made a tour through a large paper mill.

This mill was working to achieve three million man hours without a lost time accident, and was well on its way, having passed the two million man hour mark. The foreman who guided me through the plant was proud of the safety record, and pointed out various factors contributing to the prevention of accidents in the mill.

In the machine room posted above each machine was the production record of that machine. In each instance the record was very high. My guide explained that the high production record was made during this campaign to achieve the three million man hour goal. Incidently, that plant worked 723 days, or 3,280,000 man hours without a lost time accident which definitely proves ADHERING TO SAFE PROCEDURES REALLY PAYS OFF.

HOUSEKEEPING

Housekeeping is an important phase of accident prevention that requires continuous attention by the foreman. When demand for production increases there is a constant temptation to relax housekeeping rules. This was the case in our plant this past summer. We became very busy, and were breaking in new help since many people were on vacation.

The old alibi used by our supervisors was that they did not have the help to keep the place clean and orderly. However, that was not the reason for the poor housekeeping. The main reason was that the foremen were giving all their attention to production problems and not enough to planned housekeeping methods.

Planned housekeeping methods work well when closely supervised. On some of our operations the operators are not busy continually so we set up as part of their job the task of keeping their area clean. At one of our combining machines the Back-Tenders at each end of the machine, who put large rolls of saturated felt on the machine to keep it running continuously, are not always busy.

Therefore, these men have time and are assigned the task of keeping the machine room floor clean, and accumulated scrap picked up and placed in containers. In this way we keep our work area fairly clean and orderly, as everyone cooperates and does his part. However, when the foreman relaxes his attention to housekeeping prob-

lems the work areas quickly become dirty and disorderly.

Orderliness and good housekeeping are fundamentals of good supervision. The foreman who insists that all his people cooperate in keeping work areas clean and orderly will have a low injury rate and also good production efficiency.

INVESTIGATIONS

The other phase of accident prevention the investigation of every accident should be done promptly by the foreman of the group where the accident occurred. He should personnally investigate every accident occuring to workmen under his supervision to improve his own supervisory performance and aid in preventing other accidents, or the re-occurrence of the same accident. The knowledge gained by the thorough investigation of all accidents should be very helpful in the accident prevention program, inasmuch as many safe operating procedures can be set up from the information thus gathered.

Thoroughness should characterize the investigation of accidents. Every person who might have information bearing on the accident should be interviewed to gather all the facts so a complete record can be made The investigation should be made immediately following the accident to obtain all the facts first hand, while they are still fresh in the mind of the witnesses. After the investigation is completed and the cause determined immediate steps must be taken to eliminate the cause. If it was an unsafe condition, it should be corrected immediately. If it was an unsafe act preventive measures should be set up in the procedures in order to prevent re-occurence.

We foremen have to know our men as we personally instruct and train them. And we have the best opportunity in the world to correct improper practices before they can cause trouble. Research proves that 98 per cent of all accidents are preventable, and that 88 per cent are due to unsafe acts within the control of the foreman.▲

EYE SCREENING PROGRAMS IN INDUSTRY

by DR. DON MARSHALL
Kalamazoo, Mich.

I will endeavor concisely to answer six questions:

1. What does an industrial eye screening program consist of?
2. How is it established in an industry?
3. To what industries can it apply?
4. Why have one; who benefits?
5. What are the results in general?
6. What are the results in the printing industry?

I must acknowledge at the outset that this paper is based on the experience of many vision experts in industry and medicine, more than on my own experiences.

We could define an industrial eye screening program as a well-organized plan for testing every employee for his visual capabilities, studying the visual requirements of every job in the factory, and the assigning each employee to a task for which he possesses at least the minimum visual ability.

It is a program for visually sorting man and job and seeing to it that a square peg does not get into a round hole. A total vision program for a factory includes measures for accident prevention and safety, a division of the field that will not be considered in this paper.

EYE SCREENING PROGRAM

An eye screening program consists of the obtaining, compiling and application of considerable information, outlined as follows:

1. An Ophthalmologist serving as "visual engineer" with necessary assistants, procures a job classification list for the plant, and the qualifications for each job as established by labor and management. He then visits the plant and makes a survey of the visual requirements and peculiarities of each type of job, going from machine to machine.

   Does the particular job demand good near vision, good far vision, good color vision, good depth perception? How will bifocals work on an older employee? How is the illumination; what are the hazards? If a man will move, to what job does he go? What are the capabilities of workers on the job who have been fully successful at it? From this are set up visual minimum standards for each job; no employee should be assigned or changed to a job for which he lacks the minimum visual ability.

TEST ALL NEW EMPLOYEES

2. Now all new employees must be tested for their visual ability as a pre-employment or pre-assignment study. This is done by trained technicians and a machine specially designed to screen the good from the poor in many different visual characteristics. Individual records are kept, and consulted in original placement, in transfer of assignment, and if the man fails to meet production standards, or is accident prone.
3. Decision must be made whether to test all present employees, or only the dangerous or vitally important sections. One must be practical, but ideally each employee will be examined.
4. Special attention is given to screening and placing candidates for special training, those considered for promotion and transfer, those working in hazardous positions, those doing precision jobs and important inspecting.
5. After a program is well organized and in full effect, periodic surveys are needed to pick up changes in visual ability that may appear as a result of aging, disease or injury. In the interests of safety, fairness and efficiency, standards may need revising for certain jobs, either up or down.
6. In the screening tests, all individuals who are discovered to have visual ability below minimum standards, should be sent for complete professional examination and help, and nearly all of them, with that aid, will be found then to meet requirements. Nearly every worker can be salvaged, often for the job he or the employer has in mind, but at least for something. Often with professional medical aid, a square peg can be reshaped to fit a round hole.

PROGRAM SELLING

That, briefly, is what the program consists of. To establish it is not that simple. To get it going requires advertising throughout the plant, and publicity to sell the proposals to the workers, the supervisors and management. The boss must be sold on its value, and must be given reports of progress and results. The workers, by continuous publicity, must be convinced that the program is to help each of them and to fire none.

It must start, at least, on a voluntary basis. There must be a capable medical or professional consultant supervising the program, with enough well trained technicians to do the actual testing and record keeping accurately, quickly and in good spirit. There must be careful planning, with all details settled in advance.

Screening must be done on the job. It will take three to five minutes per worker. Division of cost of glasses between employer and worker must be decided. Employees must understand that the plant testing, by use of a screening machine, does not supply a prescription for glasses.

APPLIES TO ALL INDUSTRIES

To what industries can such a program apply? The answer is-*all*. Experience generally has been that almost any type of industry will benefit from an eye program. Maybe only part of the plan will apply, or all of it, but there are hardly any exceptions to the possible benefits. Any industry will profit by analyzing the ocular demands of its work, and the ability of its employees to meet those demands.

Aviation discovered this fact first. Flying was a life or death matter. They were the first industry to test for more than just visual acuity. Today no company has failed to get ample reward from such a program; no industry can claim exemption.

Now that we know, at least in principle, what we are talking about, maybe we should go back to the beginning again and ask what is the need for such a program, and what is its broad purpose? Any owner in-

terested in profit, any worker interested in security, may well be skeptical of the need for such a program and of the results. Who benefits from it?

In the words of the medical director of the New Jersey Telephone Company, L. H. Whitney, M.D., a visual program benefits management, employees and the community. Many other equally observant, objective and authoritative men have agreed, and said so in print. What is their reasoning and proof?

LABOR IS COSTLY

Of all the commodities that a manufacturer buys, labor is the most expensive, and the most variable in quality. Yet far too seldom is labor subjected to anything like the analysis and checking that is rigidly applied to other purchases. Labor is expensive and hard to get; it should and can be carefully studied, classified, improved, and utilized. A vision testing program deals with that.

In such matters as machine design, time studies, and setting up a production line, manufacturers have shown great progress. In safety measures they are learning fast, though the plant where goggles are required is still the exception. But the tools that each worker is constantly using, his hands and eyes and brain, have been neglected.

There are many characteristics to consider in classifying and placing an employee, and which determine his success at a task, —such things as motivation, dexterity, intelligence, temperament, hearing, vision and others. There are tests for all of these, and now-a-days some firms even take a long look at an executive's wife before he is hired.

But nearly all of a worker's impressions come to him through his eyes, and thus visual performance is important in every job, and the most important function of all to *test in many jobs. The visual ability of* the employee, and the visual requirements of the job can each be determined.

LABOR FORCE IS HUMAN

Better than thinking of labor as a costly and variable commodity, it should be dealt with as a group of human beings. These humans, managements' greatest asset, deserve maintenance and upkeep far more than machines. These humans deserve, more than machines, to be used intelligently, each in accordance with his own abilities and limitations.

If management does that, each worker can function with greatest ease and effectiveness and productivity. To do that, management must know each worker. Whatever helps the worker helps his contentment and his production. An employer is under *obligation to use each worker effectively.* In that spirit, both employer and employee should support a health program that endeavors to keep each employee in his best health and on the job.

The worker should be fitted to his job visually just as well as in other characteristics. Twenty per cent of job failures in some industries are due to inadequate visual skill. You would not give a blind man a truck to drive, but during the war Lockheed had 300 totally blind persons on highly skilled work, who kept up production and had a lower than average accident rate. You would not knowingly put a one-eyed man on a crane, but he might be able at color discrimination.

GOOD VISION REDUCES ACCIDENTS

Management must be convinced of the value of the program, or the medical director will be without funds. Management must be shown the fact that fitting a man visually to his job will reduce accidents, *reduce spoilage, increase production,* improve morale and reduce labor turnover and training time.

Employees must be convinced the program will benefit them, and will not ease them out of a job, or there will be no one to test. The workers worry about being substandard, and as a consequence losing pay or job. The IBM Corporation has convinced them that the company will not do anything to them, but will do something for them; that the program is not a means to speed up work, but rather to help the employee to work more comfortably and safely at his job, at home, driving and elsewhere.

No IBM worker is ever told that his visual performance is not up to a required standard, but rather he is told he can be benefitted by further examination and help, which he becomes motivated to seek for his own welfare. The employee must learn that scientific visual placement increases job

performance eight to 40 per cent, so it improves individual production and piecework pay, that it helps avoid accidents and hazards due to poor visual ability, that it reduces fatigue and job failures, irritation and absenteeism, that it promotes contentment in his mind and puts money in his pocket.

It helps to keep older people at work by finding a job they can do, and by guiding those who need it to seek professional aid for their visual disabilities. A man may be unemployable on one job while excellent at another.

Having convinced you, I hope, that everyone benefits from an eye screening program in some form, let us make this point certain by reviewing the general results in various industries of such a program.

POOR EYES—ACCIDENT PRONENESS

A multitude of reports show that management and worker have been sold on the value of an industrial vision program. Many reports stress the reduction in accidents, and the savings in lost eyes, something an accountant can easily translate into dollars. Surveys show that workers prone to accidents have generally worse visual function than the accident free.

We mention that aspect of a safety and goggles program only in passing. For one example, Shell Pipe Line corporation of Houston reduced the cost of eye injuries by 90 per cent in five years, from $5,000 annually to $500. But aside from accidents avoided, a vision program pays off to management and worker alike. IBM at Bingham reports greater production and better work, with corresponding reduction in production costs, material costs, accident costs and general overhead expenses.

Since IBM has no time studies or piece work, exact figures cannot be given. Sperry Gyroscope company at Lake Success, N. Y., found in some departments as high as 45 per cent of the workers had vision inadequate for performing their jobs comfortably and efficiently. As a result of a plant wide program of vision correction, spoilage and waste have been reduced and production increased. In one year, vision testing of applicants revealed 21 per cent failed to meet standards, until, for 90 per cent of these, glasses were obtained.

For Sperry management, the eye service program has produced results well beyond original expectations. Among 15,000 employees voluntarily screened by New Jersey Telephone company, 10 per cent were found to need a complete eye examination, to meet standards that were *not* unusually high. Timken Roller Bearing company began a visual screening program in the roller inspecting department in 1948.

PRODUCTION INCREASED

In three years the number of rollers inspected per inspector increased 28.7 per cent and the number of final rejects decreased 44 per cent. They concluded "it can be definitely stated that the increase in production and decrease in defective rollers found in final inspection is due to the visual inspection performance program." The Owensburg, Kentucky Tube Works of G.E., found in various departments from 29 to 60 per cent of their employees not up to good visual standards, the plant average being 39 per cent.

Those on piece work who met standards were averaging four to nine cents more per hour than the others. They found a direct relationship between visual performance and earnings. When a worker who failed the screening test got his eyes corrected, he increased his pay nine cents per hour. The foreman's rating of these workers who get needed help went up 36 per cent.

So much for specific experiences in specific instances of varied industries. Some companies with new vision screening programs laboriously determined the dollar value of the program. Many others were as certain of the benefits but could not or did not translate them into numbers.

OTHERS ADOPT VISION PROGRAM

IBM for example, aims to help each worker to his top potential visual efficiency, considers him as an individual, does not use predetermined visual job requirements, never tells a worker his visual performance is not up to standard, and believes that there is a place in industry for workers with physical handicaps so long as the employer is aware of them.

The Delco-Remy Division of General Motors at Anderson, Indiana found that their plant vision and safety program was so effective and beneficial that it soon spread to the local high school driver's training

courses, and later throughout the entire school system. Other local Anderson industries were forced by employees' pressure to follow the example of Delco-Remy. All reports tell of the satisfaction that both management and worker have from a properly working, carefully organized visual screening program.

What results from such a program in a printing department or firm? One excellent report, at least, is available on this, by the medical director of R. R. Donnelly and Sons, and I will extract freely from his printed results.

The program was begun in one critical department made up of composition, linotype operators, monotype operators, lockupmen and proofreaders. All voluntarily were screened. Efficiency went up and spoilage went down so much, from corrective action, that the program was authorized for the entire plant, and completed in two years.

PROOFREADERS MORE ACCURATE

The program and its results showed that proofreaders who meet visual standards are 37 per cent more accurate than those who fail; they have 7.9 points higher efficiency and produce 12 cents more value per man hour than those visually below standard. Similarly compositors visually up to standard have 5.5 points higher efficiency, and monotype keyboard operators 19.1 points higher, and produce 71 cents per man per hour more.

As in most industries, it was found that 90 per cent of those who did not meet standards, could readily do so after getting professional aid or glasses. Considering the cost of spoilage to consist of paper, inks, time and customer satisfaction, Donnelly's figured that in this one department of 336 employees (in a plant of 2,000), the savings that resulted from the vision correction program were more than $6,000 per month.

What does an eye program in industry cost? There are figures more readily available concerning accident prevention than in increased efficiency. I have already noted the experience of Shell Pipe Line corporation of Houston: cost of eye protection plus eye injuries dropped 90 per cent in five years, from $5,000 a year to $500.

In a 10 year period Sperry Gyroscope company spent $400,000 for setting up and maintaining its in-plant eye program, or an average of $40,000 per year. Employees varied between 7,000 and 18,000. At least 82 eyes were saved from loss, attested to by smashed goggles. At $5,120 each in New York State, these saved eyes saved $419,840 alone, or more than the total cost of the program.

Figuring four dollars of indirect cost for each dollar of direct accident cost, a total of $1,679, 360 was saved by not losing the 82 eyes. In 10 years there was a 90 per cent drop in first aid eye cases, an approximate saving of $200,000.

The cost of a screening program aside from safety I do not know, and it would vary a good deal, depending on how much the company and the worker contributed toward special examinations and needed glasses.

Nevertheless, one company after another has adopted and continued these programs, convinced that they are worthwhile when properly adapted and run, either on a dollar and cents basis, or on the basis of those less calculable items of efficiency, contentment, morale and productivity.

May I suggest that for those of you who may be interested, the National Society for the Prevention of Blindness has a number of short pamphlets written by a variety of experts, detailing their experience with eye screening programs in industry. These may be obtained at cost from their N. Y. office (1790 Broadway, N. Y. 19).

WHAT GOOD VISION CAN MEAN TO INDUSTRY

by KARL F. SIMPSON, JR.
director, Safety & Industrial Relations, Folding Paper Box Assn., Chicago

The Folding Paper Box Association of America is a service organization. The service we provide is concerned with the buying, selling, and producing functions which each member performs, and is specifically designed to meet their individual and collective needs. In other words, we help our members with activities directly or indirectly related to the making of a profit.

Our interest in profit is dictated by the cold fact that this symbol represents the nucleus of their thinking. This preoccupation with monetary matters is not peculiar to folding box manufacturers, but is a characteristic common to all members of top management.

Since "profit" is the symbol to which top management responds, we present programs and projects which can be reduced to monetary terms. This is necessary because management, with their analytical minds, are constantly measuring and evaluating each activity in terms of the profit symbol to determine its ultimate effect on the profit and loss statement of the organization. If we present projects which cannot be related to this one overriding preoccupation (profit), then we risk not having our program accepted, regardless of its merit.

In line with this thinking, we at the Folding Paper Box Association are actively supporting a program of vision testing and we urge our members to invest time and money in this activity. We are convinced that if they do not make this necessary investment, they risk wasting substantial sums of money and thereby place themselves at a competitive disadvantage in a most highly competitive industry.

ALL VISION FIELDS

With the credo of "service to our members" as their philosophy, the Industrial Relations committee of our Association in 1956 authorized the staff to explore the area of vision testing. From a general survey of the literature, we found that Industrial Ophthalmology is a special field of the visual sciences. It is more than just prescribing glasses. There are also the related fields of vision and the job, color, depth of field, illumination, and many other problems of a medical, production, and a human relations nature. There are three basic phases connected with the installation of a vision testing program:

1. *A Vision Survey of the Plant.* This includes a determination of vision standards for different jobs. This involves a determination of whether or not an employee is required to do close work, the importance of distant vision for each job and the significance of depth of field or color perception in relation to each particular operation.
2. *A Program of Selection and Placement of Employees Through Pre-employment Tests.* The purpose of this phase of the program is to place employees in jobs which will utilize their specific qualifications. This is necessary to insure high quality and safety of operation.
3. *Periodic Re-checks Throughout the Plant in Areas Where Good Vision is an Important Factor.* Men, like machines, need to be checked to be sure they remain in good working order so that they will be capable of continued operation at top efficiency.

RESULTS OF STUDY

Other facts uncovered in our non-technical survey indictated that the accuracy of work is directly related to good vision. This is to be expected. We also found that the visual skills for the greatest accuracy may not be the same as those required for the greatest degree of speed. The explanation of this is that those with good vision detect and correct their own errors. To keep within the tolerances specified for the job, they work at a reduced speed. On the other hand, those with poor vision are unable to see the flaws in their work and as a result they work more rapidly.

To substantiate the close relationship between quality of production and the level of visual efficiency, the Bausch and Lomb

Optical company has released the following results of a study conducted among a group of lathe operators.

EMPLOYEES RATED AS HIGH QUALITY PERFORMERS:

13 per cent of these employees did not pass the visual performance test for their job.

87 per cent of these employees did pass the visual performance test for their job.

EMPLOYEES RATED AS AVERAGE OR MIDDLE QUALITY PERFORMERS:

28 per cent of these employees did not pass the visual performance test for their job.

72 per cent of these employees did pass the visual performance test for their job.

EMPLOYEES RATED AS LOW QUALITY PERFORMERS:

68 per cent of these employees did not pass the visual performance test for their job.

32 per cent of these employees did pass the visual performance test for their job.

Information of this type has meaning to top management because it can be converted into monetary terms. As proof of this statement, I wish to cite the case of one of the pioneer companies in the field of industrial vision testing. The medical director of this organization indicates that their preliminary vision testing program cost approximately $10,000.

As a direct result of this pilot project in one area of their operation, the company realized a savings of between $5,000 and $6,000 each month from reduced spoilage alone. If we take the lower figure, this would indicate a 600 per cent return on their investment. If we assume that this is an unusual case and cut the benefit in half, we have a return of 300 per cent on the original investment.

GOOD VISION DECREASES ACCIDENTS

Aside from the benefit of reduced cost (higher quality), studies indicate a direct relationship between safety and visual ability. This, again, is not unusual or unexpected. One of these studies reported that only 23 per cent of those employees who met the minimum visual standards for their specific jobs had serious accidents, while 88 per cent of those who did not meet these minimum visual standards for their jobs suffered serious mishaps. Another report concluded that 65 per cent of those with adequate vision were accident free, while only 45 per cent of those with substandard vision were accident free.

Another aspect of the problem which has an important bearing on industrial vision but is often overlooked is the question of adequate illumination. We might ask ourselves, what good is 20/20 vision if the work area is so dark that the employee is unable to see? Studies indicate that there is a direct relationship between adequate light and the quality and quantity of production. These reports conclude that by reducing illumination below the most satisfactory level, total production declines and the number of errors are easily doubled.

This is but a brief glimpse into the storehouse of material available to those interested in the field of Industrial Ophthalmology. However, on the basis of this brief preliminary study, the Industrial Relations committee of the Folding Paper Box Association authorized the staff to set up a pilot study among a group of our member companies in the Chicago area.

PILOT STUDY

The purpose of the test, as set forth by the Industrial Relations committee, was to determine the prevalence of eye deficiencies among the members of our own work force, and to prepare a foundation for the possible establishment of vision standards for various critical job classifications within the industry. Dr. Hedwig Kuhn, an outstanding authority on industrial vision, acted as technical consultant to the pilot group which consisted of the following companies:

Container Corporation of America, 35th Street Carton Plant.

Container Corporation of America, Lake Shore Plant.

Continental Can Company, Inc., Robert Gair Paper Products Group, Chicago Plant.

Klearwrap, Incorporated

Four critical areas were chosen for a sample check of 265 employees. There areas

embraced the following departments in each of the four plants:

Press room
Cutting room
Ink room
Die and Plate department

Of all the employees tested, a minimum of 37 per cent had a vision deficiency sufficiently pronounced so as to place them outside the acceptable range of normal vision for the particular job they were performing. In the press room, 31 per cent of the pressmen needed an eye examination to secure glasses or have glasses corrected to their present need. We also found that 28 per cent of these pressmen had a noticeable deviation in depth perception, and 15 per cent of them had a color perception that was not up to par.

Of the feeders, 55 per cent in the press room and 54 per cent in the cutting room had deficiencies in their depth perception. In addition, 30 per cent of the feeders in the press room, 25 per cent of the feeders in the cutting room, and 18 per cent of the ink room employees lacked satisfactory color perception. There were also 34 per cent of the die and plate department workers who needed an eye examination to secure glasses or have glasses corrected to their present need.

VISION PROGRAM UPS PROFIT

There are but a few of the alarming highlights which pointed up the need for a full scale vision testing program. To us the significance of these findings were obvious. We did not feel that it was necessary to convert this material into specific monetary terms, since our study corroborated previous reports on the prevalence of eye deficiencies among members of the work force.

On the basis of similar studies in closely related fields, we felt the savings they had experienced would apply equally well to our own group and industry. Therefore, on the basis of this material it was decided that our Association would support a vision testing program among all of our members.

The next step concerned the development of a presentation which would "sell" member companies on the idea of installing a vision testing program in thir own plants. It is true that we had some rather startling results of our pilot survey to present. We could also point out that there was a bright side to this otherwise dismal picture since once these vision deficiencies had been uncovered, approximately 90 per cent of them could be corrected.

However, after serious study we came to the conclusion that there were two basic points of emphasis which might be stressed. Our problem was to determine which of these two arguments would best serve as the cornerstone for our presentation. One of the basic points of attack involved the safety question and concerned the argument that employees with deficient vision are not only a hazard to themselves, but they also make accident prevention much more difficult.

This argument involved an analysis of how improved vision might reduce injuries and consequently reduce human suffering as well as insurance, compensation, and medical costs. The other area for possible exploitation was the financial hazard and expenses resulting from the production of scrap and low quality work, which could be directly traced to deficient vision.

PRODUCTION QUALITY INCREASED

In presenting our program for the first time we stressed both aspects of the problem. From the beginning, however, it was obvious that the key to top management's interest and support came not through the safety argument but rather through a factual presentation of potential savings from the reduction of scrap and low quality work. Being pragmatic in our thinking we pursued the course which seemed to offer the greatest possible return.

Our presentation is now primarily based on the problem of quality control, with safety thrown in as an *added* benefit. On the basis of this approach, we feel we have achieved an appreciable degree of success as measured by the number of vision testing programs which have been installed by our member companies.

For a company to reap the full benefit from this project, a vision testing program cannot be thought of as a one shot cure-all. The simple phase of the operation consists of finding the employees with sub-standard vision. The difficult task consists of the follow-up required to be sure these employees get the medical attention they need.

Once the present work force has been raised to top efficiency in terms of vision, the program still has a function to perform. This consists of maintaining a constant check on all new employees to be sure they meet the vision standards for their specific operations. There is also the need for a periodic re-check of the whole work force in areas where good vision is an important factor. This is necessary to maintain top vision efficiency.

From our vantage point, we are firmly convinced that the case for a vision testing program is adequately supported by the facts. There appears to be sufficient monetary benefit in the areas of both quality control and accident prevention to warrant the expense of installing and maintaining the program. The big problem is "selling" the activity to top management. This hurdle is not insurmountable if you remember that "profit" is the most dynamic characteristic of our free-enterprise economy and is the catalytic force which activates our whole industrial machine.

If you evaluate a vision testing program in terms of the "profit" which can be expected from an investment of time and money, neither you nor your top management will question the worth of this activity.

HAZARDS OF 110 AND 220 VOLTAGE IN INDUSTRIAL OPERATIONS

by HOWARD A. BROWN

Rochester Gas & Electric corp., Rochester, N. Y.

Before venturing into the discussion of hazards of 110 and 220 voltage in industrial operations, we should review the factors and conditions under which these low voltages may be hazardous. There are many people who are not aware that low voltages may be hazardous either because they have never had the conditions pointed out to them, they have failed to comprehend them fully and have forgotten the details.

This presentation will review research and the authoritative opinions of people in the fields of electrical engineering, medicine and physiology. Especially I will use material by W. R. Smith which was presented before the Public Utility session of the 19th Annual Safety Convention and Exposition of the Greater New York safety council, March 31, 1949.

Dr. Cecil K. Drinker, professor of physiology, Harvard school of Public Health, states, "Teaching should be based upon the principle that no electric shock is without danger, and users of electricity must employ every means to avoid accidental contacts."

Dr. H. B. Williams, formerly Dalton Professor of Physiology, Columbia university, is an authority in the fields of medicine, physiology and electrical science. He has for many years called attention to the possible hazard of low voltage electric shock, saying, "The nature of the necessary precautions is so extremely simple that a young child may comprehend it."

Statistically, the annual number of fatalities caused by low voltage electric shock throughout the country is not large. The National Safety Council statistics show approximately 800 deaths caused by electricity, which is less than one per cent of all deaths. Of these probably not more than 200 were due to low voltage, but this small number is important because:

1. These were 200 human beings—industrial workers, wives, mothers and children.
2. These deaths were in many cases the consequence of a condition of which the victim was unaware.
3. Many of these deaths evidence the fact that, in the mind of many people, there is not yet a clear understanding as to why such deaths occur in one instance and not in another, where apparently there was a similar condition.

A large percentage of these fatalities can be prevented by a proper application of understanding and knowledge:

- Understanding the effects of electric current on body physiology
- Understanding why low voltage can be hazardous and under what conditions
- Knowledge of proper procedures and practices that will prevent conditions that are hazardous and fit us to avoid their harmful influence

PHYSIOLOGICAL EFFECTS OF SHOCKS

The first factor involved in electric shock is the type of current encountered. Generally speaking, this discussion is limited to two types of current, direct current and alternating current. The principal effect of direct current is that it will produce a very serious burn. The heat generated by the direct current is the factor which produces the injury.

Many fatalities that occur from direct current are caused by the effects of the heat when the current passed through the body tissues. A direct current passing through the body from head to foot generates heat in the blood cells causing them to expand and explode. Deaths have occurred due to direct current shocks from internal hemorrhages rather than from extensive burns on their person.

Alternating current is the most common exposure in most industries. Arcs from either direct or alternating current can produce external burns. Alternating current has several other effects in addition to burns. This current, particularly at low voltage and low frequency, can cause a paralysis of the muscular tissues. The stimulation of the alternating current, in flowing through the muscles paralyzes them.

Respiration can stop from a contraction of muscles. If this is the only effect, natural respiration will begin as soon as the contact is broken (provided the time interval has not been too long). Violent muscular contractions can also cause falls with serious consequences. Lesser currents may not affect respiration directly, but if muscular contractions prevent the victim from releasing himself, death can result from exhaustion and consequent respiratory failure and asphyxia.

The next effect of alternating current is caused when the current flows through the nerves that control breathing. Breathing is controlled by the phrenic nerves which come down the sides of the neck, through the trunk and attach to the diaphragm.

BREATHING PROCESS

The impulse of the breathing center at the base of the skull goes through these nerves and causes the diaphragm to rise and fall and control breathing. If the current passes through the nerve center, it destroys the ability of the nerve center to send the impulses down the nerves; or, if the current goes through the nerves, the effect is transmitted to the nerve center and breathing is not possible.

When this happens, we say a person dies of shock; he suffocates because he cannot breathe due to the paralysis of the nerves. Artificial respiration is an attempt to keep the victim breathing until the paralysis of these nerves and the breathing center has been reduced or eliminated and breathing is again normal by itself.

The third effect of alternating current is one upon the heart itself. The heart normally beats as a pump, in perfect coordination, 72 times a minute. An abnormal stimulation such as the impressing of a 60 cycle electric current, may cause the heart muscles to go out of step and flutter in a completely uncoordinated manner.

VENTRICULAR FIBRILLATION

There does not necessarily have to be any unusual damage to the heart. The heart quivers rather than beats, the pumping action ceases, the blood becomes contaminated very quickly from failure to circulate, nerve centers and the brain are deprived of oxygen and the person dies in a few minutes—an asphyxial death. As far as is known, there is no practical way to get a heart out of this uncoordinated flutter—known as ventricular fibrillation. Research indicates that an immediately applied counter shock will restore the heart to its regular rhythm.

These effects—the paralysis of the muscles, the effect on the nervous system con-

trolling breathing and the fibrillation of the heart are effects peculiar to alternating current. In an emergency either shut off the electric circuit or get the person off the circuit so the current no longer runs through him. The paralysis will disappear shortly.

Artificial respiration is applied for paralysis of the breathing. In fibrillation nothing can be done since it can not be determined if the heart is in fibrillation. Therefore, the only advice in the case of an electric shock is to get the person off the circuit or break the current as quickly as possible, and secondly, apply artificial respiration if he is unable to breathe.

The effect of an electric shock will depend upon:

1. The nature and intensity of the current
2. The parts of the body affected
3. The duration of the current flow

The intensity of the current depends upon the voltage and body resistance.

$$\text{Current in Amperes} = \frac{\text{Voltage (volts)}}{\text{Resistance (ohms)}}$$

BODY RESISTANCE

The body resistance is a combination of the skin contact resistance and the actual body resistance which is low because body fluids are a good electrical conductor. Skin contact resistance varies greatly from a normal dry of 40,000 to 50,000 ohms per square centimeter to a moist value of 1,000 to 2,000 ohms per square centimeter. The total resistance may vary from 100,000 to 300,000 ohms or more, or in conditions of wet hands from perspiration, a low value of from 300 to 500 ohms total resistance may be obtained.

Therefore, if the total resistance should be 500 ohms, the current would be as follows for the indicated voltages:

Volts	Current in Milliamperes (1/1000 Ampere)
100	200
50	100
12.5	25

Thus, we see the values of current that can be obtained at very low voltages.

Let us now consider what these current values mean.

Charles F. Dalziel, professor of Electrical Engineering, University of California, conducted tests on 120 male subjects and determined the following results:

1. Threshold of perception—1 to 1.2 milliamperes
2. Surprise but no discomfort—8 to 13.9 milliamperes
3. Paralysis preventing voluntary control—15 milliamperes
4. "Let-go" values painful—9.7 to 21.6 milliamperes
5. Reasonably safe values to handle continuous or uninterrupted—8 to 9 milliamperes

Note: Values for women are about 70 per cent of the above values, and for children, in general, less.

MUSCULAR CONTRACTION OCCURRANCES

Frequency affects the "let-go" value very little in the range from 10 - 180 cycles. At lower, or higher, frequencies the "let-go" currents are somewhat higher than those above.

Muscular contraction with alternating current is steady and continuous. Muscular contraction with direct current occurs when the circuit is closed and again when broken. Direct current is safer at somewhat higher values and is preferred by many for welding operations.

If currents exceed the "let-go" values, severe muscular contractions will result with consequent effects on breathing organs and eventual exhaustion. The duration of such shocks will determine the seriousness of the consequences. The above conditions will generally not affect the heart immediately.

There is no exact information on what is the lowest value of current that will stop normal respiration and produce unconsciousness, but it is believed to be between the above "let-go" values and that which produces fibrillation.

Extending the above tabulation would give the following picture:

6. Great pain—breathing difficult—20 to 50 milliamperes
7. Respiration stopped—40 milliamperes (estimate)
8. Ventricular fibrillation—100 milliamperes to 25 amperes plus duration
9. Heart action stopped by shock (result of severe muscular contraction) —200 milliamperes and above

In the relationship of currents of different values and their physiological effects, the values of currents are very small. We have only tabulated currents up to 200 milliamperes; that is only two-tenths (0.2) of an ampere. We have talked of one to 1.2 milliamperes as the threshold of perception; that is only one one-thousandths (0.001) of an ampere.

These are extremely small quantities of electricity and account for the fact that in many accidents the fuses were not blown. It was hard to believe the party was electrocuted when the power had not been interrupted.

The current that flows is directly proportional to the voltage and inversely proportional to the resistance. An increase in voltage generally results in a worse shock. Likewise, a decrease in resistance results in a worse shock. With a given voltage, the variable is the resistance. The resistance of the contact is most important.

The larger the area contacted, the lower the resistance. The more the pressure of the contact, the lower the resistance. A contact can be a tap, or brush, or a grasp which may start as a light grasp but the flow of current contracts the muscles and the pressure of the grasp tightens, and the tighter the grasp, the lower the resistance and the more current will flow.

MOISTURE INCREASES SHOCK

Moisture is also a factor involved in contact resistance. Moisture improves the contact, making it better, so that the flow of current is increased. The peak of fatal electrical shocks occurs each year during May, June, July and August. This reflects the effect of the perspiration of the men who are involved in contacts.

There is a difference in the susceptibility to shock of individuals which is an important factor. Some people are more sensitive to electricity than others. Some people can stand repeated shocks; they have experienced it before; they know what it feels like and nothing much happens to them.

On the other hand, other people are very sensitive to electricity and their heart and mental adjustment may be in such a state that they are frightened to death. Fright kills them rather than any burns or serious injury due to the effects of the current passing through the body.

I have pointed out a sufficient number of factors involved in electrical shocks. We have covered enough of the fundamentals to indicate that it is not only the voltage that kills, and not only the total resistance, but rather a combination of them that creates the condition.

You must be in the circuit across some voltage (which is usually to ground), to cause current to flow, the magnitude of which is determined by the resistance of the circuit. We have seen that it only takes a very small current flow to cause an effect which may be fatal.

INSULATION RAISES RESISTANCE

Insulation is used to keep the resistance value high, either above ground or between wires. All insulation passes current under some condition. The insulation has to be chosen to minimize the current flow at the voltage being used. Insulation may be defective or deteriorated and therefore should not be too much depended upon.

To prevent electric shock, whether it be low or high voltage, should be simple, at least in principle, for it means simply:

- Keeping clear of contact in any way with energized circuits and grounded surfaces or objects when handling electrical tools or making connections, and
- Grounding any external metal parts of portable tools or stationary electrical equipment.

The message of low voltage electric shock for the shop electrician and maintenance man is to use suitable electrical tools and devices and to clear power and lighting circuits before working on them. There are two ways of working on a circuit—"dead" or "alive." That applies to the workman as well as to the circuit. The safest way is to work only on "dead" circuits.

Probably it is a tribute to the electrical industry that we can point to evidence of complete ignorance of essential precautions in using safety with electrical appliances, tools, and devices operating on 110 volts. It is a consequence of the practical every-

day safety of the commodity we supply. We *must recognize the facts that have been presented* and what, on one day, may be an insignificant tingle, on another day may cause a fatality.

Let us summarize the essential precautions we have been talking about:

- All voltages of electric energy should be respected and treated properly. Chances should not be taken. For those who must work on or near an energized electrical connection, they should stand on dry boards or other non-conducting materials and when practical use only one hand. At all times keep the body clear of grounded surfaces, equipment and pipes.
- The normal high value of the skin resistance when dry usually safeguards those who receive shocks from any serious consequences. Extra precautions should be taken when hands or body are wet from water, perspiration or chemicals.
- Proper devices and equipment should be used with cords of high grade rubber insulation suited to the conditions. Good maintenance is imperative. All permanent sockets, especially brass shell, should have connections *polarized so that the screw contact is* at ground potential.
- Low voltages (6-32) are recommended for supplying extension cords for lights which have to be taken into tanks, boilers, *or places that are extremely damp*, or where conducting chemicals are present. Brass shell sockets should never be used for extension cords, nor in any locations for which they are not approved in the National Electrical Code.
- Portable electric tools should be properly grounded, preferably by a third conductor in a connecting cable using polarized plugs and receptacles or by a positive third wire connection to nearby electrically grounded steel, water pipe, or electrical ground bus.

If the grounded side of the supply circuit is used to ground the frame, an open circuit at any point in the grounded wire of the cord or at the plug receptacle will result in the frame becoming energized, thus creating the condition which the ground connection was supposed to prevent.

TRAINING TO CONTROL UNSAFE ACTS

by NEIL NELSON

district engineer, The American Mutual Liability Insurance co., Manchester, N. H.

Three years ago I investigated a fatal accident reported from a local paper mill. While reviewing the facts the superintendent was quite sure that the unfortunate accident was the result of carelessness. I had to agree, however, while the superintendent was sure that it was the man's carelessness, I was equally sure that most of the responsibility for the accident lay at the superintendent's door.

A young man recently employed was attempting to remove a small piece of paper from the dryer roll on the paper machine using a broom handle. In some way the handle was caught in the nip point of the turning roll and in attempting to remove it, the man's hand and arm were caught which resulted in such serious burns and shock that he died shortly after being admitted to the hospital.

Investigation of the accident established this: the young man, 18 years old, had been employed in the mill for approximately three months and was learning to be a back tender. It takes many months of constant training and experience before one can qualify as a back tender. So I asked several questions.

1. Why was the man using a broom handle when it is contrary to all good practice in attempting to remove a piece of paper from the dryer roll?
2. Why was a young man with such limited experience permitted to attempt to remove paper in the first place?

NOT PROPERLY TRAINED

It was quite evident that proper *training* had not been provided. He was permitted to remove paper when he was not trained to do it and furthermore, he was permitted to use a wrong practice. In this case it was vigorously claimed that the more experienced back tenders did use a wood spear and the right practice. However, the reason for the young man using the wrong method was not explained. It is hard for me to understand why a young inexperienced person knowing practically nothing about the operation of a paper machine, should deliberately pick up a broom handle if he had never seen that done before.

It was finally established that some of the more experienced men did use a broom if the broom was handy. Therefore, we had an unsafe practice by an inexperienced man causing his death. There is no doubt in my mind that the cause of this man's death, was, he was not trained to do the job to which he was assigned.

What do we mean by training? The desired end result is, of course, to have every person work efficiently and safely. But how do we get this? Certainly not through casual remarks about safety to a workman by his supervisor, particularly if the supervisor has not been trained in the same subject. How much training remains as an indelible stamp in the minds of supervisors when management is only mildly interested or worse, has no interest at all? There is a large number of small mills where training programs are conspicuous by their absence.

INVESTIGATE NEW WORKERS

It would be most unusual for management to buy any equipment, either new or used—sight unseen. As a matter of fact, careful investigation is made to be sure that the investment will be proper and profitable. Unfortunately, this practice is not always followed in the investment in man power. The larger mills undoubtedly do have programs, some adequate and some not.

The smaller mills make little or no attempt to secure their investment when hiring employees. There are reasons given for this, some justifiable, others are not. For instance, a small mill in a rural area may find a tight labor market, the wage scale may be lower than neighboring plants in other lines, the working conditions may be inferior to other plants, so that when a man wanders in looking for a job, if he looks normal and healthy, he is usually hired. If good luck holds, the man may be properly placed.

On the other hand if he is physically unable to do the work or is otherwise unsuited, he is soon involved in accidents and injuries. The pre-placement examination is the only way to match *the man* to the job. The job analysis is the only way to know how and where a man's abilities and aptitudes can be utilized safely and profitably.

There is no reason why a satisfactory *placing program* could not be undertaken in even the smallest mill. The mill owner or manager certainly knows the job and the physical and emotional qualities necessary for the man to do the job. There is usually a local doctor who will take an interest in the project and work with the manager. Only in this way can training people to control unsafe practices get off on the right foot.

HOW—WHERE—WHY

All of us are familiar with the practice of investigating accidents and many types of forms have been designed to record the necessary information. But all point to three important questions—How, Where and Why. Examinations of hundreds of reports indicate in a great many cases, that the investigation is superficial and does not get to the root of the problem. It is amazing to note the repetition of two statements by *supervisors*—"I thought the man knew better" and "I told him time and time again."

Now, if we agree that most men want to work safely and will carry out instructions to do the job right, there is something *wrong* when *he* makes an error and becomes involved in an accident. One reason he makes the mistake is because he does not understand what he is supposed to do, even if his foreman had instructed him. A man can be instructed only if the instructor knows how and will take the time to do it.

If you want to find out how well or how poorly your men are instructed, ask your supervisors to write up a job description showing the operation with the attendant

hazards. Believe me, you will be surprised at the omissions. This is not because the foreman or supervisor does not know. He knows the machine, job or operation as well as any man but without training he does not know how to transfer his information to another man and make it stick. Usually, the instruction consists of the supervisor telling a man a few times how to do something and when the man nods vaguely that he understands, it is assumed that he does.

This procedure, then apparently justifies the statement I referred to on the investigation report, "I told him time and time again" or "I thought he knew better." Now, if accidents are to be controlled, there can be no guess work or no assumption. A supervisor has to know that the man understands. He will know when the man can tell him and show him what he has learned. How long will it take? No one can forecast that. It depends upon the job and the ability of the man to absorb instructions.

FOLLOW-UP INSTRUCTIONS

The best of instructions need close follow up. Many supervisors lose out on all their good work by letting go too soon. If a well trained man is to continue along these lines, he needs supervision. There are many practices that creep into a man's activity that gradually undermine the whole training program. He will shortcut to save time.

He will change from the accepted procedure because he thinks he has found a better way to do the job, fail to use the personal protective equipment, ignore the presence of machine guards, get sloppy in his personal habits and aggravate the housekeeping program. If accidents from unsafe practices are to be controlled, the supervisor has to supervise. One of the problems is that an accident cause or an accident itself is not recognized or acknowledged until some injury or damage results.

Too much reliance is placed on the record of lost time accidents and entirely too little on the story told by the first aid treatment record. When a fatal or serious injury is reported or severe damage to property or equipment occurs, the entire organization corrects the cause. But day in and day out, practices are indulged in that could cause the loss of eyes, loss of fingers, hands and arms, hernias, back strains and many other injuries.

Many of these probably could have been prevented if sufficient supervision corrected the problem when first observed. I mentioned the lost time injury record and its effect on supervisors. Many times at safety meetings I have found much complacency because departments have operated for a month or longer without a lost time injury. In checking first aid reports, it was not assuring to see the trend of minor back strains, lacerations, foreign bodies in eye and so on.

PRACTICES CAUSING ACCIDENTS

My survey showed the practices responsible for these trends, men lifting improperly, cluttered storage areas where materials have to be handled and re-handled, use of make shift tools, wrong size wrenches, screw drivers for chisels, using grinding wheels without shields or goggles. Not a lost time injury reported but the ground so fertile, just waiting for a change of luck. While the investigation of a serious accident is necessary, the control of an unsafe act before the serious accident results, is even more necessary.

While we look to the supervisor to assume the leadership in his department, there are other influences affecting behavior over which the supervisor has little or no control. I always remember an accident in which a man lost a hand doing a simple routine job which he did every day safely. One morning he forgot and his hand was caught in the machine. After a while when he returned to work, I asked him how it happened.

It appears that he had just bought a new home and while he was physically doing his job, mentally he was planning the changes he was going to make in his home. There are many other problems which affect a man's stability and his judgment, worry over home problems, illness, disagreements, financial matters, rumors that business is not good and the thought of impending layoff. These are difficult problems that cause accidents.

While a supervisor cannot interfere or pry into a man's personal affairs, he can through friendly approach gain the confidence of his men that they will seek his

advice and help when they need it. Supervision means more than just running paper through a machine or pulp from digesters. It implies leadership and guidance. Most of us need both.

GAIN WORKERS' CONFIDENCE

I refer again to a statement that often appears on a supervisor's report of accident investigation. "I have told him time and time again." This means that accidents occur in spite of instruction from supervisors. It was pointed out that one reason is that the man does not understand the instructions. There is another reason, perhaps equally important. Sometimes there is a dual set of plant rules, one for production and one for safety.

I have yet to visit the mill where production rules are not observed without question. I wish the same could be said about the safety rules. It makes one wonder when we see an intelligent man accept wholeheartedly instruction on production problems and ignore or at least accept halfheartedly the program on personal safety. Men are quick to sense authority and sincerity and unless a supervisor issues his safety orders with the same degree of importance as production orders, they are not going to be carried out.

CONTROLLING UNSAFE ACTS

It is even more discouraging to hear a manager or his safety representative deplore the fact that supervisors do not take the proper interest in carrying out the safety policy. It is the same story. When the manager means what he says, it is carried out. Double talk is largely responsible for a negative reaction.

We will all agree that there are many factors which influence the control of unsafe acts. I selected for this discussion five which appear to me to be the key factors and briefly summarized they are:

1. *Job Placing*—Selection of the man according to physical abilities and emotional stability. Proper matching of the man to the job and the job to the man.

2. *Job Training*—Make sure the man fully understands the mechanics and operation of the job to which he is assigned. This can be done only if the supervisor himself fully understands all phases of the operation, the hazards attendant to the operation and the controls that should be established.

3. *Supervision*—Close checking on men for observance of safe acts taught during the training period. In the case of older employees, close supervision to maintain these practices which the supervisor has developed for safe work and operation. In this case, review of first aid injury reports, supplies many clues for the establishing of unsafe acts.

4. *Outside Influences*—Varying factors including home environment, economic problems and health problems all add to the factors responsible for the unsafe acts.

5. *Discipline*—Proper discipline to enforce the safety policy of the plant will remove the all too frequent statement, "I have told him time and time again." Unfortunately, there seems to be two sets of operating procedures where rules are concerned. Plant rules for production and process problems are observed without question. Safety rules and regulations many times are ignored or merely tolerated without too much cooperation.

INSULATING & ROOFING

(Round Table Discussion)

Presiding: Hugh M. Jackson, manager, Industrial Health program, Johns-Manville Corp., New York city

Recorder: Raymond J. Preston, safety supervisor, The Philip Carey Mfg. company, Cincinnati, Ohio

1. *Would like to hear what kind of housekeeping program plants have and methods plants use for reporting to main office?*

   a. Insurance companies have housekeeping inspection reports that could be used.

b. One plant uses a demerit system with percentage rating. Safety committee makes inspection with safety supervisor and foreman. Committee evaluates and makes ratings. A copy is sent to each supervisor giving conditions. Low rating plants receive a letter.

c. Housekeeping standards should be set. Determine how often scrap should be cleaned up. Should keep scrap and debris off floor entirely where possible. Have to set up schedules to do major cleaning jobs such as dust removal. Assign men to clean up work when there is downtime on machines.

d. Use photographs on house keeping inspections to pinpoint bad conditions.

2. How is dust removed from beams?

a. Efforts should be made to eliminate dust by collecting at the source with effective exhaust system.

b. Vacuum clean.

c. Periodic blow down, then vacuum off floor.

d. One company uses a portable vacuum cleaner with plug-in stations for vacuum at various locations along the line to eliminate the use of an excessive amount of hose.

3. Have employees been given any type of formal training in the use of liquified petroleum gas?

a. In some states the code calls for very stringent safety precautions in the handling and use of liquified petroleum gas.

b In one plant the general engineering group developed a manual which is used in a training program for all persons using or handling this gas. Articles are also printed in the plant publication to educate people further in the safe use of this type of gas.

c. Written instructions for people filling gas tanks.

4 What type of training program is used for all in-plant truck drivers?

a Only one company has formal training program which includes an obstacle course. Annual physical examinations are given with emphasis on vision and heart.

5. Have plants experienced eye inflammation from dust particles?

a. Generally only irritation was experienced.

6. What has been the experience with correction of pallets dropping on toes?

a. This seems to be a fairly general problem. One company makes it mandatory that employees wear foot guards on jobs such as take-off on roofing machines where pallets have to be dropped into position.

b. Use metal straps to cradle shingles which eliminates pallets.

c. Use jig instead of pallet. Pick up shingles from jig with fork truck and place in storage.

7. How do you get unsafe pallets out of service?

a. Supervision's job to check this and see that they are taken out.

b. Pallets to be taken out of service marked in warehouse with dab of red paint.

8 How do you create safety awareness on part of employees?

a. Personal contact with employee by supervisor is best way. Have 15-minute-a-day program with at least three men per day. This program can be audited by asking men if supervisor has talked to them.

b. Silver dollar approach. Ask employees how many days since last disabling injury or certain safety rule in their department. If they can give the correct answer, give them a silver dollar.

c. If an employee has too many injuries send a letter to his supervisor.

d. Create enthusiasm through departmental safety meetings.

e. Use Safetygraphs from the National Safety Council.

f. Make sure employees get the proper instructions.

g. Safety awareness comes through training.

h. More engineering is needed before we can say that lack of safety consciousness is to blame. Example: New shingle mill machine installed. Take-off man had to reach about head high to catch shingles. He pulled a pallet up and stood on it to make working position less tiresome. Several days later as he stepped down off pallet he turned his ankle. Report showed that employee was careless. But wasn't lack of proper engineering the real cause?

i. Need better communication between engineering, safety and production departments. Plans for all new installations to be approved by all concerned.

j. Use industrial engineers to make sure proper methods are set up and audit periodically to see that safe methods are still being followed.

9. How do you prevent the two inside men on shingle take-off from tripping over rollers or striking head?

a. No one else seemed to have this problem. Most take-off's are designed so that all take-off positions are on the outside.

10. What is the policy on use of and providing eye protection?

a. No company represented makes wearing of eye protection mandatory over the entire plant. Most plants define hazardous areas such as machine shop, saturator area, take-off, etc. and makes wearing of eye protection mandatory in these areas. One company makes wearing of eye protection mandatory for employees with one eye and maintenance employees.

b. Most companies provide other than prescription safety glasses and goggles to employees. Some companies secure prescription safety glasses for employees at company cost if employee provides the prescription. Other companies stand the full cost of providing prescription safety glasses for their employees.

c. Use of a mild soap solution to wash glasses will help to prevent fogging.

d. Bifocals on the top of the lens of glasses for welders, electricians or other employees required to read gauges overhead have proved to be very satisfactory.

11. Is wearing of safety shoes mandatory?

a. Most companies do not make wearing of safety shoes mandatory.

b. In one company operation where toe protection is mandatory the company provides over-the-toe metal guards. If employees wear safety shoes, the guards are not required.

c. Most companies provide shoes at cost.

12. Is anybody checking operating efficiency other than by accident frequency?

a. Check by accident costs.

13. Does anyone have mandatory rule of not wearing rings on the job?

a. Most companies do not have such a rule.

b. One company has a mandatory rule after having a serious finger injury.

c. One representative reported that just before coming to Chicago to the meeting he had to cut a wedding band off the finger of one of the employees in his plant.

14 What has been the experience with back X-rays on pre-employment physicals?

a. Only one company reported having experience with back X-rays. The cost is about $15.00. Reveal about 65 per cent have some back problem. Not all are rejected, but rejects run high in some cases. Back cases have been reduced since prorgam was initiated. Plan to extend program to other plants within the company.

REHABILITATION IN ONTARIO, CANADA

by DR. BRUCE H. YOUNG
superintendent, Hospital & Rehabilitation Center, Malton, Ont., Canada

The aim of our program of treating the injured workman is to prevent accidents and subsequent disability and loss of skill to industry. To accomplish this, the united effort of legislators, management, labor and medicine is required.

The immensity of the problem is seen in the statistics of Ontario, where more than 120,000 work accidents occurred resulting in more than 70,000 persons being off work for more than five days. The answer to this problem is sought through the combined effort of the legislators, management, labor and medicine, with legislation interpreted by the Workmen's Compensation Board, consisting of three members. It is within this framework that we can accomplish some success in rehabilitation.

I shall discuss our work in cases where an accident has occurred and injured the workman. Our program considers the injured person as its key.

AIM OF PROGRAM

A definition of rehabilitation is "the process of returning an injured workman to a normal and healthy position in his community." The basis of our process is rehabilitation, and to be successful it must be continuous from the first aid station to the return of the injured workman to suitable and gainful employment. In the majority of injuries the patient's own community is where this program should be carried out. Consequently, we strive to utilize the community's resources in medicine to their maximum.

There is a point in the injury when more than the supervision of a doctor, physical therapist or any other single person is necessary. There is also a point in the process of the patient's recovery when the patient's belief in himself begins to wane. To deal with this set of circumstances the Ontario Workmen's Compensation Board provides a Hospital and Rehabilitation Center.

At this Center are the various skills to accomplish our objective, and to superimpose leadership towards recovery for the man by a team. The needs of any given individual vary. Consequently the services offered by the various representatives of this team will vary, depending upon the individual patient requirements. Thus, we provide a program that may be fitted adequately and suitably to an individual's needs.

LADIES GUIDE MEN

We do no active surgical care at our Center. Ours is the care of the patient after the initial medical and surgical therapy. The members of our team are staff doctors, occupational therapists, physical therapists, remedial gymnasts, rehabilitation officers, psychologists, nurses, recreational officer, part time teacher and an administrative staff to see that the overall unit functions smoothly and without delay. In addition, we have the various elements of a maintenance staff, such as cleaners, kitchen and dietary personnel, making a total of 225.

Only male patients are treated at our Center. Therefore, we choose a good percentage of female therapists, since it is my firm belief that we are all notoriously lazy and selfish, and have a natural instinct to exhibit our talents in front of members of the opposite sex.

In this way we have an atmosphere which is void of any militant routine and one in which the necessary element of patient cooperation is stimulated. The young ladies on our staff are particularly skilled in the approach to our workmen, and in obtaining a maximum performance under a given set of conditions.

Our program is basically to gain the maximum physical performance which a man will do. Any program under any circumstances, is only an observation what a man will do, not what he can do, for none of us really know what we can do in terms of physical output, but we all are aware of what we will do. We will do best only what we want to do (the selfish side of our nature), and in our own time (the lazy side of our being).

Certainly the old adage that "you can lead a horse to water, but you can't make him drink" applies in our work. It must be remembered that the sum total of this program is the assessment of the individual from start to finish, and this assessment is only on the basis of what a man will do, not what he can do. In ascertaining the physical capacity of an individual, we must have the patient's full co-operation. This can only be achieved by gaining his confidence.

GAIN MEN'S CONFIDENCE

At the outset we attempt to gain the patient's confidence by a thorough discussion of his problems with a staff doctor. This discussion is then followed by a complete examination of the injured part. We must remember we are treating an individual, not merely an injured part.

Therefore, during this interview and examination we relate the man to his injury. Our patients frequently remark this is the first time they have had an opportunity to discuss their problems thoroughly with a doctor. This initial period also gives the doctor an opportunity to understand the patient's problem, and from this a program of active treatment, based on physical function, is assigned.

There is a saying at our Center that if the man remains with us for four days he will remain willingly until his treatment is completed, because he observes the staff's personal interest as well as his own opportunities for improvement. He also talks with fellow patients and they impart to him knowledge that we try to assist him in getting better.

PHYSICAL THERAPY

Just as it is essential to have the patient's co-operation, it is equally important for the patient to see the actual benefit from his treatment. Most of our patients feel the only form of treatment which benefits them is physical therapy. This is the application of heat to a given part to ease discomfort, the use of massage for relaxation and to ease discomfort, the applications of electrical therapy, or the use of the full length water bath for relaxation.

Any one or all of these methods are interpreted by the patient as being active and useful treatment. These various forms of therapy by easing discomfort, facilitate the next step of the rehabilitative treatment—functional treatment.

In this treatment various occupations offer the necessary use of muscle co-ordination to increase strength so the patient will gain confidence in his own ability and make progress. The use of these methods prepares the man for the work he has to do. I try to explain this to my staff by using the analogy of taking a quinine capsule. None of us would take a spoonful of quinine and drink it down with water, even though we knew the results would be beneficial, because of the extreme bitter taste of quinine.

However, in a capsule it is easy to take and we obtain the same beneficial results. So, with the passive forms of treatment, these act as a capsule around the next step—obtaining proper muscle action individually and in a group manner, thereby increasing strength, as well as re-establishing patterns of movement. It is in this particular field that our Center has made its unique contribution.

PATIENT SELECTS ACTIVITY

We use occupational therapy to develop and re-establish muscle patterns, adapting a craft or activity to a production function. In choosing an activity for the patient, we find if a patient chooses to make a product he or his wife or mother might be interested in, then we have the first evidence of good co-operation. We follow this, with direction by the occupational therapist, into that activity which will produce the most benefit for his injured part.

The activities which we use of a lighter nature are arts and crafts, of a moderate nature we use carpentry, handling projects made from wood, and in our heavy program we use gardening, or simulate or duplicate the man's activity. For example, if it were a hand case, we may want a fine movement such as a needle and thread activity.

However, we go over a list of projects with the patient to find out what he would like to make for himself, or others. His choice will be guided so that making the article will require proper functional use of his hand. It will have the interest necessary, because our patient is doing something he wishes to do, and he will also be exercising his hand properly, regaining its proper co-ordination with other parts of the body.

In this way we have rugged lumbermen, miners and construction workers accept light, unrelated activities with enthusiasm. Certainly a few patients are not interested in this project, so we must look further to find what will satisfy their desires and our requirements. It is necessary that the patient understand his activities.

CASE HISTORY

I like to mention the case of John, hospitalized at our Center after an amputation of his right arm above the elbow joint. On the first day of his hospitalization, he came to me in my office to say in a very belligerent manner, "I don't see any reason for staying here at all. That girl in green gave me, if you can imagine it, a ball to throw, and horseshoes to pitch with my left arm." He said, "I certainly see no reason why I should be required to do this, nor am I going to stay any longer to find out."

After discussing his problem for one hour, he was convinced that although we were going to fit him with a prosthesis and that the prosthesis would help him in holding and carrying activities, he would have to utilize his minor hand and arm to a greater degree than before. The principle behind having him throw a ball and play horseshoes was the first step in gaining co-ordination of this part into a new muscle pattern, and gradually finer skills could be introduced for this previously little used hand.

REMEDIAL GYMNASTS

This patient was the secretary of a local press plant union, and in a week he became one of our staunchest advocates. One's greatest support comes from the opposition who have been converted, because he has been converted by reason. By the same token, men with shoulder injuries work on looms, working at the level of the shoulder, which requires increasing range and muscle power to hold the arm in its new position, and all the time the arm is exercised in its proper manner.

In this stage, to gain muscle power we utilize resistance exercises through the guidance of male therapists. These therapists are called "remedial gymnasts." In this field we consider the male represents a better leader than the female. Under the remedial gymnasts we also have group exercise activities graded into classes. These classes are organized on an anatomical basis, for example, the back class, shoulder class, foot class, hip and knee class and special hand class. In these classes we have group morale development which stimulates the patient. Here the patient sees those about him who are much worse off physically. It is generally true that the more severely handicapped put forth a greater effort, and, in truth, shame those less severely handicapped into a greater degree of co-operation and performance. After a patient says he feels he can go back to work if so-and-so, who is much worse off than he, can perform the way he does. He sees no obvious reason why he should not be able to carry on at his former gainful occupation.

MEN, GARDEN, PAINT, PLASTER

In this group of classes we also have an obstacle course, which is a means of increasing physical exertion, as well as a lot of friendly competition among our more advanced patient groups. As the patient progresses with his program, we try to increase his activities so that he is putting forward an effort as near to the maximum as possible. To do this we utilize a variety of media.

We have 12 acres of grass to cut, and purposely do not have power motors. We have our patients with various types of injuries push the lawnmowers in groups, and thereby keep the lawns in shape. We have flower gardens prepared, planted and maintained by patients. We paint the insides of our buildings, not once, but many times by patients who are painters by trade, or require shoulder activity on their particular job. By graduating these activities the patient gains confidence in his ability to handle his own work.

WORK ON BOXCARS

We have the shortest railway in Canada, which is frequently raised and lowered by injured railway personnel. For the plasterer, we have an area of wall which is continually being plastered to test the man's skill in plastering; for the bricklayer we use the bricks of his trade and allow him to re-establish the fact that he can bend, if he is a back case, or lift and handle bricks, if he is an arm or shoulder case.

He may also carry the hod to gain confidence in ladder climbing. We also have provided a boxcar for those railway men who have to climb and walk, and otherwise handle a boxcar. All these activities are used on a graduated basis to regain the conditioning of the workman for his previous occupation.

If a medical or surgical consultant is required on case, we refer these men to specialists. In our particular area we utilize the staff of the University of Toronto to assist us in sorting out the difficult problems regarding treatment. One year ago we acquired the services of two highly skilled psychologists to evaluate a man's potential for work, to give aptitude tests to those who must change occupations, and assist us in counselling patients who are not responding to the program. We represent as large a psychological unit as there is in this type of work, because our program stimulates psychological health.

A question commonly asked us is, "Do you have out-patients at your Center?" The answer is, "We do not." We can better rehabilitate the patient if he remains for the entire treatment day. By doing this we can control his daily routine.

In addition, we provide him with recreational facilities during the off hours and evenings. A patient who takes our program is required to maintain a reasonable habit as far as work hours are concerned. He is up at 7:30 a.m. for breakfast at 8:00, and commences his daily six hour program by 8:30 p.m.

WALK 2-3 MILES DAILY

Every patient is required to walk a minimum of two to three miles a day. Actually most of our staff cover the same distance. This is true without any other treatment consideration—about five to 10 times the distance he would walk while at home. There are no places nearby to obtain food other than that provided at the Center.

Consequently, our patients are reasonably prompt at meal hours, and this keeps them in touch with the type of control most are accustomed to in industry. The program is on a timetable basis, which requires their attendance—and their attendance is checked. This, again, is supervision comparable to that in industry.

When the patient is sufficiently improved to return to employment, we arrange his discharge from the Center. Approximately 80 per cent of our patients return immediately on discharge. This is arranged through our industrial placement officers during the patient's stay at the Center. They contact the patient's employer and try to give him an idea when the man will be available for work. From the medical side, the original attending doctor is informed by a full medical report on his particular patient every two weeks.

No matter what type of program is set up, we cannot really duplicate all aspects of a man's occupation, and therefore, return to work represents the fourth stage in the man's recovery.

THE REAL TEST

The fourth stage means returning to old friends, to areas where his skill was used before, but where he tests his real ability in competition, and must not only co-operate, but co-operate and produce at the same time. This is an added factor which is most difficult to duplicate.

We, therefore, ask our employers to consider this fact, and many patients receive some form of work modification. The duration of the modification varies with the individual case.

The employers in our province assume a moral obligation in the vast majority of cases to take back their injured workmen. This is a purely moral obligation, because no employer is, by law, forced to accept a workman after injury. We feel that those who do not return to work represent the failure from the Center, even though they may have recovered sufficiently to become independent.

We like to feel that there is a place back in industry, since each of these men came from industry. We do not want to see a scrap pile of broken, unproductive bodies, which represents people whose whole aim in life has been shattered by an industrial accident. However, some end this way despite all our efforts.

The greatest contribution to lessening serious industrial disablement is preventing the accident which has caused the disablement. If it does occur, however, I have

described a program of activity led by a team of dedicated people, from the sweeper to the doctor, whose only interest is locating a solid road to recovery for the injured workman.

We do our utmost to abolish disability which can be abolished by treatment. But if this is impossible we then assist the patient in accepting his disability, and attempt to motivate him to come out with an accepted disability with which he will meet his future in the industrial world.▲

SAFETY TRAINING FOR FIRE PROTECTION FORESTERS

by JOHN F. SHANKLIN

staff assistant, U. S. Dept. of Interior, Washington, D. C.

An official report transmitted by the Bureau of Land Management to the Secretary said of the bad fire situation which existed in Alaska this past summer:

"As a result of a combination of factors, the Bureau of Land Management is experiencing a serious fire situation in Alaska. The driest year in the interior since 1906, coupled with the normal difficulties of vast areas, isolation and rough terrain has created a "bust" fire suppression condition. To combat this situation the Bureau has expended Emergency Fire Funds at a rate of 15 to 20 thousand dollars per day during the month of June. Such expenditures are continuing this current fiscal year and will probably continue through July unless normal rainfall occurs.

"Approximately 400 fire fighters have been mobilized and dispatched to going fires, 12 supervisory personnel were drawn from Area 1, Portland, for assistance in directing fire fighting during June, and 12 replacements have been obtained from Area 2 at Salt Lake and Area 3 at Denver for similar aid during July. Extra tools and equipment have been purchased through GSA at Seattle and flown to Fairbanks. In addition to the six BLM owned and operated aircraft, light planes and helicopters have been chartered from private sources. The military forces have provided excellent cooperation on an emergency basis by providing helicopters and manpower. In addition, the military has assisted the logistic situation by flying gasoline and other supplies into air strips being used as fire operations bases.

THREE FIRES DAILY

"An average of three or four new fires has been and is being reported daily. Most of the fires are lightning caused and appear to have started high on the ridges in spruce timber. During the initial period of the fire fighting season simultaneous lightning fires at great distances apart forced the Bureau immediately to commit its full fire fighting resource to its physical limit. Continued dry weather, increasing hours of daylight, and exhaustion of manpower soon created a lag in the number of fires reported and the number upon which initial action could be taken.

"To meet this continuing demand, the Area Fire Control Officer was forced to establish areas of priority within which initial action could be taken consistent with existing transportation and communication facilities. Manpower has not been the critical item. Once a fire crew was committed to action on any one fire, additional demand immediately developed for the air transportation of relief manpower, additional tools and supplies. The air transportation of these items thus became the limiting factor.

"Action on all new fires occurring outside of the limits of air service had to be postponed or ruled out. It is for this reason there has been an average of approximately 40 fires burning daily with about half of them being manned. Complete control action without rainfall on fires in excess of 40,000 acres appeared to be physically impossible. By July 1 an increasing smoke pall from the several large fires in excess of this acreage had made aerial reconnaissance and regular fire line service practically impossible in some areas."

During that period contact was lost with fire fighters for as long as three days at a time, due to the tremendous volume of smoke. Difficulty was experienced in dropping food supplies and additional fire fighting equipment. More than five million acres were burned over. The tremendous and hazardous operation to bring these fires under control has a direct relationship to the training in safety instituted by the Department of the Interior.

To understand the problems confronting the Department in its safety training program as related to the forest resources administered by the Department requires first, an understanding of our responsibilities.

EXTENT OF RESPONSIBILITY

The Department of the Interior has a total of approximately 57 million acres of forest and woodland in the continental United States. In Alaska it is responsible for some 125 million acres of forest and woodland, including 40 million acres covered by mature timber and 85 million acres of woodland most of which has been devastated by fire and in various stages of natural revegetation. There is an additional 225 million acres of range, marsh and timber requiring protection.

The annual utilization of timber from forests administered by the Department has been averaging approximately 1½ billion board feet in volume and with a value of nearly 25 million dollars. The average number of fires for the past 10 years has been slightly less than 2400 and our average fire loss for the past 10 years has been slightly more than one million acres.

Four Bureaus of this Department are concerned with land management and especially with forest administration; the Bureau of Land Management, the Bureau of Indian Affairs, the Bureau of Sport Fisheries and Wildlife and the National Park Service. Wide differences exist between these Bureaus as to their basic objectives.

The National Park Service administers approximately six million acres of forest lands in the States and approximately one-half million acres in the Territories of Alaska and Hawaii. The obectives of management are primarily to maintain the forests as nearly as possible in their natural undisturbed condition. These forests are cherished for their aesthetic and scientific values. Portions of them are heavily used for recreation.

CARES FOR WILD LIFE

The basic problem of management is to devise ways and means of handling the increased visitor load to the parks safely and at the same time conserve the forests in their natural state. A total of 55 million people visited our national parks and monuments in the calendar year 1956.

The Bureau of Sport Fisheries and Wildlife administers about ¼ million acres of forest lands of which ⅓ million acres are considered as commercial forests. The timber lands found on the national wildlife refuges are managed to demonstrate practical means of developing and maintaining optimum game populations, to produce removable surplus wildlife species for restoration projects undertaken by other Federal and state agencies, to determine the practicability of research findings in the management of forest habitat, to explore means of managing wildlife population, for removal of animal increment through regulated public hunting and, consistent with these objectives and in accordance with sound forest management practices, to obtain the maximum timber yield and return from the refuge forests.

OPERATED FOR INDIANS

The Indian forests, of which 6½ million acres are considered commercial, have the distinction of being managed under the first Federal legislation in the United States in which the practice of sustained yield management was definitely prescribed. The management of the Indian forests is directed towards the same objectives sought in the management of a public forest. However, there are certain

fundamental difficulties which give rise to radically different management problems.

Indian lands are private property held in trust for the Indians by the United States. As such, the timber resources must be managed for the best benefit of the Indian owners. Moreover, by reason of the fact that the Indian forest property is so closely interrelated with the welfare of the Indians themselves, forest management plans must recognize the general Indian problem and be coordinated with the whole program of social and economic betterment for the Indians. This necessitates a far greater flexibility in long-term forest management plans than is ordinarily required or considered ideal from a purely technical viewpoint.

Generally speaking, the first objective of Indian forest land management is to obtain high level timber production. The second is to obtain for the Indian owners the highest possible income not only through the sale of stumpage but also through the direct employment of Indians.

The forest lands administered by the Bureau of Land Management fall into three major categories. The first, the revested Oregon and California railroad grant lands and reconveyed Coos Bay Wagon Road grant lands in western Oregon, commonly referred to as the O & C lands. Second, the public domain forest lands in the continental United States, and third, the public domain forest lands in the Territory of Alaska.

TOP AMERICAN FORESTS

Forestry on the O & C lands presents one of the most challenging problems in American timber management. On these lands are some of the finest stands of original timber left in this country. Their economic and social importance both locally and nationally places them in the front rank of American forests. In accordance with basic legislation, it is the policy of the Department to restrict cutting timber on these lands to their sustained-yield capabilities.

It is the policy of the Department to direct all timber cutting operations under approved rules of forest practice. Moreover, it is the policy of the Department that these rules of forest practice shall be established only after full consultation with a local advisory board consisting of citizens of the State of Oregon who represent the lumber industry, the forestry college, conservation associations, labor unions, grazing mining and agriculture.

The management objectives for the approximately three million acres of commercial public domain timber in the West are much the same as for the O & C lands. However, these plans are subject to the establishment of policy determinations as to whether the lands should be retained under the jurisdiction of the Federal Government or should be disposed of to public agencies, private citizens or corporations.

In addition to these commercial timber lands there are 25 million acres of woodlands on the public domain. These are found chiefly within the grazing districts and are of considerable importance locally as a source of fence posts and related material for use by the range industry. The management of these lands is definitely keyed to the objectives sought in the management of the range lands.

FIRE SAFETY MAJOR PROBLEM

In the Territory of Alaska a major problem confronts the Department in determining proper management for the tremendous extensive areas of forest and woodlands. To date the objective has been to provide something approaching adequacy of protection from fire. This has not been entirely achieved, as reference to my opening statement in this paper will show. But the future appears to be much brighter due to a better understanding by the citizens of Alaska of the need to exclude fire from the Territory.

To relate safety training for fire fighters to the fire situation referred to in the opening paragraphs of this paper, let us look at exactly how the Bureau of Land Management provides safety training.

The Bureau at the present time does not have either a safety manual or any specific safety instructions issued solely for training in safety with respect to forest management. General instructions pertaining to the entire work of the Bureau have been prepared by several of their field offices. All field areas use safety material issued by other agencies, Federal, state and private.

The Bureau does not have a safety committee functioning at its national level, but each of its major regional offices has a functioning committee. None of these regional, or area offices as they are termed by that Bureau, nor any of its state offices have made any special safety studies in the field of timber management, and no analyses have been made of accidents occurring in the timber management field alone.

TRAINING SESSIONS

However, each year training sessions are held for fire control and timber cruising. Such programs always include training in first aid and safety.

The Bureau has approximately 300 permanent foresters and 60 temporary foresters. It operated during the past year 18 fire training schools at which approximately 250 employees were present. It also operated five timber cruising schools at which approximately 100 employees were present. Furthermore, 24 Bureau employees attended some six training schools supervised by other agencies.

All employees are required to follow certain safety practices including those employees concerned with forest management. These safety practices include:

1. Equipping all of the Government vehicles with fire extinguishers and first aid kits.
2. All fire fighters are being equipped with hard hats as rapidly as sufficient funds are made available.
3. On all project fires a first aid station is manned by qualified first aid attendants.
4. All employees are encouraged to take the essential courses in first aid.
5. It is general practice not to permit single persons to work in an isolated area. Two or more are always assigned.
6. Radio communications are being installed as a safety measure in fire control.

As examples of the exact safety program, two states will be described quite comprehensively.

IDAHO SAFETY PROGRAM

The Bureau's program in Idaho is fairly well organized. It so happens that the Area Fire Control Officer is also the chairman of the safety committee. Accordingly, he also handles the safety programs at the fire training schools. All Bureau vehicles in this state are equipped with a safety packet which includes a first aid kit and instructions for first aid treatment together with the necessary forms required for accident reporting.

All grazing districts in this state are equipped with a very high frequency radio communications network. A base station is located at strategic high points to insure communications to mobile units operating in other parts of the state. From a safety viewpoint, radio communications are very necessary.

Second, the Territory of Alaska. In Alaska, as we have already indicated, special problems confront the Bureau in safety training. In Alaska, two foresters serve on the Territorial Safety committee. All permanent and temporary foresters and temporary fire guards are required to take first aid training. This training includes instructions on survival in the Arctic. To insure the safety of employees working on fires, cruising timber or on routine inspection, it is mandatory that the crews consist of two or more.

USE CHECK-OFF LIST

In order to insure the safety of all employees involved in air operations in connection with the fire control and timber sale programs of the Bureau, the Civil Aeronautics regulations are followed explicitly. This includes the use of a printed check-off list before each takeoff.

The Bureau has developed picnic areas along the highways in Alaska especially at those points where the highways either cross streams or are close to lakes. This was done essentially as a fire hazard reduction measure. Campers, picnickers and travellers who stopped along the highways to cook a meal usually found heavy debris and deep organic material. To clear out a place for cooking or warming fire was quite discouraging. Many times fires were built on wet organic material that was in some cases mistaken for

mineral soil. Many fires have originated from such a situation. However, with the development of over 30 picnic areas by the Bureau, the incident of man-caused fires along the highways was measurably reduced.

Comparable training is given in the Bureau of Indian Affairs. However, there is a very interesting development in the field of fire safety training which involves the Indians under the administration of this Department. We have what is called the Red Hat Program in which several hundred Indians from the Southeastern states are annually trained. These Indians, it has been found, make the finest fire fighters of any personnel in the United States, and their services are utilized by all forest fire services both in this Department and in the Department of Agriculture as well as by state agencies.

LOW ACCIDENT RATE

This training program, initiated by the Bureau of Indian Affairs, includes training by the Forest Service and the National Park Service. The training afforded these Indians has certainly paid off well, not only in bringing fires under control but in taking care of themselves while on fire lines with the least possible record of accidents of any group of forest fire fighters commonly used in this program.

The isolated nature of the installations maintained by the Bureau of Indian Affairs on each large reservation presents serious problems in protection and safety training. Many of the reservation agencies are in close proximity to extensive areas of forested land.

The protection and training of thousands of Indian children who attend reservation schools in programs designed for their safety are of special concern.

Fire hazards are high because the agency buildings are generally old. Consequently the wiring and heating systems are often inadequate by present day standards. Occupational hazards are ever present in the numerous garages and other service shops where power tools are in use.

In recognition of its special problems the Bureau has a safety committee functioning at the national level. Similar committees function at the Area and Agency levels. In all, there are over 100 safety committees. A Safety Director has been appointed to head up the program. Two safety engineers were hired within the year to provide guidance and impetus to it.

NATIONAL SAFETY COMMITTEE

The enthusiasm created in all ranks of personnel by these developments in the safety field insures that this program will take its rightful place among all the others carried on by this Bureau. The safety training of fire control personnel should benefit under the skilled direction now available.

Finally, let us look at a problem in safety training which is allied with our management work. Recreation is considered one of the multiple uses within the over-all forest management programs of most land managing agencies. For example, more than 33 million visits were made to the national parks and monuments last year, and while these visitors are on Department lands every effort is made to insure that the visit includes a safe experience.

SAFETY FOR VISITORS

Here are some of the activities in health and accident prevention which are applied to visitor activities and also to employees in general by the National Park Service. In order to insure visitor health, many types of actions are required including:

a. Provision for potable water.
b. Provision for sanitary rest rooms.
c. Provision for adequate garbage disposal and camp ground cleanliness.
d. Provision for first aid facilities.
e. Provision for inspections of eating and lodging facilities in order to insure adequate sanitation.
f. Provision for hospitalization and medical care.
g. Periodic inspections of bathing and swimming facilities.
h. Elimination of noxious insects, plants and animals in public use areas.

Many things are done for the safety of vistors. Highway safety practices are included in the design, construction and maintenance of park roads. Hazardous trees such as leaning or dead trees are removed from the public use areas and road sides. Elevators, used principally in those parks with caves, are regularly inspected.

All structures within the National Park System are given regular periodic fire hazard inspections. Fire control facilities for all structures are available and building fire brigades trained in structural fire control. The Service maintains regulation and inspection of all mountain climbing activities. It maintains regulation and inspection of many water activities. It inspects ski lifts and tows and provides for safe practices for winter use activities. The Service trains and provides lifeguards, patrols and rescue teams.

It provides for safe walking surfaces, including hand rails and guard rails at hazardous points within the parks. It provides boardwalks in the thermal areas and enforces all visitor activities pertaining to enjoyment of bear and deer. The Service insists that safety features be followed in the designs of new public use structures. It also has regulations for the installation of automatic sprinklers in multiple story hotels.

EMPLOYEE PROCEDURES

As employee safety has a direct relation to visitor safety, the National Park Service has developed many specific general employee safety procedures. It has safety committees at all field and regional levels and follows the dictates of the Department requiring Government drivers' licenses.

It provides orientation training and on-the-job training for employees, including training in safe practices. All employees' quarters and working structures have regular periodic structural fire hazard inspections. First aid training is required of all protection personnel. It requires training of all personnel involved in structural fire control, water activity protection, and all mountain and winter sports personnel.

The Bureau of Sport Fisheries and Wildlife has an over-all safety program which applies to the management of its forest resources as well as all other activities. The program is based on the Bureau's safety policy which, in essence, states that safety is an integral part of every task. No job is so important or no service so urgent that sufficient time cannot be taken to perform them safely.

Each employee is directed to give safety the same serious thought and consideration that he gives other phases of his work. The rules for safe operation of motor vehicles and certain other equipment and tools as well as safety in construction work are set forth in a Safety Requirements Handbook and other instructions.

EQUIPMENT STANDARDS

The Branch of Engineering is responsible for the establishment of standards in respect to the acquisition, operation, maintenance and review of operating methods for all equipment from the standpoint of job adaptability and safety, industrial safety, fire prevention, public and employee safety and provides technical assistance to the regional safety committees in evaluating the causes of accidents and making recommendations for remedial actions.

Each Regional Office has a safety board and a fire board responsible to the Regional Director for program development, directed toward improving safety conditions and reducing fire losses. The fire board is specifically directed to assist the Regional Director in determining responsibilities, developing programs to prevent fire losses and in improving fire pre-suppression and suppression.

The National Wildlife Refuges and Fish Hatcheries hold monthly safety meetings and on-the-job training in their respective work activities, including timber management and fire suppression. Periodic fire inspections are made on all buildings and facilities. Over-all safety inspections are required of Regional Supervisors on each visit.

Public education and active participation in fire pre-suppression and suppression are sponsored in those areas of high

fire hazard and extensive public utilization. Radio communication facilities are used extensively in the National Wildlife Refuges to facilitate patrol and for directing fire fighting activities. Controlled burning is practiced as a means of wildlife management and to reduce fire hazards in certain areas. Slash disposal and other fire safety requirements are written into timber cropping contracts. Each National Wildlife Refuge and Fish Hatchery has a fire plan appropriate to its problems.

The Department provides for safe working conditions for employees and where functions are hazardous, provides the necessary training to alert employees how to handle themselves safely.

HOW TO SET UP AN INDUSTRY SAFETY TRAINING CONFERENCE

by W. C. CREEL
safety director, North Carolina Dept. of Labor, Raleigh, N. C.

Safety training is one of the greatest needs in accident prevention work. While this need is generally recognized, very little has been done on an industry basis to promote safety training. One idea used successfully by one section of the National Safety Council is to use the conference method to promote safety training.

The leaders of the fertilizer section of the National Safety Council promote safety training for the fertilizer industry. They believed that the need for safety training was so great that a special committee was set up to promote safety training.

The committee further felt the greatest need was on the supervisory level, and therefore, set up the Supervisory Training committee. This committee, with the full assistance of the entire fertilizer section has conducted two successful industry safety training conferences.

MUST TRAIN SUPERVISORS

The first objective in setting up an industry safety training conference, is to sell the industry on the idea. In the fertilizer section, the selling job started with the entire executive committee of the section. The proposals of the Supervisory Training committee were explained, and suggestions were received at a regular executive committee meeting. After complete plans were approved, the executive committee was asked to endorse the plans, and give full cooperation. Securing this cooperation was probably the most important step in assuring the success of the safety training conferences.

The great need for safety training in the fertilizer industry is on the supervisory level, as is true in the wood products section and the pulp and paper section. Once the level of the conference was established, emphasis was placed on making the conference as practicable as possible. With these ideas in mind, it was decided the conference should be in the form of a training course—more of a school than a social get-together.

The general idea for the meeting was to instruct fertilizer industry supervisors in the latest techniques of accident prevention and to train them in setting up their own plant safety programs. The importance of a supervisor in a plant safety program and the ways he could reach the worker was stressed throughout the program.

The topics on supervisory safety training included "Safety and the Foreman," "Know Your Accident Problem," "The Human Element," and "Safety Education and Training."

Besides the topic of supervisory training, basic subjects in a plant safety program were presented. These included "Safety Organization," "Materials Handling and Storage," and "Housekeeping."

A special session on "Practical Problems in Supervisory Safety Training" was held to allow all participants to take part in an open discussion.

The course was based on the needs of the industry and followed the suggestions in the National Safety Council's Supervisory Safety Training Manual. In fact, this was one of the two textbooks used for the course. The other was the Safety Subjects, revised 1956, U. S. Department of Labor.

The agenda for the meeting was planned so that a wide variety of methods of safety training could be used. The straight lecture was used only in combination with some other method.

DISCUSS MAJOR HAZARDS

A most important part of the two day program was a planned group discussion on major hazards in fertilizer plants.

Each student was asked to designate on a card the group discussion section he wished to attend. Assignments were made on the basis of these requests and each student attended one of the three group meetings where the leaders presented the problems and lead an open discussion. At the end of one hour the groups met together and a designated person reported for each of the groups.

The audience participation plan was used in the "The Accident Problem" presentation. Each student received a series of 12 questions to answer. At the end of the period the instructor gave the correct answers. The questions covered basic information on the accident problems in the fertilizer industry.

The audience participation method was also used in the presentation of the topic on "Plant Inspection." Each student was given a flow chart showing the steps in the operations of a dry mixing plant and asked to mention hazards with which they were familiar. The instructor then summarized likely hazards for the important fertilizer plant operations.

MOCK SAFETY MEETING

A mock safety meeting was used as one form of panel discussion. The instructors acting as members of a plant safety committee actually conducted a plant safety meeting. The instructor briefly gave the fundamental ideas of a safety committee before the mock demonstration, and summarized the safety committee's part in a plant safety program after the mock demonstration.

The instructors for the safety training course were selected to give variety to the sessions. A college professor presented the basic ideas of training, and an industrial safety engineer with teaching experience gave the basic ideas on accident prevention. Discussion leaders from the industry were selected to give prestige and guidance for the meeting. The idea of balance, as well as variety, was stressed throughout.

The accepted basic methods of presentation were used, including some from our visual aids. In every unit, one of the best received visual aids material was the new National Safety Council series of training films, "Safety and the Foreman." This series is recommended for any safety training course.

The committee went to great lengths to plan details for the meeting. Besides the usual name badges, banquet and local newspaper publicity, two or three different ideas were successfully used for instruction. At the mid-morning and mid-afternoon breaks, cokes were provided saving time and offering an opportunity for fellowship. In addition, all participants were given an opportunity to meet with one of the industrial leaders for an individual conference, on their specific problems.

The two conferences were attended by 94 people representing 56 plants. Each participant received the basic ideas of safety training and instructions and materials to set up a safety training program for their individual company or plant. Other regional conferences are being planned for the fertilizer committee. The executive committee of this section has completed a successful project and has done much on an industry wide basis for the cause of accident prevention.

I believe the following conclusions will be of interest and benefit to all engaged in industrial safety.

- There is a real need for supervisory safety training in the fertilizer industry as well as the wood products and pulp and paper industry.
- The industry recognizes the need for supervisory training and will send plant

representatives to a regional safety training conference.

- Full cooperation of the National Safety Council, state agencies, and safety leaders can be obtained for conducting supervisory safety programs.

The fertilizer section of the National Safety Council is comparatively new. The wood products section, and the pulp and paper section are not only much older, but are larger and more influential. It is a real challenge to you as individuals and representatives of your section to do something about the need for safety training in your industry. If you want to make a lasting contribution to the cause of accident prevention in your industry, urge the executive committee of your section to start immediate plans for safety training.

PROMOTING WOODS SAFETY

by J. KENNETH PEARCE
professor of Logging Engineering, College of Forestry, University of Washington, Seattle, Wash.

In considering what I, an amateur in safety, could say to you professional safety men who represent firms with excellent safety programs and award-winning safety records, my thoughts wandered back to my laboring days in the woods. Thirty-seven years ago I was hired as a third rigger on a Lidgerwood skidder out of Union Mills, Washington, now a ghost town. I had worked on ground lead and high-lead yarding crews but had no experience with skylines.

My first morning on the job the head rigger handed sledge hammers to me and another green young third rigger and told us to go knock the tail hold on the skyline loose. That was all the instruction we received. We proceeded to the back end where the one and one-half inch diameter wire rope skyline was wrapped around a stump and fastened with railroad spikes. One thousand feet of skyline was suspended 100 feet in the air between head tree and tail tree shoes.

SAFETY ORIENTATION

The surplus length of the skyline lay stretched out on the ground to one side of the stump. We started knocking out spikes, and soon the skyline started to run. The wraps sizzled and smoked around the stump and the loose end flailed around like a snake. How we got out of there alive I don't know.

That incident typifies the "let him learn the hard way like I did" attitude toward the green hand coming into a logging camp in those days. No one told him how to do the job safely. Great progress has been made in woods safety since those days. In the operations today safety goes hand-in-hand with production and safety-minded foremen keep a watchful eye on the training of the green hand. But are you doing all that could be done to promote safety at the time the worker is most receptive, most eager to learn? This time is when a young man first comes to work in the woods, or in your operation.

Many of my senior logging engineering students have worked one or more summers in logging labor jobs. Some have worked for companies with outstanding safety records. When I asked the students what orientation or safety training they received, all replied that they started right to work with the whistle the morning they reported. Any orientation they received came from their immediate supervisor.

They felt it was just luck if they started under a helpful, safety-minded supervisor. (Of course it was good management, but they did not realize it at the time, and no one told them this was part of the safety program.) The concensus of the students said that the weakest part of the safety and labor-relations program of the employer was how they were handled when they first went to work in the woods.

Some executives in the Pacific Northwest logging industry have felt concern that young men from communities which traditionally furnished woods labor are going instead to aircraft and other industries. One deterrent to recruiting the active, intelligent young men is the accident record of the logging industry, well known in woods communities.

ACCIDENTS DISCOURAGE WORKERS

Not so well known is the fact that logging accident statistics show the highest accident frequency rate among the youngest age class and the group with the least number of months experience. Efforts are being made through Junior Logging Congresses, vocational talks to high schools, and industry films, to attract young men to the logging industry. A good safety record could be a potent recruiting aid.

The book "Safety Subjects" published by the Bureau of Labor Standards, U. S. Department of Labor, used as a textbook in my class "Safety Practices in Forest Industries," makes a distinction between safety education and safety training. Education is defined as broadening of knowledge and understanding; training as the development of skill in performance. Safety training is usually competently handled by the safety-minded supervisor. But what about the safety education, particularly of the new employee? Is this a weak link in the chain of woods safety promotion?

University authorities have found it worth while to take the first one, two or even three days at the start of the new academic year for the orientation of the freshman and other new students. If college students need orientation, is the man in the same age group entering industry any less in the need of orientation?

SAFETY EDUCATION PROGRAM

The following program of orientation, and initiation of safety education, is suggested for groups of new employees of large operations. It embodies suggestions from students as to what they would have liked to have had when they first started to work in the woods, as well as my own ideas, as an ex-logger, foreman and superintendent.

1. *Orientation Session.* The first morning they reported the new men would be brought together for an orientation session. The Logging Superintendent would tell them of management's interest in safety and other company policies. An organization chart of the operation and authority might be shown.

Opportunities for advancement in jobs with the development of skills and learning by experience would be explained. The timekeeper would explain pay periods and procedure, deductions and insurance plans. The forester or fire warden would emphasize the importance of fire prevention and the organization for fire-fighting, since every man in the woods is a potential fire-fighter.

2. *Safety Education Session.* Following the orientation session, the safety supervisor would take over, and tell them of the safety program, first aid facilities and the training program. Safety training films are available from the various Loggers Associations, the American Pulpwood Association, State Safety Departments and the National Safety Council.

REPETITION VALUABLE

Booklets or cards covering job safety instructions would be issued and discussed. The value of repetition cannot be over-emphasized. Even college students can learn only by the repetition of reading the textbook, taking notes on the lecture, and writing the examination.

Ample opportunity and encouragement to ask questions should be given. Time for private talks with the personnel man should be made available for men who have a question or problem they do not want to voice in the group sessions.

3. *Observation.* Opinion among my students was divided as to how the first afternoon should be spent. Some thought that a tour of the whole operation, and observation of the various operations, such as yarding and loading, felling and bucking, road construction, and the shop to give the whole picture, would be helpful. Others thought that the afternoon might be better spent by observing the particular activity or job in which they

are to work, in company with their foreman, who would point out the safe and efficient way to do the job.

The foregoing orientation and safety education program is obviously not suggested for boomers or drifters who will hit the road with their first paycheck. Rather it is intended for the "home guards" who can be expected to stay on the job long enough to justify the time and money expended on them. It would be followed up at intervals with evening safety education sessions, using audio-visual aids.

Since the average 20 to 24 minute film teaches more lessons than can be absorbed, combining the running and re-running of short sections of a training film with the discussion-conference technique, is advocated. As an example, the Rarig Motion Picture Company of Seattle reproduces the sound-color film "Hauling Logs" which they made for the British Columbia, Pacific Northwest and Redwood Loggers Associations, in six four-minute sections. They publish a film guide of questions and answers for each section and a "Conference Leaders' Manual" to accompany the films.

The small operation, or the one to which new men come singly, presents more of a problem. However the same objectives of orientation and safety education, accomplished by individual discussion, rather than group sessions, would improve labor relations and promote woods safety. This is only a preliminary to the most important on-the-job safety training under a safety-minded supervisor.

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CURRENT SAFETY TOPICS Volume 25

RAILROAD INDUSTRY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE RAILROAD SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Railroad Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Railroad Section carries on in behalf of its members, and for the benefit of accident prevention work in the railroad industry generally. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of railroads.

The activities of the section are under the direction of its executive committee, the members of which are listed at the close of this volume.

TOGETHERNESS IN TRANSPORTATION

by J. T. URBAN

assistant to the vice president & general manager,
The Denver & Rio Grande Western Railroad co., Denver, Colo.

Our subject "Togetherness in Transportation"—*deals primarily with safety in that* field although, literally, it is applicable to every department of railroading since they are closely integrated. Functionally—to a greater extent—they involve personnel, from which are developed the foremen and supervisors of the organization; herein lies the basic alliance with the safety program. How much—how broad—and the proper ingredients—are difficult to estimate but the proof lies in the fact that members of the National Safety Council have provided the receipt—the policies and procedures to be followed:

"Togetherness" means from the start—not just ultimately. It is generally agreed that a majority of potential accident risks can be spotted during the pre-employment test period. Various methods of obtaining the initial information are employed—as you are no doubt aware. *Considering the data at* hand, indication of a spotty job history, frequent minor injuries, numerous hospitalization and evidence of law violations, arrests and convictions (through finger printing the applicant) all suggest instability and/or pre-disposition to have accidents.

Social and legal-aid agencies, credit agencies and banks listed may also yield valuable information. Tracing with all former employers as to the employment record and job experience of the individual are highly important. Not only does this preclude spending an endless amount of time and money testing an applicant who may later be disqualified because of his past record, but such a program provides some degree of assurance to the regular employee that management is attempting to secure the safest employee possible to work with them in their regularly assigned duties.

FINGER PRINTING APPLICANTS

To touch upon one phase of this program, approximately seven years ago the Rio Grande instituted finger printing the applicants. To date, slightly more than 13,500 individuals have been finger printed, out of which approximately 2,500 had a police or criminal record—although more than 50 per cent of these denied ever having been arrested, and 520 of the total with police or criminal records were not considered employable.

Coincident with this program some clues may turn up as to his personality traits and how well a worker adjusts to every day living is just as important as his ability to get along with other people. Further, it is possible to gain some measure as to what his future behavior will be. If he is a misfit he will develop a poor record, part of which will be his accident and injury rate. Hence with proper orientation and cooperation from foremen, supervisors and co-workers, we may prevent a new man from becoming a misfit or poor performer. Generally speaking, he wants to make good and the natural thing to do is to capitalize on *this feeling.*

Negative and hostile attitudes may be spotted during the first impressionable days of the employee on the property. Job satisfaction is a personal feeling a man has to his job. Morale is a group feeling, rather than personal—*both of which can, and do,* exert a tremendous influence on the potential accident and injury rate.

LACK CONSTANT SUPERVISION

A short step beyond the new employee is *the presently* employed worker—the "old timer" and the "in-betweener." Unlike the mechanical and maintenance of way worker, a transportation man is not under constant supervision by his foreman. Protective devices and engineering safeguards have about reached the point of diminishing returns in accident prevention.

The next approach must be to people. We are all susceptible to the malady of boredom and monotony. Younger men, through observation, may learn bad habits or practices in safety from older men who feel secure in the fact they have gotten away with their home-made short-cuts over a long period of time.

Supervision at the division or department level cannot ignore its safety responsibility *and assume, incorrectly, that it is the safety* department's duty alone—and vice versa. Their "togetherness" must be complete and harmonious—clearly understandable—through distinct communication so they may be compatible, complement one another and obtain the proper end results. In this connection, the division supervisors should endeavor to make a detail survey of all accidents or injuries to develop the real cause, uncovering therefrom potential or unsafe practices or conditions that might lead to, or result in, a more serious situation at a later date. This is the procedure when a claim is filed—and it can be just as efficacious without waiting for such an occurrence.

SELF-INTEREST UNIVERSAL

Strange, complex and "*mysterious*" as we human beings sometimes are, there is one trait we all have in common—the spark or urge to have something better out of this life—of which safety is not the least. This urge of self-interest is so strong some people even dwell on their "safety" or "welfare" in the hereafter.

Couple self-interest with participation among employees and supervisors as well and it makes quite a team to hitch to your safety wagon. Of course, this is what you, as safety supervisors, devote a life-time to selling. How well your product is accepted lies not so much in the safety record as it does in the day to day performance or application by the individual and his conscious awareness of its benefits to all concerned. The only price tag on safety is the price you are willing to pay for its neglect. It cannot be over-sold, over-preached or overstated. With human error being on the increase we must never lose sight of the worker's attitudes.

Even with the most ideal hiring procedures, training programs, supervision, and physical working conditions and with good morale and satisfied work force, accidents will happen. But there are some or many things we can do and are doing to improve the situation. In considering a worker's behavior or attitude, certain signs may predict an inclination towards trouble, such as:

—Excessive and/or chronic absences;
—Repeated visits to medical department;
—Series of superficial injuries;
—History of minor accidents;
—*Frequent complaints and grievances;*
—Poor worker performance;

Or evidence of—
—Poor safety training;
—Poor supervision;
—Weak selection procedures;
—Ineffective enforcement of safety procedures;
—Inadequate safety procedures.

Supervisors and foremen may observe his appearance—whether it is tense, altered or *troubled, anxious, strained, sad, pre-occupied.* Are his habits showing a loss of interest in activities previously enjoyed? Increased absenteeism? Alcohol and smoking increased? Does he display an attitude of loss of interest in his work, or more dissatisfaction? Lack of care about safe practices or unconcern over near accidents? Cool or evasive towards supervisors or others? Overly sensitive? A tendency to be edgy, irritable, excitable? Lack of confidence displayed in his feelings or emotions? Indecisive in his general behavior, showing a lack of interest and enthusiasm? More mistakes?

HELP EMPLOYEES WITH PROBLEMS

It would seem that these items when used in combination and not singly would be reasonably *predictive of accidents.* With empathic understanding—putting yourself in the other fellow's position—you should not pass up an opportunity to manifest some interest in the individual's behalf and indicate your willingness to assist in his problems. Remember that cooperation from the worker is not entirely his responsibility but depends to a large extent upon the effort put forth by management (or supervision) to secure and sustain that desire.

Achievement—safety-wise—by the individual is the only thing to help management or supervision because it pays inestimable dividends to both parties!

The very nature and scope of train and yard service operations makes the administration of safety to employees in this area of occupation most difficult from a practical standpoint. Supervision can only go so far. There inevitably comes a time when the employees are on their own. They must

be made aware that the best preventive medicine is alertness to the possibility of changing conditions or situations.

Complacency in itself can be a monster but when allied with reliance on past practices or experiences can be devastating to any safety program as well as fatal to the individual. "Togetherness" at this point—to be effective—should constitute the supervisor's personal contact, wherever or whenever possible with the trainmen, enginemen or yardmen. Making themselves available at terminals to discuss safety or operating problems and displaying a sincere interest in their human affairs, will promote confidence.

CONSIDER ALL SAFETY COMPLAINTS

Rather than taking an arbitrary attitude towards the questionable performance of an employee, we shall gain more in unblocking the human communication system by becoming an impartial listening post. Safety complaints and grievances that warrant consideration must be carried to the proper level for a fair hearing. To retain his confidence and respect, the employee must be assured this is being done with subsequent advice to him of the outcome—through corrective action, or reason for declination.

Even some observation by the supervisor, in yards particularly, that a standard practice of doing a certain job is awkward for a particular employee may lead to helpful assistance in his behalf. We have unlimited opportunities to manifest an interest in our people. When adversity strikes the family of an employee or supervisor do we always prove our close friendship by offering assistance? Do we feel we have been "spoiled" in the past by such so-called "paternalism?" I doubt it!

How long has it been since the "boss" has acknowledged to you personally his appreciation or gratitude for your own performance? How long has it been since you did likewise to those similar deserving individuals? Weeks? Months? Years? We do have to have—and insist upon—a positive attitude of safety education to all concerned and see that we obtain a positive response in return.

Encouragement is a valuable implement in our aptitude for improvement. How's your sense of humor? The humorous approach may be direct or subtle. Some of these little cards with just the word "think," "think before your louse something up," "think—it might be a new experience," "use your brains—it's the little things that count," can arouse a chuckle—and convey the message—without being offensive. There are many others.

Pooling our efforts with those of others and spreading our influence we can—and have—achieved worthwhile results. "Togetherness in Transportation" often helps to break the ice for the supervisor with the men under him. Most of them will respond if you are considerate and courteous.

Then with pride and humility perhaps some day we can say:

"We met the challenge for man's need—
By planting deep the safety seed.
God's help and spirit does the rest
Our privilege was to do our best."

Personal Contact with Road and Yard Train Service Employees is Essential to Safety

(A Symposium)

WHY IS PERSONAL CONTACT ESSENTIAL TO SAFETY?

by CHARLES A. THOMAS

switchman, Denver & Rio Grande Western Railroad co., Grand Junction, Colo.

Personal contact is essential mainly to make the employee safety conscious. We on the Rio Grande as all railroads have our safety rules which of course, are important —but safety rules do little good if the employees don't use them. Hardly a day of work passes when there isn't a safety rule broken, and in the most part the worker realizes that he is breaking a rule when he does it.

Of course, in the majority of these cases the worker's intentions are good—he's thinking that he is saving time or saving himself some steps. A great many times a worker responsible for an accident has the poor excuse of "I didn't think" or "I forgot."

On the Rio Grande the personal contact is made by a supervisor to the employee on the job. This is done to show the employee the advantage of the safety program to himself as well as to the company. It makes the employee feel that he is a part of the safety program. Also, it gives the employee an opportunity to give his own views and ideas which may improve the safety program—as well as a chance to report any unsafe conditions which he may have observed. As a whole this is a good means to improve the management—employee relationship.

Another method of personal contact used on the Rio Grande is our visual education program. This consists mainly of safety films and posters, and acquaints the employee with the hazards that exist—as well as the safe way to handle the work.

They also show films of accidents caused by neglect of the rules. These, to be sure, leave a vivid and lasting impression in the mind of those doing work. These things turn out a safe worker—which is a good worker—and makes a good safety record.

We of the Grand Junction division went seven months and 29 days without a reportable injury in any department. So we feel that personal contact really pays for the employee as well as management.

HOW IS PERSONAL CONTACT ESSENTIAL TO SAFETY?

by W. R. BREHM
safety supervisor, Union Railroad co., East Pittsburgh, Pa.

You can have weekly personal safety contacts with all road and yard service employees! How? . . . Utilize your first line supervisors. There is probably one major problem you will have to overcome to insure effectiveness. The average first line supervisor has certain deficiencies that deter from his effectiveness in this responsibility. First, he has had little experience leading meetings —especially—safety meetings. He lacks time to prepare and hold meetings. He lacks sufficient safety knowledge to direct and control his meetings.

He lacks a method of communication with the yard and road employees working with him. Last but not least he needs a common meeting ground for supervision and labor from which a free flow of safety discussion will come—keeping safety on the lips and mind of the workers at all times . . . these deficiencies seem insurmountable. However, they can be combated. We use a tool called the visual aid.

The visual aid is no invention. It's an application of the National Safety Council's safety graphs. It is portable, easy to present, makes a point concerning safety and is relatively inexpensive to make on a "white print machine." On one side is a picture for the crews to view and the other is a script for the supervisor to follow. The stand consists of two sheets of hinged plywood . . . to further explain the use of the visual aid in a crew room situation, let's do a little play acting. You be the crew members and I'll be the supervisor—while I present a visual by 35 m.m. slide film media.

VISUAL SLIDE PROGRAM

This visual is one of a series that was written and presented to reinforce the role the visual aid plays in our safety program.

2nd Slide—This is Vic the Visual Aid. His job is to tell you stories. He hopes each time he makes a point. Do you know what part he plays in the safety program?

3rd Slide—Since the railroad can be dangerous, there is a definite need for a safety program. Vic will help you define your safety program and you'll have his purpose in a nutshell.

4th Slide—He can't convince you of the dangers of your job. Only you can see them. Only you can hear of the injuries that are happening to other men on the union.

5th Slide—Can he tell you the right way to railroad? No.—You have learned to railroad through your own experience and what others have shown you.

6th Slide—Vic is only a reminder. Once a week he tries to call your attention to a problem. All he wants you to do is think about it.

7th Slide—If he can help start a discussion, you should get a better understanding of each other's safety views. Exchanging your own views will make you more interested in safety than Vic could.

8th Slide—He aims at your problems hoping he can be the basis of an understanding between yourself and the yardmaster.

9th Slide—He also wants to relate to you the happenings on other parts of the road so that you might benefit from them.

10th Slide—Vic hopes that safety can become a part of your basic way of living. His job is to be just as he is named—a visual aid to every man in making safety an active part of his life. Since Vic should be interesting and helpful, do you have any suggestions how he can do his job better? We would appreciate your ideas for future visual aid topics.

With the final question of the visual aid the supervisor leads discussion during the remainder of the meeting period. Meetings are held to a limit of 20 minutes of company time. We have been using visual aids weekly since the beginning of 1957. Evaluation has been taken in two methods. The results of a written evalution form showed 80 per cent acceptance on the part of working man in meetings when the visual aid was used.

Performance-wise we are appreciating approximately a 60 per cent reduction in the number of reportables this year as compared to last. From this evaluation one might say some success has resulted; however, the use of visual aids during this period has brought to light a new group of problems. Though a new subject has been used every week, a state of monotony has resulted. An intermittant change of pace is needed.

VISUAL REVEAL NEW HAZARDS

Even with the aid of a visual the supervisors are not doing an effective job. Part of the failure we find has resulted from our trying to tell our people to be safe. Since you cannot tell a man how he should work, measures must be taken so that he will come to his own conclusion about safe working habits.

We hope to eliminate the current problems by training our supervisors. Every yardmaster will have three full days of training pertaining to holding effective safety meetings. The training will cover effective meeting procedures and introduce the problem-solving technique for the yardmaster's use in the field. All our yardmasters will be trained by January 1st.

WEEKLY SAFETY MEETINGS

When's the payoff? Frankly, I don't know . . . looking ahead to 1958. There will be a prearranged schedule of topics to be covered in the weekly safety meetings. For change of pace the weekly topics will be covered by visual aids, movies, printed matter, and problem solving sessions.

In this manner we hope to arrive at certain planned results. A line of communications will have been established both up and down. We will have our employees and first line supervisors finding the group solutions to their safety problems.

We don't feel this is a panacea for everybody's accident prevention problems. It is only a method by which personal contacts can be made. We don't know how successful it is yet. However, the Union Railroad company appreciates the chance to review what we are doing to combat personal injury. We'll continue the fight—we feel sure you will too.

WHEN IS PERSONAL CONTACT ESSENTIAL TO SAFETY?

by E. F. WINTERROWD
assistant superintendent, Texas & New Orleans Railroad co., New Orleans, La.

The methods and techniques of safety have been developed by trial and error and proven by results achieved. It can be safely said that although continued improvement and refinement of methods is to be expected, the knowledge of how to reach and maintain top safety performance is sufficient for the job to be done; the problem is primarily one of securing adequate application of tried and proven methods.

Getting people to work safely is primarily a sales job. People can be ordered or even compelled to do things, up to a point, but compulsion cannot get really good performance in anything. Only interest—the desire to do good work—can bring about the results that all of us on the railroads are striving to obtain. Enforcement of safety rules may at times be necessary. When it is, however, it certainly means that the sales effort has failed with the person or persons involved and, therefore, it is necessary to use the substitute—enforcement, pending the time when the sale can be made.

Selling safety is a difficult job. It has been proven in this field that advertising, although helpful, is not sufficient. Here, close personal contact is essential. I think that those of us engaged in selling the product, safety, in most instances face more

difficulties than the sellers of some of the more tangible products.

The first essential in any sale is a good product. A product is good only if it yields the purchaser a profit, a profit in service, or pleasure or satisfaction, or some other value. Safety is definitely such a product. It brings to people and employees freedom from injury and suffering, loss of wages, and hardship for dependents. We, as salesmen of safety, should be very careful to make no exaggerated claims. The truth is enough.

A good supervisor, by personal contact, can make the sale and secure the necessary cooperation from operating employees by conducting himself in such a manner that he has the respect and confidence of the employees, understands their problems and is always ready and willing to administer those little preventives that keep both individuals and groups satisfied with and receptive to the established safety and operating rules under which they work.

When these rules are formulated in such a manner as to command the respect and conformance of the rank and file, they will observe them automatically and spontaneously, and will encourage others to do likewise. In other words a concept of citizenship will prevail. The term "citizenship" is used to mean that the individual recognizes that he owes an obligation to himself, his family, his community and to the company for which he performs service.

FEELING OF BELONGING

This feeling of obligation can only be made prevalent and deeply developed in any organization by affording the individual an opportunity to belong and contribute according to his means and talents.

A famous trainer of men, when asked the secret of his success, answered "First off you must know people." In order to know people, continuous personal contact is essential.

It has been proven that people can be motivated and, when they have a good working knowledge of the job they are performing, are aware of the hazards involved and understand the rules. Then it is comparatively easy by personal contact to insure success in your safety program by motivating them in the desired direction.

While it is necessary for a supervisor to maintain a close personal relationship with all employees to insure and maintain a high level of interest in safety matters, I think the most opportune time that personal contact will bring the best results is when a new and inexperienced man is first interviewed after his application for employment has been accepted. At that time he is entering a strange, new world and will be in close association with people he does not know.

EDUCATE NEW WORKER

A supervisor at this time has an opportunity that will never again be available to make a sale in safety. The individual will be alert and receptive to all suggestions and instructions. A pattern for his future performance can be laid out that will insure development of a safe, careful and conscientious employee.

I can best substantiate this statement by relating an actual experience. In the latter part of 1955, it was necessary to employ in the New Orleans Terminal 65 yardman and 32 firemen, in connection with the inauguration of the five-day work week on our railroad. These employees were scheduled to begin service on December 1, 1955, which is, so far as weather conditions are concerned, probably the worst month of the year in the New Orleans area. We were concerned over the possibility of some of these new employees sustaining personal injuries before they had obtained sufficient knowledge to cope with operating conditions they would encounter.

In an effort to alleviate this situation, each applicant was carefully screened and those accepted were assembled in groups of four for an informal discussion, at which time we obtained all information possible about the individual. The job for which they had been selected was fully explained with special emphasis being placed on the importance of safety.

TRAINING PERIOD INTERVIEW

Then began a 14-day training period after which each completed a written examination on the operating and safety rules of our railroad. They had then completed all requirements necessary to entering their railroad career. As an added precaution, however, each employee, before being permitted to mark up for duty, was again interviewed

by an operating officer who had been assigned to watch closely and supervise these employees during their break-in period. This association enabled him to be in a position to point out and correct some of the unsafe practices observed before they became a habit.

After two years and 10 months of service, not one in this group of new employees has sustained a disabling injury on the job. The positive attitude and interest displayed by these new employees was like the measles —contagious, infecting the older employees to the extent that they also began noticeably displaying more interest in safety. Today, the yield from the seeds of safety sewn in the fertile field of new employees has been very gratifying, since their accident ratio is among the best.

DAILY PERSONAL CONTACT

I do not mean to infer that after the initial discussions mentioned that the new employees were allowed to go about their daily tasks without help and supervision in the matter of safety. Almost daily personal contact with supervisors welded together a strong chain of communication and understanding, which is a must in any undertaking. This permitted the exchange of ideas and questions on a man-to-man basis —an understanding of the ideas, comments and feelings of the other fellow by looking at the situation from his point of view.

Keeping employees informed about their performance, as individuals, is the responsibility of a supervisor and a right due every employee. We should be informed as to how he stands and how he is doing. He deserves praise when he does a good job, and constructive criticism when he doesn't.

It is easy for a person in a supervisory capacity to fall into the habit of ignoring the positive values of giving praise, saying nothing as long as things go right, but raising the roof when they go wrong. This attitude in the majority of cases will cause employees to develop a negative attitude toward both their job and their supervisors.

Great strides have been made in past years in the field of safety. To insure continued progress, we, as people who must live and work together, must develop a greater sense of human values and responsibilities to one another. We, as supervisors on our respective railroads, are daily living examples for those who look to us for leadership. How we guide them, how we work with them will determine the degree of success obtained.

It is, therefore, necessary that nothing be left undone to improve ourselves so that we may inspire others to do likewise.

THE IMPORTANCE OF SAFETY IN MECHANIZATION

(A Symposium)

TRACK MAINTENANCE

by L. A. VILLELLA

safety inspector, The Pennsylvania Railroad, Philadelphia, Pa.

In considering the importance of safety in the mechanization of the maintenance of track and roadbed, it must necessarily be considered from a train accident standpoint, as well as from an employee personal injury standpoint, because both are closely related and both result in economic loss.

Since the earliest days, when what we now consider crude methods and inadequate tools were used, and on through to the present day with our improved methods, tools and better machinery, the prevention of accidents has been the greatest concern in the maintenance of track and roadbed. As a matter of fact that is one of the reasons for the progress to-date in the art of maintaining adequate track. It has never been enough for our engineers to maintain

a track and roadbed which will support the weight of our trains and to provide a constantly available facility upon which to run them.

It has always been their concern to maintain efficiently the safest track and roadbed so that it can, not only be utilized to get a ton of freight from here to there, but to make sure that it gets there safely. While it is partly true that there has been more talk than action in this direction, there has been enough action to establish an admirable record of safety in the transportation field—a record met by few and exceeded by none.

MANAGEMENT PROMOTES SAFETY

Particularly in the last 30 years we have seen a definite effort to integrate into our practices and work procedures the known reasonable precautions to prevent accidents, both to the operation of trains and to the activities of our employees, in maintaining the roadbed. The intense interest manifested by management in this connection, has resulted in a universal practice, followed by the men presently responsible for formulating and executing the policies in connection with track and roadbed maintenance, that all phases of safety must be foremost in their endeavors.

As a specific example of this, the chief engineer of The Pennsylvania Railroad has established a practice of soliciting the assistance of the safety department during field experimental work involving changes in methods or machinery. This policy has resulted in the further integration of the principles of safety with the principles of production methods. The manufacturers of equipment and materials used in the maintenance of track and roadbed have been for some time and are *now*, increasingly *concerned* in the matter of integrating safety with their design of equipment.

Fortunately for us in safety work, there is a happy natural union inherent in the mechanization of all phases of track maintenance work with safety and efficiency. There are certain basic characteristics of mechanized work in this field which automatically set up circumstances of safer conditions. For example, from an overall safety standpoint mechanization appears to afford a better opportunity for supervising and controlling the operation, and thereby resulting in fewer avoidable injuries and less economic loss.

With mechanization of operations there is every opportunity for specialization with the obvious result that men working in such mechanized gangs may become more proficient, with the natural result that within a reasonable length of time the transition from manual operations to mechanized operations will create an atmosphere wherein more effective measures can be taken for the avoidance of personal injury, the prevention of train accidents, and the elimination of production losses.

By the very nature of the mechanized work being done by large forces making a concerted effort to do a complete job in a concentrated area, the precautions necessary to make this an economically efficient operation provide protection for the men so employed. To get highly efficient production from a large mechanized gang, it is obviously necessary to take a track out of service for a period of time; and by so doing, automatic protection is afforded employees working in these gangs which was not always provided with the manual gangs.

So it appears from a safety standpoint, whether prompted by an accident prevention motive or not, mechanization by the very nature of economic necessity and practicability calls for safeguards which are assured for economic reasons.

LESS LABOR REQUIRED

To sum up some of the many advantages of mechanization in track and roadbed maintenance, we should point out of course the obvious advantage—reduction in the number of gangs. Machines reduce the number of manual operations and, therefore, personal injury exposures for a given amount of work. With mechanization men become specialists in their particular work, become more proficient themselves and are more easily supervised.

Many complex manual operations actually requiring a supervisor with "a thousand eyes" are now being changed to the simple operation of moving a single lever on a machine which can be readily observed. Readily supervised mechanical operations should result in practically no deviation from established procedures, and should lend themselves to prompt detection and correction of unsafe acts.

Further advantage is the increased practice of taking a track out of service when work is to be performed on it which greatly eliminates a train accident potential and eliminates the occasion for chance taking. This procedure also eliminates the possibility of employees being struck by trains while working on the track and provides a safe place for them to clear quickly and easily for the passage of trains on other tracks. The construction of some machines permits working without assistance from any person on the ground, without obstructing any other tracks, and without requiring gang watchman protection.

Further, there is reason to believe that in the foreseeable future machines will possibly become sufficiently automatic to permit proper spacing, moving and working by remote control without an operator on each machine. This will certainly eliminate or greatly reduce at least, the accident potential to employees.

On the other hand for every advantage gained, some price must be paid. One of the immediate results of mechanizing maintenance work, which we as safety men must seriously consider, is the immediate effect upon the morale of the employees. The morale of our men and the attitude they have toward their job have a serious effect upon their individual safety. For this reason we must recognize the age old tendency to feel that machine work interferes with their well-being as workmen.

In the development of plans for further mechanization of track and roadbed maintenance, there are several factors which must be taken into consideration. We must see to it that either the designers of the machines or our own people provide the necessary safety features on the machines. We must make sure there are sufficient in-operation checks so that we will know the condition of these machines, and that these checks are followed by repairs or adjustments to insure that the machines are well maintained and clean. Thirdly, we must select and train competent machine operators, and fit other employees into places for which the performance indicates they are best suited.

Fourthly, we must to a greater extent insist upon compliance with known practical safety precautions, as well as with the accepted machinery and work procedure instructions. And we must be sure that in our plans there is no letting down on safety precautions in order to obtain, what may be apparent but not actually real, production improvements. It is obvious from our past experience that by integrating the proper principles of safety, production performance does not suffer, but rather is increased.

Our experience with mechanization has been that with an efficient utilization of the machine, our overall good economic operation is obtained if strict safety precautions are followed and the rules for accident prevention are respected.

BRIDGES AND STRUCTURES

by E. P. HACKERT

division engineer, The Denver & Rio Grande Western Railroad co., Denver, Colo.

In speaking on any phase of safety, it is difficult to be original or to suggest original ideas. Those of us who have worked toward making our properties safer places to work are agreed upon the basic principles by which men can be lead to keep safe working habits always uppermost in their mind. Unfortunately, there are those of us who, in their zeal to get a job done quickly and economically, lose sight of the fact that violations of these basic principles are sometimes being condoned by supervisors and foremen.

They are too busy at the moment to take time out to correct an action or condition. Besides, that was a condition which was incidental to a unique phase of an operation and won't come up again, and nothing happened that time anyway! While possibly not thought in those exact words, I'll bet almost anyone here can recall an incident where his thinking was similar.

These few lapses in the practice of safety can be disastrous. Safety isn't something you sell at a big bargain sale, or a rummage sale, or a "going out of business sale" to sell your quota for the week and then relax. Safety must be sold—and I do mean sold—like popular cigarettes, or automobiles, by the constant, confident presentation of it until it becomes a household word, not by the high pressure type of salesmanship—until a man would not think of using a grinder without wearing goggles anymore than he would pick up a red hot piece of iron. The most successful salesman is the one who talks softly and confidently and knows his product.

SAFETY NEED SALESMANSHIP

The practice of safety in connection with increased mechanization of bridge and building crews is just such a problem. A man doesn't touch something hot because every man at one time or another has been burned with painful but usually not disastrous results. However, a man does not go a fast round with a runaway hand power saw and come off with just a painful blister—unless he is a lot more lucky than most people.

Yet, how many of us have taken the time to inquire of a foreman if a new man had been shown how properly to use such a handy surgical instrument? A 10 inch power hand saw does a good job rapidly on a three by 12— and it is equally efficient at shortening an arm or leg—but not as neat! That a man does not know he should not lift a running saw from a cut is understandable if he is a novice; but it is not understandable that any experienced person should let him use the tool without such instruction and further guidance until it is known he can use it safely.

Since much of the use of power tools depends on an electrical source for power, and since six of my seven gangs are road gangs, it follows that the electrical source must be furnished by a portable generator. No doubt many of you have a similar situation. The Underwriter's Laboratory has endorsed the use of a three-conductor cable for electrical power tools so that the body of the unit will be properly grounded and the operator saved from severe, if not fatal, shock should an insulation failure occur.

A portable generator unit of, say, 2,500 W can kill as well as can a commercial source. A man working under a bridge boring holes for sway brace bolts—just as an example—is usually himself pretty well grounded; much better, in fact, than a mechanic in a shop standing on a concrete floor.

I could go on great length along these lines, but since we are, I believe, agreed that we believe in safety, are willing to extend an effort to promote safety and sell it, these few examples may lead to further thought and the possible discovery of an obvious condition which has been overlooked.

Just remember, a man could get a nasty gash from a carelessly used handsaw; but he can lose an arm or a leg to a carelessly used power saw. He may get sore muscles wielding a ship auger, but he can come up with a broken arm from an improperly held power drill.

Properly used, power tools and other forms of mechanization make the work easier for our men, turn out more work better and faster—but only if properly used and cared for.

We are now precisely where we started; but, I hope, with some food for thought. You observe, but you observe all of the time; you teach, but you teach all of the time; you correct, but you correct all of the time. Now you have made safety a by word and the practice of safety a habit.

SIGNAL AND COMMUNICATIONS

by A. L. ESSMAN

chief signal engineer, Chicago, Burlington, & Quincy Railroad co., Chicago, Ill.

I don't know when safety has been so important in the performance of our duties than it is at the present time, particularly when a large share of our construction men have either just finished high school or have been released from a branch of the Armed Service, and in most all cases rarely have they ever had experience with any type of machinery other than an automobile.

No doubt, a large number of you have lived close to a street intersection where, because of its heavy traffic in one or more directions, arterial stop signs have been installed. Quite frequently you will hear the screeching of brakes, the sound of sliding tires, and the roar of an exhaust pipe, causing you to get out of your chair to see what has happened only to find a car driven by some teen-ager.

With such experiences, one can readily understand why, when we endeavor to insure our automobile, the question is asked if there is any one in the household under 25 years of age who would be driving the car. If there is, I think that most of you have learned your insurance rate is much higher. I make this point because to me it is one of the important things in assigning personnel to the handling of mechanized tools in both the signal and communications departments.

PROFIT FROM INSURANCE COMPANIES

Surely, the rate structure of insurance companies has been made only after a careful analysis of the age brackets in which a large number of accidents occur, and I think that we can profit by taking a page from the insurance company's book of experiences when we select personnel to handle mechanized equipment and every supervisor, foreman, or anyone delegating responsibility for the handling of this equipment, should keep this uppermost in his mind.

The adaptation of mechanized tools and equipment would not appear on the surface as being extensively used in signal and communications departments. There is, however, considerable mechanization, but only to the degree in which savings in labor can be brought about. Signaling, in particular, is more of a tailor-made job. Communications follows closely to this pattern.

However, in the construction and maintenance of pole lines for both signal and communications purposes, there has been the advent of the power augers for drilling holes for poles, winches and derricks for the erection of such poles, and equipment to facilitate the stringing of wires. Other mechanization has been made principally in shop procedures of these departments.

In viewing such operations from a safety standpoint, it is my opinion that too many and too often people have been misled by the word "safety." I refer more specifically to the safety belt used in climbing poles, safety shields on grinding machines, safety guards on trenching machines, safety hooks on ladders, and safety valves on pressure tanks.

CAN'T RELAX SAFETY

Of the various types of machines used, it is recognized that in their operation a greater hazard exists at one place more so than at another. As a result, someone tacks on a safety shield or safety something and the individual's attention is, in some cases, relaxed because of such mis-nomer devices. In my opinion, when the word "safety" is used, it is a need for using extra precaution over and above that which is normally used with tools of this kind.

I recall, just the other day, viewing a young lad climbing a power pole. He proceeded up the pole with his safety belt properly snapped on his tool belt. As he reached about mid-point of the pole, he fastened his safety belt around the pole so as to permit both hands to be free to hook a chain on the pole to permit it being lifted out by derrick. As he proceeded down the pole, he unsnapped one side of his safety belt, letting the loose end dangle from his tool belt. When he reached the bottom, the first foot reaching the ground stepped on

the safety belt, and as he started to step away from the pole with his free foot, he was pulled to the ground. There was a good chance of his receiving a serious injury from one of the gaffs on his leg, and this is usually the result.

I am reminded of another incident involving a safety belt where a young lad was on a pole, which had not as yet been equipped with crossarms, and was in the process of transferring wires from an old line across the top of the pole to another side. To perform this operation, it is necessary for the man to be sufficiently close to the top of the pole so that the wires could be laid over its top. The safety belt was fastened around the pole in the proper manner and presumably was fairly close to the top of the pole, and in an effort to become more comfortably situated he grabbed hold of the safety belt with both hands a short distance from the pole.

He shifted his weight forward to ease the tension on the belt and with such tension so relieved, would move the safety belt upward with both hands. In so doing, the belt moved too far so that there was not enough bearing of the belt on the top of the pole to hold his weight when he settled back into the belt, and the man fell to the ground. The purpose of this belt was for his safety while he was on the pole so as to permit him to use both hands, but yet the very thing that was to assure him safety was the very same thing that caused him injury.

MUST USE SAFETY DEVICES

When we view a man in the shop using a grinding wheel which is equipped with safety glass shields, again, the man is misled to the point where he feels that goggles are not necessary. He proceeds to grind the material without realizing that fragments of the material or the wheel could become dislodged and glanced from other surrounding objects, striking him in the eye.

Safety hooks on ladders will, at times, prevent the ladder from slipping away from a cable or messenger, but the mere fact that there is a safety hook provided does not mean that the man should not take the necessary precautions to see that there is proper footing for the ladder. In most cases, that is the principal reason for ladders slipping or tilting.

In some signal and communications departments, there is in use hundreds of miles of cable suspended airily from messenger attached to the pole. Some of this cable requires painting and inspection. When using cable buggies for riding the messenger, the operator should never relax from the requirements of knowing that the cable buggy is properly seated on the messenger. Where the cable is painted by paint guns, sprays or shuttles, even though the equipment provided is the best that can be secured, there is always the need for extra precautions to be taken in connection with its use.

SHUTTLE ACCIDENT

I am reminded of an accident that occurred recently where the shuttle type painting process was used. This process is where the long tube is placed over the cable with gaskets at both ends with provisions to either pull or push the shuttle from one pole to another. The paint completely envelops the cable, and because of the limited size to permit the shuttle to be pulled inside the messenger rings, it has to be filled with paint approximately over two poles; and to facilitate this filling process, pressure cans are employed.

In this particular instance, the man was pumping up the pressure in the can and only had performed two operations of the pump when the tank exploded, blowing out the bottom of the tank causing the pump on top to strike the man in the face. There was a flaw in the seam of the bottom of the tank which was not detected although this particular tank was used for three years for such operation. The principal reason the pressure in the tank was so great after only two operations of the pump was because of the fact that the tank had been sitting in the extremely hot sun for a considerable length of time. Other instances have also occurred where safety valves have not performed their function.

BE ALERT CONSTANTLY

I think it can be said that, in most cases, where there is a device employed on machines which a great many of us use and where the name is preceded by the word "safety," it is possible that such term has misled some in its use. Therefore, where there is some extra hazard, I think one of the important things which should be advocated in the use of mechanized equipment or machines, employing the word "safety," is that the individual should be alerted so that extra precautions can be taken.

The equipment should not be treated as an ordinary tool because, surely, there are extra hazards existing or the extra equipment would not have been applied. There is nothing more discouraging to a signal or communications officer than to receive a report that a man had fallen from a pole because of not having safety belt properly snapped to the ring, or where a man has lost his eye because of not wearing his goggles simply because the grinding machine had been equipped with a glass shield, or where a man had received a lacerated thumb or finger because of having caught his hand in a payout or take-out reel.

If there was some way of impressing upon all persons that have anything to do with mechanized equipment, regardless of the departments in which it is used, that if there is a machine that is powered by any means or if there is any automatic action to that machine, it should be considered as a hazard for which extra precautions must be taken.

SAFE TROLLEY MAINTENANCE

by T. B. KIRK

assistant engineer, Electrification Dept., Chicago, Milwaukee, St. Paul & Pacific Railroad co., Seattle, Wash.

The Milwaukee Road electrification over the western mountains, because of geographical location and type of power, has been somewhat isolated from the other main line electrification in this country. This has resulted in the development of a trolley maintenance system and organization relatively independent of the influence of other electric roads.

The Chicago, Milwaukee and St. Paul completed the westward extension of the rails to Seattle-Tacoma in 1909. Because of the severe profile, plans to electrify the mountain sections were initiated shortly after steam operation started. Electrification of the 436-mile Rocky Mountain division in Montana and Idaho was completed in 1918. The 226-mile Coast division in Washington was placed under electric operation in 1920.

This electrification was the pioneer 3,000-volt direct current installation, its nearest predecessor being the Butte, Anaconda & Pacific Railroad electrication at 2,400-volts D.C. in 1912. Today, the trolley voltage is 3,400 D.C., fed from motor-generator substations spaced at 35-mile intervals. A 100,000-volt transmission line parallels the railroad in the electrified sections and supplies power to the substations. All power is purchased and received through transmission line interconnections with several power companies.

The trolley system is primarily wood pole, bracket arm construction. Span wires are used where there are two or more tracks. Cross arms on the trolley poles carry one or two heavy trolley feeder cables and a 4,400-volt A.C. circuit supplying power to the block signals.

When electric operation was started, maintenance procedure was essentially copied from the numerous street railways and inter-urban lines, but with a few concessions to the higher and more dangerous trolley voltage.

TROLLEY TROUBLES

The trolley system is subject to the same structural and insulation troubles as a power company line, and the same trouble from wind, lightning, floods, fires and trees. In addition, there is the necessity of maintaining the contact wires in close vertical and horizontal alignment with the track. Any serious misalignment usually damages the engine pantograph collector, and frequently tears down overhead system.

Trolley maintenance from the start has been mechanized in varying degrees. During the first few years of electric operation,

maintenance was performed from insulated platforms built on top of box cars which were pulled with steam engines. The work trains also included living quarter cars for the line crews and train crews. Later, each work train was consolidated into a single, self-propelled, gas-electric car, converted from passenger service.

These cars had living quarters for the line and train crews, had storage space for considerable material, and an insulated working platform on the roof. The cars were equipped with air-operated tools which included winches, jack hammers, drills and wrenches; powered by the car air compressor. Each of the maintenance crews, so equipped, normally maintained a division of more than 200 miles.

During this period, construction work and scheduled heavy replacement was usually handled by extra line crews, working out of box car camps and using track cars for transportation.

With the trolley system aging and requiring heavier maintenance, the work train type equipment proved inefficient and too costly. About 10 years ago, a gradual change-over was made to crews working out of a home terminal. These crews replaced both the maintenance and construction crews and took over both types of work. Two or more crews are sometimes combined to handle large construction projects and major cases of trouble.

WORK CREWS' EQUIPMENT

The basic equipment for these crews is a highway-rail truck, equipped with hydraulically raised ladders. These trucks have track car type flanged wheels and axles, mounted fore and aft of the regular truck wheels. The truck is driven up onto the track and the tires lined up on the rails, usually at a road crossing, but may mount onto the rails at any point with the use of light wood frogs. The flanged wheels are then lowered to the rails and the steering gear locked.

Most of the truck weight is on, and all of the driving and braking is through, the tires. These trucks can change from rail to road operation in less than a minute. They can be moved off the rail at any point where there is sufficient shoulder on the right-of-way to allow clearance from the rails.

Heavier straight road trucks, equipped with pole derricks and power diggers, are used when possible on construction and transmission line work. Use is also made of track cars, small towers on push cars, and light duty road trucks. All road-rail trucks and the heavy road trucks are four-wheel drive and are equipped with power take-off driven winches. Electric tools are powered by portable generators. Electric and gas chain saws are used, particularly on tree clearing projects. Portable air compressors for occasional rock drilling work, and bulldozers, when needed, are usually furnished by the track department.

The complement of the trolley maintenance crews is made up of men trained through the railroad apprentice program and of experienced power lineman able to meet the railroad qualifications. An otherwise fully qualified power lineman requires considerable education on the job as to railroad operations.

NO MAINTENANCE SAFETY

Because of train movements, it is necessary to perform a major part of all maintenance work with the trolley and signal feeder circuits energized. As such work, particularly trouble shooting, must be done in all kinds of weather and frequently during darkness, there is, unless safe working practices are applied, a high degree of hazard involved.

As previously mentioned, original maintenance working procedures were mostly evolved from previous experiences with street railway and power companies. In common with power company methods of that day, safety rules and practices were very rudimentary. It was, in general, each man for himself. Rubber gloves and other protective equipment was available but seldom specified or used. As might be expected, accidents to lineman due to electrical shock and burns were frequent and serious.

In the electrified territories, during the period 1915-1931, eight linemen were electrocuted and many received serious injury. In the same period, 18 railroad employees on the electrified divisions died due to electrical shock and burns.

In 1931, a new code of safety rules and instructions for line crews was issued, and a policy of education and strict enforcement adopted. These rules prescribed a definite procedure to cover as many types of work as possible, and spelled out protective measures that must be taken. This new code was based on 15 years operating experience, plus a digest of power company rules applicable to trolley work. Also, a set of rules and instructions was issued to engine and train servicemen, and other employees on the electrified sections who performed work there was a possibility of contact with high-voltage circuits.

These safety rules, although amended at various times, still remain essentially unchanged and the results have been highly satisfactory. Beginning in 1932, there was a period of over 24 years without a fatal accident to electrification forces, including both line crews and substation men.

ATTITUDE CHANGE NEEDED

When the new rules were first placed in force, the most pressing problem was to reverse the thinking of the line forces and their supervisors. Rubber gloves are always uncomfortable, and the requirement that they use protective measures was considered by some lineman as a slur on their ability to take care of themselves; and some of the supervisors thought the rules would slow down the work.

Concurrent with the strict application of the rules was the insistence that the men work as a team; that warnings are to be given and be acknowledged, of any unsafe or unusual condition present or developing; and, also, that there must be complete and explicit understanding by all members of the crew of the work and of all intended moves.

Essentially, the rules define work that may or may not be done with the lines energized, protective measures required for hot work, and procedures for de-energizing and grounding.

Hot line work must be done in such a way that any potential circuit through a workman's body must be protected against by at least two insulators in series, so placed that not more than one can be accidentally bridged. An insulator in this rule is a porcelain insulator rated for the voltage involved, protective rubber hose and blankets, or 12 inches of the surface of a pole in good insulating condition.

When it is impracticable to provide double insulation otherwise, rubber gloves may be considered one of the insulations. However, rubber gloves must be worn always when working on or near live high-voltage circuits.

The transmission line must be de-energized when any projected work will bring men, material, or equipment to within five feet of the conductors. The trolley and signal circuits must be de-energized when the double insulation stipulation cannot be met; when installing or removing cable or fixtures which cannot be handled in complete safety; after accidents to the trolley system when the extent of the damage is not fully known; and when, because of emergency conditions, repairs are to be made by inexperienced men.

The rules are very explicit on handling work on de-energized circuits. The same care to prevent verbal misunderstanding must be used in handling circuit clearances as in handling train orders. Protection against locomotive pantographs bridging the insulation between live and dead sections of trolley is provided by train order and/or flagging.

All circuits de-energized must be short-circuited and grounded before they can be considered clear. Grounds are applied by the line crews at the location of work and are under their direct control.

Rubber gloves are vulernable to damage from sharp objects, and require regular checking by visual inspection, air tests and water tests. The gloves and all other rubber protective equipment receive a standard voltage test each 90 days. Tools and equipment are inspected regularly, with particular emphasis on the flanged wheels on the trucks and track cars.

Much heavy pole handling and setting must be done by the relatively small crews, and each rail truck and most straight road trucks are equipped with winches to furnish the power for this work. Considerable insistence has been placed on safe rigging for heavy pulls and lifts.

CODE REGULATES OUERATION

The operation of track cars and of the road-rail trucks is under the Consolidated Code for Track Car Operators, under which all qualified car operators must be examined each year. The road-rail trucks, in par-

ticular, require careful operation, so they can run long distances on the road out of sight of the track, and then return to rail operation at any convenient road crossing.

When there is a doubt as to the location of trains, portable phones are used to obtain the information, or the necessary flag protection is used. For the protection of other track cars, the intended working limits of the trucks is included in the track car line-ups each morning.

In general, while all basic safety concepts have been retained and improved on when possible, an attempt has been made to take advantage of all new developments in equipment and tools in line with the continuing modernization of the electrification in particular, and the railroad in general.▲

HIGHWAY — RAILROAD CROSSING SAFETY

REMARKS OF H. G. J. HAYES

executive secretary, Ohio State Safety Council, Cleveland, Ohio

If our program is in any way unique it may be because of one of two features. The executive committee of the Railroad division, which is the body that develops and administers this highway-rail crossing program, embraces not only representatives from each of the major railroads in our state having more than one mile of track in Ohio, but is rounded out by delegates from the Ohio Assn. of Chiefs of Police, Buckeye State Sheriffs' Assn., Ohio Highway Patrol, the Ohio Department of Highways, the Ohio Department of Education, Ohio Department of Highway Safety, the Ohio Federation of Women's Clubs, the Ohio Congress of Parents and Teachers, and several other organizations.

Another point which may be slightly unusual is that we depend almost solely upon the media of mass communication in the development of our program. In line with the directive of the executive committee, at the time this program was first undertaken, the highway-rail crossing incidents receive only that share of attention which is proportionate to their importance in total traffic incidents and casualties having gone from eight per cent to five per cent.

Newspaper and radio form the backbone of our public information program. The grade crossing problem is referred to perhaps a half dozen times a year in regular releases, which deal with the general accident problem for the period under discussion.

Special emphasis is confined to just one week in the year. Usually it is the week just preceding May first. In this period, while there are special releases devoted to the grade crossing situation, we have that problem featured in every regular information service.

GRADE CROSSINGS SAFETY WEEK

"Safety for my Family" and "So Help Me, It's the Truth" both are keyed to the crossing situation, or give it a large share of attention in that week.

I am sure that some of you may be acquainted with the details of our Highway-Rail Crossing Accident Prevention Week, perhaps you will not mind if I summarize quickly the elements that this week embraces.

We obtain a proclamation from the governor designating the period, calling attention to the crossing accident problem and to the progress that has been made in bringing that problem under control. The Department of Highway Safety produces a special crossing safety poster, printing in excess of 25,000, which are distributed throughout the department's normal channels of distribution. Several thousand are available to the Safety Council's members. About 4,000 are provided to the participating railroads for display in places of public access on railroad property.

Well in advance of the designated week, we make a tape recording using the voices of civic and safety leaders throughout the state and a number of railroad safety officers. This tape is edited and transferred to platters which are provided to 10 strategically located radio stations, who have agreed to use the message on the platter on a saturation basis during the week. Most of these stations use one of the messages at least every hour, so that in a week's time we have in excess of 1,000 short safety pitches made by radio.

CIVIC LEADER TAPE MESSAGE

In addition to this, all radio stations in the state receive brief messages which can be used by any station personality. Similar short items are provided to the newspapers. Both newspapers and radio receive a detailed story of the week's activities and a number of special items which may be used on the air, or in the column, at the discretion of the program director or editor.

Ordinarily crossings are observed by one railroad each month during the year, to discover the frequency with which drivers violate the proviso that they shall not drive on a crossing when an electrical or mechanical signal gives indication of the approach of a train. During the grade crossing accident prevention week, however, all railroads make observations at crossings which they select.

Since all roads are notified periodically of those counties in which crashes at crossings are most frequent, the railroads naturally tend to concentrate their observations in those counties along their rights of ways which have the poorest experience.

We will receive 50 to 60 reports of vehicles that have not complied with the law during that week. The owners of these vehicles are identified and the Council sends a letter to said owner telling of our program, asking that they caution all drivers of that vehicle to approach crossings cautiously. Sometimes we receive notice of a vehicle that observed the warning exceptionally well, and a complimentary letter is sent to its owner, much in the same fashion as we appeal to the owner of violating vehicles.

In 1948, which was the year just before the start of this program, there were 178 persons killed in crossing crashes, giving us a fatality rate of 0.723 deaths per hundred million vehicle miles. In 1956 we had 122 deaths and a fatality rate of 0.339. This was the second best year we ever had. However, a rash of multiple death crashes made 1956 the first year in six when we did not have a reduction in the number of persons killed. For the year 1957 to date, we are substantially below the experience of 1956, not only in deaths but in the number of incidents as well.

The railroad men who have been identified with the program are generous enough to say that the collaborative, concentrated, activity that has been our pattern from the beginning, is responsible for the results we have obtained. They seem to be good, but neither the railroads, nor the Ohio State Safety Council, will be satisfied until we get the deaths below the hundred mark for a year.

I admit quite willingly that we do not believe that this pattern is the only answer. It has produced reasonably satisfactory results in Ohio. Many non-railroad groups contributed to these results . . . and we are reducing accidents, injuries and deaths at grade crossings. Possibly some other state can do better in another way. If so, our railroad representatives will be sure that we consider it. We never will be satisfied until we reach that irreducible minimum, zero.▲

REMARKS OF E. G. KIESELE

superintendent of safety, Chicago, Milwaukee, St. Paul & Pacific Railroad co., Chicago

While the work of all committees of the Railroad section is directed primarily to service to our fellow man, it probably is more predominantly emphasized in the work carried out by your Highway-Railroad Grade Crossing committee.

First let us look at the record as given in the 1956 progress report on the Signs of Life Program. During the 12 year *period 1945 to and including 1956, there* was a total of 18,109 deaths in collisions at highway-railroad crossings which was 4.3 per cent of the total of all motor vehicle deaths.

There has been a rather consistent reduction in this ratio throughout the individual years, dropping from 6.1 per cent for the year 1945 to 3.3 per cent for the year 1956.

The actual number of deaths in highway-railroad grade crossing collisions declined from 1,703 in 1945 to 1,325 in 1956 or 22 per cent while those in all motor vehicle accidents increased from 28,076 to an estimated 40,000 in 1956 or 42 per cent.

DEATH RATE DECREASED

The total motor vehicle death rate, representing deaths per 100 million vehicle miles, decreased 43 per cent while the rate for highway-railroad crossing collision deaths decreased 71 per cent for those same comparative years 1945 and 1956. These are encouraging results and yet it should be obvious that there is still much to be done.

In what better manner can we serve our fellow human beings than to try to keep them alive? Alive to enjoy life itself, a full three score and ten and more if possible.

We cannot afford to conclude that our work has been finished because of the reductions made but rather this should serve as a challenge for all of us to find ways and means for greater and even greater accomplishment.

Just as long as one death occurs at a highway-railroad grade crossing, there is work to be done by this committee and by all railroad employees.

By the same token, we as safety-minded citizens should likewise realize that the same applies as long as one death takes place in a motor vehicle accident of any kind or at any place, and for that matter in any kind of an accident.

Service to mankind is never ending and has many ramifications as well as many avenues of approach. No one person in a *given lifetime can successfully attain the* ultimate in each phase of such service. However, we can dedicate our lives to that phase of service which concerns the safety of our fellow human beings and I believe this to be the overall purpose of the National Safety Council.

DEVOTE TIME, ENERGY

Let us pick just one phase of service that of devoting time and energy toward the elimination of all types of accidents which will include those at highway-railroad grade crossings. It should be a service extending far beyond the ordinary call of duty as we have come to regard it.

As railroad people I believe we can all understand this and those who have seen military service of any kind undoubtedly know what I am talking about.

To be of service in this most worthwhile endeavor we will have to extend ourselves. It may be necessary to make some sacrifices of time to attend meetings of Parent Teachers Associations, service clubs, community gatherings and the like—all for the purpose of bringing to those people the message of safety; the message of how lives and limbs may be saved.

SIGNS OF LIFE PROGRAM

An excellent approach in many instances is the Signs of Life Program. Here you have a story to tell which is ever new and thought provoking. The National Safety Council stands ready to supply you with the necessary materials and I urge you to use them at every opportunity.

In practically all phases of safety work, results are measured by the comparison of the number of accidents or injuries for any given period compared with a corresponding period of previous years.

However, certain safety activities are carried out which can be measured; not to such an extent as to be able to state definitely the number of accidents or injuries prevented but certainly to a degree to indicate the likelihood of such prevention. I refer to the programs known to be in effect on at least three railroads in the United States whereby violations of the laws covering the approach to and the crossing of railroad tracks which intersect streets or highways are reported to the owners of the motor vehicles for handling with the drivers.

Generally the owners have responded with a letter of appreciation and with assurance that appropriate action had been taken to avoid a repetition.

EMPLOYEES REPORT VIOLATIONS

It would be most helpful to have such activities carried out by all railroads. The plan is a simple one. Briefly, the motor vehicle laws pertaining to the crossing of railroad tracks at grade for the states through which the railroad operates are made known to its employees with request that they report to the division superintendent any violations of the laws as observed by them. The superintendent then writes a letter to the owner or operator of the vehicle calling attention to the violation requesting that the law be obeyed in the future in the interest of safety.

In a period of approximately two months on one railroad, letters were written on violations of the law by 200 tank trucks, eight school buses, six other buses, two trucks handling explosives and to the operators of three other trucks handling ordinary materials which trucks narrowly cleared trains.

It is a cooperative program as are most safety programs. The railroad employees *must cooperate in noticing the violations and* in gathering sufficient details for writing the letters. The operators of the vehicles on receiving the letters should handle not only with the offender but all their other drivers as well. Such cooperation on the part of all interested individuals is bound to bring results.

It is a plan which will be helpful in reducing the number of highway-railroad grade crossing accidents and is strongly recommended to all railroads.

I would like to ask that you consider seriously the suggestion that you resolve to be of greater service to your fellowman in this life saving program.

FINAL SESSION ADDRESS

by E. F. TUCK

chief mechanical officer, St. Louis-San Francisco Railway co., Springfield, Mo.

Supervisors have a leading role in safety. But safety is, in truth, a one-man job, and the man who is most responsible for an individual's safety is that man himself. All of the gadgets in the world will not keep a careless man from getting hurt—and a man is a careless man if he is thoughtless for only one fleeting second, because that moment may mean life or death to him.

If a person is careless for only an instant he is not keeping up his practice of safety long enough.

Safety is a challenge to all. We are constantly faced with hazards, whether at home, on the street, in the office, in stores, theaters, our own private cars, or public transportation systems. No matter where we are, as long as there is motion there is a challenge to safety.

One only has to read the paper to find a report of some kind of accident. But that accident which rates publication may only be one of the freaks or one of the more serious which, because of its nature, is classified as news. I wonder how many other accidents occur for that one "freak" which never make the papers? How many daily challenges to safety were not successfully met? Many, many more than reach the news caused discomfort and loss of time to the injured.

SAFETY IS A CHALLENGE

Safety is a constant challenge if we are to overcome the tremendous losses sustained by humanity every year in loss of time—in loss of income—in permanent impairment of faculties—in just plain discomfort. Safety is a constant challenge if we are to increase our longevity—if we are to better our chances of living a fuller life—better our chances of remaining whole, hale and hearty.

Who is challenged? Every man, woman and child on this earth, rich or poor, young or old—none escapes hazard, none is safe unless he thinks safety constantly. Even the home, that sanctuary to all, is full of challenges. No one is immune, no one is sheltered. The only remedy, the only chance for victory lies in thinking and practicing safety—it should be preached, policed and practiced by all.

You men in safety work occupy a most peculiar position. You have an unlimited quantity of a most valuable article to give away—data on safety—but, unfortunately, this is an intangible item.

I wonder what would happen if you were told that you had an infinite supply of cigarettes at your disposal and your company's only request was that you give them away—free—no strings attached—just give them to any and all who would accept—all you had to do was give, give, give. How much trouble do you think you would have? None—customers would return and return, time and again, and new ones would be added. But don't forget—*your supply is unlimited*—as long as folks will accept, you can give. Wouldn't that be an easy job to handle—and a pleasant one?

CAN'T GIVE AWAY SAFETY

Well, you have something of much more value—you have unlimited quantities to give away—but it is intangible. The peculiar situation about your position is the fact that with an unlimited supply of a most valuable item—safety—you can't give it to people—you can't get them to come after it—you have to sell it to them.

There's no charge—*it's absolutely free*—but you still have to sell it, and you have to be just as good a salesman as you would to sell any commodity on the market today. Your safety record is your order book—it is a daily challenge to your salesmanship.

It is most disheartening to try, try and try, and then see reports of accidents that should never have happened—accidents that could have been prevented if the victim had only accepted that free item which was available to him in unlimited quantities—that item you had to give him, and tried your best to sell to him.

We are all familiar with the hazards that beset one during each day of his existence, and we reiterate them pictorially

and statistically to those under our supervision with the hope that extra thought will be given to practicing safety.

Are we always getting our story across as we intended? My position is directly connected with safety because in the operation of a railroad many hazards exist. The men are fully aware of the risks involved in that sort of occupation—they are naturally more careful than they would be if engaged in some less hazardous task. However, we find it necessary to remind them constantly of oversights on their part—to remind them to practice safety every minute of every day.

As in other large industries, we on the railroad compile statements and statistics about our accidents. Through these statistics we arrive at a ratio—the number of accidents occurring per million man hours of work.

How much does this mean to you—men engaged primarily in safety? It means a great deal to you—but what does that ratio mean to the units that formulate it—those units are men, the workers. I'm afraid that a 5.1 ratio or a 95.1 ratio would indicate little to them.

MAN IS PRIMITIVE

Man is fundamentally primitive—he grasps quickly the simple things and flounders upon the complex. When he began his existence, he first noticed his fingers, and then his toes—and to record numbers, he began by using these. Five fingers on one hand, five on the other—that made it easy for him to comprehend up to 10. After he progressed a little farther, he included his toes—and then he could comprehend 20—10 fingers here, 10 toes there.

He is still primitive—he still subconsciously uses his fingers and his toes. When you go beyond, and beyond, and beyond that into the realm of astronomical figures —*million miles, million dollars, million light years*—and, yes, million man hours—he's hopelessly, irrecoverably lost—so far lost that he shrugs his shoulders and says "so what—a million, a billion, a trillion—I'm only one—that first finger on that right hand, that's me—and the millions, billions, *trillions are of no concern.*

Yes, I can think beyond me—that hand has five fingers on it; me, my wife and three kids—that's one hand, that's one family —my family. Now you are talking about something I can understand . . . but a million man-hours—and there goes the shrug again, and "so what."

Now, you are intelligent men and are familiar with statistics—you work with them all of the time—you should be most adept at understanding them. I am going to quote to you some figures about a particular railroad.

During a certain month, the total man hours worked on that road was 9,320,000. There were no fatalities during that period but 43 injuries did occur. The ratio of injuries per million man hours totaled sufficiently to make a ratio of 4.61.

DON'T COMPREHEND MILLIONS

Now, as I said before, you are exceptional men in this line of thinking—it is your work, your job . . . you do it all of the time. But I wonder how many of you could repeat the figures which I just quoted —a few, yes—the majority, no. How many workers, *the units you use to make your* statistics, your ratios—*men*—how many of them could comprehend what those figures mean? Very few, if any. How many would say "millions—billions—trillions—so what?" Very many?—Yes. Why?—Because the story has not been given to them in the *units they can understand readily*—10s and 20s—10 fingers here—10 toes there.

Now let's see if there is some way we can bring these figures down to earth—get them out of the skies so that a man without a telescope of higher learning and without the astronomer's mind can understand them. Let's see if we can't get them down to the units he understands.

The average man today works eight hours a day, five days a week—that's 40 hours a week or 2,080 hours a year. How many years would it take this one man—this "me" —*this man you are talking to*—to complete one million hours of work? Why, at the rate of 2,080 hours a year it would take him 480 years.

So, we're still way out of his realm—we are talking about a period approximately *seven times as long as he will live, if he* lives to reach 70. We are far—too far—away from his 10 fingers and 10 toes. We'll have to get closer than that.

Our ratio per million man hours was 4.61. That means that for every 480 years this "me" would, according to the law of averages, be injured about four and one-half times, or once every 106 years. Still too far away—but we're getting closer.

Let's say—and we won't be far wrong—that the average worker spends 35 years at his task. That means it takes the lifetime of three workers to make 106 work-years—and in that 106 years of work, our ratio shows one accident is due.

ONE OUT OF THREE HURT

Now we're getting down to the fingers. One worker out of three will have an accident—one out of three. Now, can this "me" we are trying to impress understand? You bet he can—he can look around him and see two other workers, and say to himself "one of us is going to be hurt in our lifetime, one of us three—will it be me?"

There, you've made the story click. He knows that unless he and his fellow workers do better practicing safety, his chances are one out of three to get hurt—and one out of three is pretty big. He doesn't have to use many fingers to count that—it's pretty close to home.

Now, safety is everybody's individual job and it is an everyday, around-the-clock business. It's our job to preach it and police it to see that it is practiced. It's our job to let the workers know where they stand and what their chances are—it's our job to bring the story home to them.

We want to make everybody safety-conscious all of the time, and bringing the story home will do a most fruitful job.

The illustration I have used can be applied to any form of accident we care to illustrate. It only takes a little trained thinking on our part to put it in language our hearers will understand—a language that will put the "me" in the picture for them. And when you have them thinking about their "me," you've got them thinking!

THE IMPORTANCE OF SAFETY IN MAINTENANCE OF EQUIPMENT AND STORES

(A Symposium)

LOCOMOTIVE MAINTENANCE

by C. H. GRAY

master mechanic, Chicago, Rock Island & Pacific Railway co., Chicago

Inasmuch as railroading is one of the oldest industries in the United States, the railroads have some of the oldest structures, the oldest methods, the oldest ideas, the oldest men, and in the case of safety, the oldest problems. In the case of the oldest problems, the oldest answers are not necessarily the best ones and new answers to old questions and problems are in demand, by the newer and aggressive managements.

There are innumerable problems that stand in the way of maintenance of equipment safety, but if we spend our energies toward curing the ailments, instead of listing the problems by numerical order, we find considerable headway has been made.

The responsibility for the safety of the men working in the maintenance of equipment department belongs to the boss. One can delegate authority to subordinates, but cannot delegate responsibility. The head of the department must formulate a plan to be followed to accomplish a safe working program. He must be able to sell his program for safety to his supervision, in such a manner that they in turn, will be able to put the program across to the people working in the shops.

ALL METHODS VARY

The same methods of obtaining results in safety, will not always work in different shops, or with different groups of people. Generally speaking, however, action that ends in results that can be seen, will go a long way toward putting safety program on its feet, and cause it to gain momentum.

When a fire department arrives to put out a fire and finds someone else has done so first, they don't go away mad. When the bridge and building department arrives to repair an unsafe stairway or ramp, and find someone else has done so first, there is sure to be a big fuss—but whoever said for certain, they would ever arrive in the first place?

Why should they complain if an unsafe condition has been repaired and a possible injury prevented? The responsibility of safeguarding of mechanical employees is with the mechanical officers, not with the bridge and building department.

Included in this responsibility to accomplish safe work, is the responsibility to provide a safe place to do it. The safe place is one with adequate room. It is sometimes surprising to find that floor space is increased 50 per cent when material is stocked in the storehouse, instead of the shop floor, and when the scrap is removed regularly by one man rather than periodically by a dozen men. When working in cleanliness instead of dust, a man not only does his work faster, but cleaner, better and safer. Good housekeeping is fundamental in a good safety program and a well organized and operated mechanical facility.

Sometimes, as strange as it may seem, safety first needs to be given respectability. I have had the misfortune to be transferred to a mechanical facility at which the officer in charge, only paid "lip service" to safety first. He walked through the shop day after day when it was in disorder and filthy dirty. He would continually walk by unsafe conditions and men performing their work using unsafe practices and do nothing to straighten the place up or stop the unsafe practices.

He would meet with the safety committee and promise anything and do nothing. Generally the safety meeting took the aspect of a labor committee, meeting to handle grievances. There were safety items that

had been reported for eleven years and no action taken.

My first action was to inquire who was respected by a majority of their fellow-employees and then dissolve the old safety committee. I formed a new committee and explained to them that certainly there was one problem that would not become an issue between the employees and shop management and that was *safety first*. In one year we had made tremendous strides in cutting down injuries; we wiped the 11 year old safety items off the books and were working currently on conditions that were reported. In 90 per cent of the items brought before the safety committee, the answers that solved the problems came from the employees themselves.

The shop management and the safety committee were respected. The rank and file knew that the officer in charge of the shop backed up safety, because every day he made some corrections of poor housekeeping or unsafe conditions in plain view of other employees. The safety record improved 75 per cent in 60 days. The supervision in the shop knew that safety first was first in their duties.

SAFETY IS TEAMWORK

Now the shop safety achievement doesn't happen by accident—it needs promotion and whose responsibility is it to promote shop safety? The same fellow who has all the rest of the responsibility. Only the men involved might know as much as they do about it, so let's let them do a little of the work themselves. This is team work; with team work use gimmicks, tools or any other means to attract attention to safety first, but avoid being ridiculous and thus cheapen the program.

At one of our facilities, we do the following things:

1. Fly the American flag and the safety flag over the premises.
2. A safety meeting committee made up of highly respected men meet twice monthly to discuss safety and solve safety problems.
3. White caps with the Green Cross, emblematic of *safety first*, is worn by each committeeman during their tour of duty. This allows employees easy access for handling safety first ideas. It is felt some employees will go to a fellow-employee rather than a boss.
4. Each craft foreman and departmental foreman has above his office door a light that flashes green and bears a number indicating the number of days without a reportable injury. Should a reportable occur, a red light flashes until the end of the month, when the count starts over.

Of the items mentioned above, each one was suggested by employees themselves and seeing their own devices and programs at work, they have a feeling of pride and a desire to see their own program succeed. Moreover, in the instance of the green or red flashing lights, the crafts are in competition with each other and none wish to walk through the doorway that bears a red flashing light.

PUT VARIETY INTO MEETING

One of the common complaints among employees is that the same people talk to them in safety meetings, saying the same things over and over. I have heard it said so many times—"Why don't we have new faces and hear new things."

About two years ago, in one of our large shops located in a community which included a large number of heavy industries, I obtained the names of several safety superintendents of such industries as John Deere Plow company, American Aluminum company of America, and International Harvester. Arrangements were made for these gentlemen to speak at our safety meetings held once a month in a mass meeting in the shop. Much to the surprise of all the employees, it was found that many of the same problems in *safety first* confront these other industries that confronted us. It seemed to me that our employees were more satisfied to buckle down to our problems and do a good job of *safety first*.

As safety suggestions are solicited, received and put into effect, a momentum is established which sometimes inspires more and better ideas. Any enthusiasm is a good thing and can be directed into a clean up campaign that winds things up even further.

We find that a good way to promote safety among our people is occasionally to have a *safety first* rally in our shops and invite the families of the employees.

We also realize how much influence the wife and family exert on the husband or father. If the families become acquainted with the supervision and the shop facilities in which their men work, we can enlist them on the side of *safety first*. After seeing these facilities, we believe they will help us instill this in the husband and father. We have held such safety parties as I have mentioned and know that such affairs are beneficial.

HOLD SAFETY PARTY

On November 1, we held a safety affair as I have outlined for the entire Chicago division of our railroad. Shop employees and their families attended and employees and their families from all of the other departments were present, approximately 2,000 people. *Safety first* was the theme of the party and a special train brought our people to the party. The shop was decorated by the various crafts and departments, door prizes were given—and, there was dancing and refreshments.

As part of the entertainment we had a safety film suitable for the family to see and a short *safety first* talk. Important too was the opportunity for the members of the employees' families to meet the officers and the supervision for whom their men work. Also the men had an opportunity to display their shop.

I have not attempted to discuss technical safety practices to be followed in the maintenance of equipment; the technical safety practices will come if the boss is sold on *safety first* to a degree that he can intelligently put his program across to his supervision and they in turn will sell it to their fellow workmen.

Good housekeeping, respectability, salesmanship, intelligent instructions, progressiveness, aggressiveness and team work—will lick any problem.

Therefore, if the boss accepts his responsibility and makes certain all of these ingredients are placed in the pie, there can only be a final result—*safety first*.▲

FREIGHT AND PASSENGER CAR MAINTENANCE

by D. L. CRONKHITE

master car builder, Chicago & Eastern Illinois Railroad co., Chicago, Ill.

It has been my responsibility and [illegible] to serve on safety committees and to foster and promote safety of operations in freight and passenger car maintenance for the [illegible] several years. During this period of time, I have seen the accidents involving personal injury accepted without much thought to the pain and unhappiness caused, and I have seen the gratifying reactions to an aggressive drive to eliminate this scourge of pain, suffering, and tragedy which affects our happiness and economical well-being. This change in attitude has not been achieved individually, but by the cooperation of management and employees in their endeavor to make everyone safety-conscious.

This drive to eliminate the old habit of accepting an accident as something that just happens occasionally, and to substitute the habit of trying to avoid or prevent an accident before it happens, has resulted in a much better accident rate on our railroad. The maintenance of equipment department last year achieved a record of working one million man hours without a reportable injury, and we had over 500,000 hours on the second million before an accident occurred which broke our record.

We received the Award of Merit from the National Safety Council for this achievement, and for this we are justly proud and happy. This did not just occur, but represented the cooperation and earnest endeavor of all our employees. Another department on our railroad, the maintenance of way department, previously received an Award of Merit also for one million man hours worked without a reportable injury, and spirited competition has developed between these departments to see which will receive the next award.

During my work and experience in the field of safety of operation, I have conducted many inquiries into the causes of

accidents involving personal injuries. Although hazards were involved which if eliminated would undoubtedly have improved the safety of operation, I feel the greatest cause for accidents is the lack of individual thinking on the part of supervisors and workmen. I believe that we must get the lazy thinker sufficiently interested in the subject of safety so he will recognize the hazards and take necessary precautions to protect himself and his fellow workmen from being involved in an accident.

In some cases, we have found individuals who showed sharp and alert thinking. But in the majority of instances we have found that there was just plain carelessness and negligence, and the thinking was after the accident had occurred. I do not wish to imply that this lack of thinking applied only to the party who was injured, but that supervisors, safety committees, and other individuals all failed in their responsibility of doing some constructive thinking and taking necessary precautions.

CAUSES OF ACCIDENTS

It must be recognized that in our work there are conditions which are dangerous and which are liable to cause accidents if proper precautions are not taken to work with them safely. This applies to the methods and practices which have been in effect for many years, and to the innovations in the field of mechanics, electronics, and chemistry, which present new hazards where they have been adapted to our field of operation.

In the past, most of our injuries were due to such causes as muscle strain in handling heavy materials, working with hand tools, flying rivets cut by hand tools, or being struck on the jaw with a jack lever. Today, we have injuries due to being struck by motorized equipment handling materials, flash burns to eyes exposed to electric welding, or exposure to gas fumes which may be irritating and in some cases toxic.

Therefore, if we are to enjoy the better things for performing our work, we must also avoid the hazards, and through education and constant and consistent thinking provide ourselves with a solution for living safely with these hazards.

We have technical experts to assist us in our programs of safety education, but we must always remember that getting each individual to think safety is most important in any program for eliminating accidents. And we should not be selfish with our knowledge of safety of operation. We should be ever on the alert for the new and inexperienced man, to see that he does not become lax in his thinking about the safe way to perform his work.

I can not tell you how to get a man to think correctly in the field of safety. I do know that we must have a program into which our safety activities must be channeled, and the better the program, the better benefits can be expected. We must have the intestinal fortitude to keep at it consistently, and not allow mistakes and frustration to discourage us to the point of interfering with the program. We must have a sincere desire for a better safety record, and we must instill that desire in our employees if we are to lead our organization to that goal.

STORES OPERATION

by F. F. FORBES
supervisor, scrap & reclamation, Erie Railroad co., Meadville, Pa.

It is the little things that annoy us. "You can sit on a mountain, but you can't sit on a tack." Paraphrastically, this old saying sums up our safety program for maintenance of equipment and stores operations. We have learned to respect the potential hazards in the many complicated problems of handling dangerous commodities, such as explosives, inflammables, etc., but in the simplicity of daily routine, we have had and will continue to have the problem of contending with the unpredictable behavior of the human element at work.

Little new can be written about safety that has not already been expressed in varied ways, somewhat similar to our religious inclinations, bolstered by repetitious reminders of shortcomings to keep us from backsliding. We continually strive to create interest in safety programs and many times feel we are getting nowhere with them. By the same token, we must not relax in our efforts to contact and teach employees to join hands in the all-out "Fight for Life."

Education is a major process through which accidents can be reduced. We can and we must make such provision for the education of the rising generation to make them safety conscious to the "nth" degree. The conditions under which they will work, play, and live, will be even more dangerous than present existing conditions, as we live in a world whose chief concern is more and more speed.

In this haste and speed we violate safety rules or laws which in turn build up sales resistance which is hard to overcome. It is this phase of our safety work to which we must devote our greatest effort. In the maintenance of equipment and stores, American railroads recognize this problem and spend untold time and money in educating employees in the matter of personal safety. By so doing, they keep pace with changing conditions through those now employed who must set the example for those who will follow. This educational endeavor is getting results and has contributed its part in the reduction of accidents.

An active safety committee, making routine inspection of properties, equipment and stores operations, ferretting out dangerous conditions, faulty equipment and improper tools is a medium that becomes a part of a positive approach in getting across to the individual the sincerity that must be the keynote of the program. The person who contributed the following was on the right track when he wrote:—

"No man will pay heed to anything he is not interested in. To capture his mind, you must first get full attention, and this can be accomplished by stirring his personal interest. Man is more interested in himself than anything else in the world. When you prove to him that you are interested in him and that you are sincere in your thoughts and actions, your task of developing him into a Safe Man has progressed greatly. Keep faith with your men; show them that you are interested in their welfare and they will respond. Establish the idea in the mind of your men that the result you are endeavoring to produce is the elimination of personal suffering, rather than an endeavor to build up a record of rule violation."

To me, it would seem the first requisite of a good safety committee, attempting to install a positive and active program of accident prevention, is the ability to gain the confidence and respect of all employees. The day of prohibitions and rules of *Don'ts* sponsored by safety workers is gone; their work now must be inspirational and educational, and their contact with employees pleasant experiences.

It might be of interest to you to know how a safety program is planned at one of our terminals to emphasize the logic that a safe-working employee is more contented and happier in his work and contributes to better relationship between management and himself by actively engaging in promoting safer working conditions.

This terminal is at Meadville, Pa., where I am chairman of the division superintendent's safety committee. (All such activity on the railroad comes within the jurisdiction of our superintendent of safety). There are 400 employees in 16 sub-departments that are contacted each month at 12 locations where they can be readily assembled. The committee is made up of the top departmental heads of the local operations.

PROGRAM SET-UP

The chairman sets dates for meetings and notifies the members, as well as sends notices to all departments for bulletin board posting. The notices carry the time for the meetings and the subject matter to be considered. Diversified material is used; however, only one subject is taken up each month, e.g.—

Review of preceding year's safety posters.

Checking on safety rule books and their usage.

Proper clothing and health protection.

Thanksgiving, Christmas, New Years, or any special holiday can provide suitable topics for safety talks, as well as the seasons of the year, vacation, school opening, etc.

Once a year a motion picture on safety is shown and the following month a discussion on the film creates interest.

Every possible angle that can be used to keep a fast-moving, 20-minute, safety meeting on the chosen subject is employed to create human interest.

Near the close of each sub-departmental meeting, a short discussion period is held for a status report on items brought forward from preceding month's meetings. Additional items requiring attention are solicited and only safety items that cannot get immediate correction are considered for the summary report given to the division superintendent. Handling in this manner, the list of items is kept to a minimum and include those requiring further study and in a few instances require appropriations which must be approved before corrections can be made.

DIVIDED INTO GROUPS

The functioning of the committee is simple. Ordinarily there are 12 members who make the rounds and this number is divided into three groups of four members each, referred to as Groups A, B, and C. All members present themselves at the first location. Immediately with the start of this meeting, or the subsequent meetings, Group A moves forward to the next location to assemble employees and introduce any preliminary feature or arrangement in anticipation of Group B.

The talk or message is handled by Group B as are the discussion periods. Instances where more time is required than the scheduled 20 minutes, Group C stays on to clear up safety items that become involved during the discussion period. The success of the meetings depends greatly on a functional and well-balanced schedule, and the dividing-up of the Committee into the three groups has been very effective.

The primary objective of the work of this committee is to encourage employees to actively participate in the safety program to correct the causes of accidents, and help correct unsafe practices and conditions regardless of department which becomes involved. In this safety promotional work, maintenance of equipment and stores operations are so involved with the safety of every department that it is felt greater benefits are obtained through a committee representing all operations. Possibly this procedure would be of value at other railroad terminals.

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SCHOOL AND COLLEGE SAFETY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE SCHOOL AND COLLEGE DIVISION

This volume is a record of the sessions held at the 1957 National Safety Congress by the School and College Division. The conduct of these Congress sessions each year is only one of the many cooperative activities which the School and College Division carries on in behalf of its members, and for the benefit of accident prevention work in the field of education generally. The Division gives guidance in the preparation of a great variety of technical and educational material useful in day-to-day school safety programs.

The activities of the Division are under the direction of the School and College Conference. The officers of the Conference as well as those of various School and College sections are listed at the close of this volume.

PREVIEW OF EVENING DIVISIONS

PLAN OF ROTARY GROUPS

by FRANK BENNETT

specialist, Safety Education, Public Schools, Baltimore, Md.

At the President's Highway Safety Conference at Atlantic City, N. J., in May, 1956, arrangements were made for a series of meetings that were repeated for rotating groups. The members had a choice of the meetings they wished to attend, so that it was possible to provide for delegates with wide interests and for those who wanted to be oriented on most of the facets in any one or more areas.

When I mentioned this type of arrangement to the program committee last year, there seemed to be considerable interest. The committee agreed to try this arrangement, and invited me to explain the procedure.

This afternoon you will meet the five Chairmen of the leadership teams. Each Chairman will have an opportunity to indicate the areas of interest, current problems, and perhaps some of the leading or promising practices or trends in his particular field. This evening, each of the Chairmen will have a team composed of consultants who have had wide experience in their respective fields. After the Chairman has introduced the consultants and "kicked off" the subject, there may be key statements from each consultant with respect to the discussion subject.

Then, the whole area will be opened up for questions and discussions by the members in attendance, with questions being directed to any one of the consultants either by the individual participant or through the Chairman who may turn the question over to any one of the consultants.

This evening, you will have an opportunity to attend three of these discussion sessions as each group will hold three one-half hour sessions. The five topics under discussion will be:

1. The Schools and Fire Safety
2. Safety for School Personnel
3. What the Boy Scouts' Safety Good Turn Means to Schools and Colleges
4. Safety Through Physical Education
5. Safety in the Practical Arts

You are invited to select the three meetings you wish to attend and go to one from 7:30 to 8 o'clock. At the sound of the gong you will be dismissed and are to go to the next meeting which will begin promptly at 8:10. At the sound of the second gong at 8:40, you are invited to go to the third meeting which will begin promptly at 8:50.

This procedure will give you an opportunity to get a general background in three areas. If you wish to gain further information, and or have direct questions you would like answered, raise these at this time in the discussion groups. If you wish more complete information and background you may remain in one of the discussion groups for an extra period.

In the event that you go to one of the discussion and find every seat taken, will you kindly go to the meeting of your second or third choice, and come back to the same meeting for the second session; or, if it should be filled a second time, make a switch and come back to this meeting for the third time.

In planning these sessions, it was the program committee's hope that this procedure would make it possible to gain a wider spread of interest and yet an opportunity for detail. We hope this plan will appeal to new Congress visitors and to veterans also.

SAFETY FOR SCHOOL PERSONNEL

by LESTER L. WASSERBURGER

supervisor, Employees' Safety Education & Accident Prevention,
Los Angeles City Board of Education, Los Angeles, Calif.

Your concern for the topic "Safety for School Personnel" will be influenced by your answers to the following questions:

1. Is your responsibility for safety concerned with a small, medium or large school district?

2. Do you have a formalized employee accident prevention program?

3. Do you have a token program with someone responsible on a part-time coordinator basis?

4. Do you know the premium paid for Workmen's Compensation Insurance by your school district?

5. Do you know the relationship of loss-experience to insurance premiums?

6. Do you make a monthly accident analysis of on-the-job accidents to all employees?

7. Do you have within your staff a trained person capable of investigating and analyzing accidents?

8. Do you make any attempt to convey to personnel in your district the information gathered from the investigation and analysis of employee accidents?

9. Do you know whether it is your teachers, custodians, clerks, maintenance crews, cafeteria workers, bus or truck drivers, or warehouse employees who are involved in the most on-the-job accidents?

10. Do you know what could be the expectant dividend you would receive of the total premium paid for Workmen's Compensation Insurance if you reduced your loss experience for on-the-job accidents?

If you know what you are paying for Compensation Insurance and what dividend can be expected by an active aggressive Employee Accident Prevention and Control Program you can classify yourself by the following formula. Forty per cent of the total premium paid can be returned if you have reduced your loss experience through a reduction of on-the-job accidents to employees.

Are you interested in saving $5,000, $15,000, $25,000, $55,000, $105,000, $155,000, $205,000 or $255,000, which is being poured down the proverbial "rat hole" with not even a remote chance of recovery of even a single penny?

WHY, WHAT, AND HOW?

A well planned Employee Accident Prevention and Control Program organized on the basic philosophy and fundamental principles of Industrial Accident Prevention is the start to recovery of this economic loss to school districts all over the United States. Perhaps this stimulates three important questions:

1. Why do school districts need an Employee Accident and Prevention Control Program?
2. What are the approaches used to organize a program?
3. How do we plan a program which will fit the needs of our school district—whether it be small, medium or large?

The answer to the Why! is basically that school districts have a legal and moral responsibility to their employees and the general public they represent.

Primarily, the legal concept of the statutory regulations, establishing a "degree of responsibility" for safety of employees as required by all school boards, superintendents, administrators, supervisors, and foremen, is generally misunderstood and misinterpreted.

Legally, school districts have a greater "degree of responsibility" as they operate under four specific codes: The Education Code, Workmen's Compensation Laws, Labor Code, and various types of safety orders issued by a division of industrial relations or some comparable agency.

The above codes all contain sections which place the "degree of responsibility" on school districts to provide a safe place of employment. Further, they shall include measures to acquaint employees with the hazards of their employment and instructions in safe practices and procedures in performing their work.

The power and statutory responsibility is vested in the school district governing body. They have a moral responsibility to employees and the public to prevent human suffering and waste. They have a civic responsibility to the public to reduce costs to a minimum without jeopardizing the educational program. They can fulfill all of these responsibilities by establishing an Employee Accident Prevention and Control Program.

MORAL, CIVIC RESPONSIBILITY

Endorsement of a program by a governing board or an administrative representative, delegated the "degree of responsibility" to organize the program, is imperative. This statement will assure the rightful status necessary to the success of your program.

The answer to the third question How! evolves around the basic principles and philosophy of industrial accident prevention.

In the organization and planning of your program, consideration should be given to the immediate and long range planning. The immediate approach should be towards direct control of personal performance and environment. The long range approach should encompass training and education.

Basically, the purpose of any accident prevention program is to assist all employees to *recognize*, *evaluate*, and *control* the hazards of the environment in which they *work*, *play*, or *live*. If we review this definition we see that such a purpose involves both on-the-job and off-the-job safety.

EMPLOYEE ACCIDENT REPORTS

You can recognize your hazards by requiring that all employee accident reports be sent to the office of the person delegated the responsibility for employee accident prevention and control.

That office can begin to *evaluate* hazards as to the agency which was the proximate cause of the accident. Analysis of reports will reveal the accident source and the nature of injuries.

The *recognition* of the hazards and the *evaluation* of resultant causes of your accidents will suggest *controls*, which must be established to prevent similar occurrences of the accident.

The above three criteria for the *evaluation* of your immediate program will pinpoint the occupations where you will need to place emphasis in your long range approach to a program of training and safety education.

Experience in accident prevention has shown that we can reduce on-the-job accidents to a fraction of what they were. As school districts why should we not profit and benefit by the experience of Industrial Accident Prevention?

SAFETY IN VOCATIONAL AND INDUSTRIAL ARTS EDUCATION

by J. F. INGRAM

state supervisor, Trade & Industrial Education,
Dept. of Education, Montgomery, Ala.

It was once a rather common thing among educators to ask any man who was a teacher and had a finger missing or a mutilated hand, "Where do you teach manual training?" This question had several implications: (1) that teachers themselves were not good examples of the matter of safety, (2) that the program was one of "training" the hands only, (3) that the program involved unavoidable accidents and (4) all manual training teachers sooner or later met with an accident.

Progress has been made in this respect. There are more better-prepared industrial arts teachers. Industrial arts is now recognized as an educational program which extends much beyond woodworking. More teachers with some industrial experiences are being used, and modern machines and equipment with standard safety attachments are more commonly used.

More emphasis is placed upon safe practices as an integral part of the curriculum as opposed to isolated "courses" in "safety." Industrial arts is recognized as an educational program through which pupils master and apply considerable knowledge while sampling the arts and skills of industry through safe practices.

TEACHING SAFETY WITH SKILLS

There is an important philosophy which must be basic to any functional safety program. In the first place it must be understood that no piece of equipment, process or machine is, itself, dangerous if properly installed, serviced, and/or used. Then one must believe that all accidents can be avoided and all hazards minimized with correct knowledge and practices. Fear of tools, machines, and equipment can and should be displaced with confidence based upon skill and applied knowledge in their use.

Safety must be considered the practice of using the correct tools, machines and equipment to perform work in a correct and safe manner. In other words, safety is "learned by doing" just as any other skills are learned. Safety is taught best with a positive approach—always stressing the safe ways of doing things, using proper tools, machines, equipment, and techniques.

There are many sources of teaching aids and helps in the matter of safety. For instance, the manufacturers of tools, equipment, machines and materials provide some excellent materials on safety which relate to their products. In many instances manufacturers will send safety engineers out to assist in the layout and color schemes which contribute to safety and will teach the instructor safe use of the product.

Modern textbooks for industrial arts now include more and better instructions in safe practices in the school shop. However, too much of it is still negative rather than positive instruction. In the hands of good instructors it can be made very effective.

CASE METHODS OF TEACHING

Teachers must be well-trained and educated in the principles and practices of safety based upon a thorough knowledge of the problems and of the best practices found in industry and business.

A technique which has been quite successful in reducing accidents in industrial school shops has to do with an accident reporting procedure. Immediately after each accident occurs the instructor is required to make a detailed report of all facts concerning it. Then a thorough analysis is made of the causes and detailed statements of how the accident could have been avoided.

These are used by all instructors as supplementary aids in teaching the safe use of machines, tools, or equipment. This is a case method of teaching and points up hazards at the same time showing how to minimize them.

Perhaps the National Safety Council working through its affiliated local councils has done more than any other one single group to make this country safety conscious.

WHAT THE BOY SCOUTS' SAFETY GOOD TURN MEANS TO SCHOOLS AND COLLEGES

DISCUSSION SESSION REPORT

Leadership Team:

Chairman—Donald M. Higgins, director, Health and Safety Service, Boy Scouts of America, New Brunswick, N. J.; Daniel DenUyl, associate professor of Forestry, Dept. of Forestry & Conservation, School of Agriculture, Purdue University, Lafayette, Ind.; Lonnie Gilliland, director, Safety Education, Public Schools, Oklahoma City, Okla.

The 1958 Safety Good Turn Program of the Boy Scouts of America is planned to follow this schedule:

February, 1958—Kickoff in Scout Week —February 7-13.

March, April, and May—Traffic Safety —Each Scout unit takes part in or puts on a project in automotive, bicycle, pedestrian, railroad, or farm equipment safety.

June, July, August—Outdoor Safety— Each unit takes part in or puts on a water, fire, firearms, or farm safety project.

September, October, November—Home Safety—Members of the Boy Scouts of America will deliver a message about family preparedness for emergencies to every home in America. Materials will be furnished and distributed to Scout councils by the Federal Civil Defense Administration. Units will also take part in or put on fire prevention and home safety projects.

February, 1959—National report as part of the Report to the Nation.

The National Council, Boy Scouts of America, has been given the support of many national organizations in planning and organizing the activities of the Good Turn Program. The National Safety Council, as part of its effort, supplied an enrollment card for all delegates to the 1957 National Safety Congress to report their availability to local Scout officials to help carry out the purposes of the Good Turn Program.

These cards, picked up from all sessions of the National Safety Congress, will be routed to the National Council, Boy Scouts of America, and in turn sent to the appropriate local Scout officials for their information in locating professional safety personnel in their communities.

School officials are urged to make personnel and other facilities available to the program whenever this is possible and support it through bulletins, announcements, and other methods consistent with the policies and programs of their schools systems.

Recognition of the Safety Good Turn project and cooperation in its various features can be the basis for activities of student councils, parent teacher organizations, safety councils, and other groups in or related to school affairs.

The cooperation of school faculties and students can be of value to the Good Turn Program in these ways:

1. arranging and conducting exhibits, demonstrations, and assemblies for the project.
2. preparing and disseminating information through various media .
3. assisting in recruiting, training, and selecting speakers who can publicize the Good Turn in the many meetings held daily by civic, social, and commercial organizations.
4. helping to establish the proper educational approach to the program as it is prepared for adults and the various other levels of interest and comprehension.
5. assisting Scout officials to uncover the adult leaders who will cooperate in making the program maximally effective.
6. evaluating and future planning of safety programs, publications, etc.

At the collegiate level, many of the foregoing services of public and private schools will also apply. In addition, there is in existence on many campuses local chapters of Alpha Phi Omega service fraternity which consists solely of former Boy Scouts, many of them of the Eagle or Life Scout class.

This fraternity and other men's and women's service groups cooperate both in campus projects and college community enterprises. Safety has been a project for them in the past. Many of them will undoubtedly welcome the opportunity to cooperate in every possible way with the Boy Scout Safety Good Turn Program in 1958.

I should like to emphasize the importance of making your safety skills and understanding of community service available to the local Scout officials who alone can make the Boy Scout Safety Good Turn program a vital force in American life today and in the future.▲

SAFETY THROUGH PHYSICAL EDUCATION

INTRODUCTION BY HOMER ALLEN

associate professor, Physical Education, Purdue University, Lafayette, Ind.

This subject means "Safety in other activities, now and later, as a result of having participated in a well conceived program of physical education." In other words, many of us who have been working in the whole area of physical education feel that a well balanced training program will be conducive to fewer accidents and injuries in *any* type of physical activity.

We know in the average school, either at the elementary or secondary level, about one third of the accidents and injuries occur in the gymnasium or on the playground. We accept this fact as almost inevitable, due to the physical activities involved in these areas.

On the other hand, at least one-half of these accidents are the result of:

A. Poor facilities and/or equipment

B. Overcrowded classes or groups

C. Poor supervision

The following questions might lead to some interesting and fruitful discussion:

1. What kinds of physical activities are suitable to children of various age groups? Can we specifically list certain activities in which an average child of a certain age may be expected to participate with a minimum risk of having an accident?

2. How strong, physically, should a child be to indulge in a specific activity?

3. Can we measure strength, or stamina, or a combination of the two, in an average school child?

4. Does strength, as such, determine ones fitness to participate in a physical activity?

5. Does the average person, (child or adult) consider his physical fitness in relation to: ability to participate or susceptability to an accident, in a specific activity?

6. Does physical fitness contribute to: coordination, skill, suppleness, awareness of ones physical limitations or personal safety?

I have from time to time composed what has laughingly been referred to as poetry. In the following verses I stress a few aspects of attaining safety through physical education.

To introduce my subject in a rythmic sort of way
Might add a little sparkle to the things I want to say.
For safety in the gym or on the playground or the pool
Can certainly be bettered in your home town public school.

We talk of training children in the skills of many sports.
We let them play on floors and fields and even tennis courts.
But do we give them training to develop strength of heart
And of all the other muscles which they need to do their part?

Small wonder that a youngster shies away from active stuff
If he knows he cannot take it when the going gets too rough.
For a bump upon the noggin, or a twisted leg or neck
Puts him on the shelf completely as an un-heroic wreck.

To those of us who've tried at times to practice what we preach,
Abolishment of accidents is not beyond our reach.
But it takes a lot of planning, and practice, every day
To make our children really safe and keep them fit for play!

An Analysis of Graduate Theses in School Safety In the United States from 1925 to 1950

by CHARLES PETER YOST

Ph.D., Thesis, University of Pittsburgh, Pittsburgh, Pa.

BACKGROUND OF THE PROBLEM

Numerous people have conducted research for the purpose of making our nation a safe place to live. Some research has been done by graduate students in partial fulfillment of an advanced degree, and has been concerned with presenting feasible plans of school safety. Very little has been done, however, to organize and classify the findings of graduate theses in school safety for functional use by school personnel. Rather than have the findings of these studies scattered throughout the United States it was believed that an accumulation of findings, located in one source, would provide a means by which school personnel could *better understand various facts, practices,* procedures, and policies regarding school safety, and hence initiate or conduct efficient programs in school safety.

The problem for study was to systematically identify and analyze masters' theses and doctoral dissertations in school safety as a *basis for identifying acceptable policies,* practices, procedures and instructional information in school safety for functional use by school personnel.

METHOD OF PROCEDURE

An examination of theses' titles in bibliographical references and in information received from leaders in the field of safety education revealed that 307 graduate theses had possible bearing upon school safety. Through inter-library loans 298 (97 per cent) of these studies were obtained for analysis purposes.

In analyzing the graduate theses, these questions were asked: (a) Was each study a graduate thesis or a "seminar report"? (b) *Did each study* have direct bearing upon school safety as *defined* for study purposes? and (c) Did each study meet the evaluative criteria developed for study purposes? The criteria were developed through the jury technique and were primarily concerned with ascertaining the scientific accuracy of each obtained graduate thesis. The above three steps were utilized in determining those these which could be used for purposes of the study. In applying these *steps to the obtained studies, it was found* that nine studies were not graduate theses (as indicated in bibliographical listings) but were "seminar reports"; ten did not have direct bearing upon school safety; and 13 failed to meet the evaluative criteria established for study purposes. This left a total of 266 graduate theses which could be used for study-purposes.

Further analysis of the useable studies involved noting various descriptive characteristics *including the years and institutions* when and where studies were completed, the degrees for which they were submitted, the research methods involved, the grade levels for which the studies were primarily concerned, the general topical emphasis, and the geographical areas where the studies were conducted.

Findings of the useable studies were analyzed and classified for functional use by school personnel by formulating various major topics and subtopics emerging from the graduate theses themselves. These major topics included "The General School Safety Program," "Safety in Athletics, Physical Education, and Recreation," "Safety in School Shops," and "Traffic Safety." For each major topic various policies, practices, and procedures were formulated. The conclusions are in outline forms as follows:

SELECTED CONCLUSIONS

1. *Identification and Descriptive Characteristics of Graduate Theses in School Safety.*
   a. No single source was available to identify graduate theses in school safety. Bibliographical listings were erroneous in some instances, and titles of graduate theses were sometimes misleading.
   b. The scholarly research effort reached its peak in 1940 and 1941 when almost one-fourth (24.8 per cent) of the studies were produced. The majority of the studies met recognized research standards.
   c. Sixty-three different colleges and universities produced a total of 266 graduate theses. Over three-fourths (78.5 per cent) satisfied requirements for a master's degree. Iowa State Teachers College produced the most masters' theses (17 or 7.9 per cent) while New York University produced the most doctoral dissertations (27 or 57.4 per cent). The single institution producing the most graduate theses was New York University (38 or 14.3 per cent). In regard to institutions producing the most graduate theses in various areas of school safety, New York University with 21 studies led in the area of "General School Safety Program"; New York University with ten studies also led in the area of "Safety in Athletics, Physical Education, and Recreation"; The Stout Institute with six studies led in the area of "Safety in School Shops"; and Purdue University with nine studies led in the area of "Traffic Safety."
   d. The normative-survey type of research has extensive use (used in 214 instances or 80.5 per cent). Of particular significance was the small number of experimental studies (32 or 12 per cent). The greatest percentage of experimental studies in any one area of school safety was in the area of "Traffic Safety."
   e. The most commonly used techniques for collecting data include "literature survey," "questionnaire," "group testing," "observation," and the study of "accident reports." The use of the questionnaire by writers of doctoral dissertations was generally accompanied by collaboration (jury).
   f. The majority of graduate theses dealt with safety at the secondary school level. School safety at the college level received major emphasis in 19 (7.1 per cent) studies.
   g. Graduate theses in school safety were concerned with safety in various areas. The topical emphasis of "General School Safety Program" received the greatest stress. "Farm Safety" received the least emphasis.
   h. The Midwest District of the American Association for Health, Physical Education, and Recreation was the geographical area where the most graduate theses (77 or 28.9 per cent) were produced.
   i. The topic of evaluation was given little emphasis.
   j. Graduate theses primarily listed as the cause of accidents the last acts of individuals involved. Personal factors were scarcely recognized as causes.
   k. From 1925 to 1941 courses of study were favorite topics for graduate theses. These studies followed the principles of general curriculum construction.
   l. The idea that "a program of safety education is essentially a local problem and must be dealt with accordingly" was quite pronounced in graduate theses which proposed safety programs for a specific school or community.

2. *History and Philosophy of School Safety.*
   a. No one time or place can be designated as the beginning of school safety. Limited evidence in the area of "Traffic Safety" indicates that driving instruction began in the early 1930's. Early safety instruction in the schools was received as relatively unimportant subject matter until the public realized the fact that accidents were taking the lives of numerous school-age children.
   b. Accidents have become the leading cause of death and disability in school-age boys and girls. However, this is not the primary cause for school safety. Safety is a fundamental life condition and therefore has a place in the school curriculum.
3. *Findings of Graduate Theses in School Safety in Various Areas.*
   a. *"GENERAL SCHOOL SAFETY PROGRAM."*
      (1) The organization and administration of school safety varied. Safety instruction through emphasis in established subjects, as a separate subject, through pupil safety organizations, through homeroom periods, or through "incidental" instruction were the methods used or advocated. There are many courses in the school curriculum in which safety can be correlated. No evidence could be found to indicate that safety education objectives could be achieved better by correlation than by offering safety as a separate subject.
      (2) Safety instruction lends itself to a variety of teaching methods. The choice of any one method is dependent upon available materials, the needs and interests of pupils, the time element, and local factors. Thus, no one method is best.
      (3) Although positive instruction has become popularized in safety instruction, no objective basis for the current interdict against negative forms exists. There is very limited evidence which suggests that negative language forms exists. There is very limited evidence which suggests that negative language forms are slightly more effective than positive forms.
      (4) Analysis of pupil activities, and the studying of where, when, how, and why accidents occur seem to offer the best means for selecting subject matter content. It is essential that all accidents be reported and that accident reports be used as constructive devices in improving the school safety program.
      (5) The widespread use of school safety patrols, particularly street safety patrols, is indicative that school authorities were receptive to modern educational philosophy which stresses "learning by doing," and "developing good citizenship qualities." Although non-school authorities sometimes had the responsibility of supervising patrol members it must be borne in mind that safety patrols should be under the direct supervision of school authorities.
      (6) A high degree of compatibility exists between the objectives of safety education and the objectives of general education.
      (7) Failure to assign major responsibility for the organization, direction, and supervision of the school safety program to one individual may handicap the program so severely that its success will be hampered. The title assigned to this individual may be supervisor, director, consultant, coordinator, or any other title which concurs with local administrative policies.
      (8) Schools can scarcely realize successful safety programs without enlisting the aid of outside organizations and agencies interested in promoting safety. It is highly essential that attention be given to coordinating the efforts of these organizations and agencies otherwise unnecessary and wasteful overlapping or duplication might occur thereby preventing maximum results. A careful check should be made to determine if services extended by such organizations or agencies are worthwhile and educationally sound.

      (9) An important phase of the school safety program is the provision and maintenance of a safe school environment. All school personnel must do their part in keeping the buildings and grounds in safe condition. This entails periodic inspections and good housekeeping.
      (10) Safety is a dominant factor that must be given the utmost consideration in the transportation program of any school. Essential safety features in pupil transportation include safe buses, competent bus drivers, safe transportation routes, legislation governing the actions of motorists who approach school buses stopped to load or discharge pupils, a safety education program regulating pupil conduct upon entering the bus while riding the bus, and when leaving the bus, and sound business practices.
      (11) Although fire safety is intensified during Fire Prevention Week, the nature of the school fire problem necessitates that year-round instruction be offered. A desirable program in school fire safety includes a safe school environment, standard rules and regulations, instruction in fire prevention and fire protection, fire drills, and cooperative community action.
      (12) Aside from the instructional program of first aid, first aid materials must be available in the school and a qualified person to administer first aid to injured persons.
      (13) Teacher education colleges have lagged far behind the needs of public school in the preparation of safety teachers. The development of college training programs had been retarded by the failure of state and local educational authorities to give deserving recognition to safety education. By 1940 only 23 states had direct or indirect statutory legislation requiring the teaching of safety, and few of these states designated the amount of time to be spent on safety instruction. Until school authorities demand that teachers be qualified, colleges and universities cannot be expected to offer safety courses, nor can teachers be expected to take available courses.
      (14) In the absence of a statute, the prevailing principle of law is that a school district or a school board is not subject to liability for pupil injuries. Individual school employees, however, are subject to liability for pupil injuries, if negligence can be shown. School employees should be familiar with the principles of liability as a means of protection for themselves and the school. Proper application of the knowledge concerning legal liability not only aids to avoid liability but helps to establish precautionary measures which safeguard the welfare of the pupils.
   b. *"SAFETY IN ATHLETICS, PHYSICAL EDUCATION, AND RECREATION."*
      (1) Many activities in the areas of athletics, physical education, and recreation are hazardous in nature, but the element of danger and adventure makes the activities intriguing and alluring. Many accidents which occur, however, are not due to the inherent dangers which are a part of the activities. Over 50 per cent of the accidents are due to improper facilities, equipment and poor leadership.
      (2) Football causes more deaths and injuries than any other interscholastic activity, but the dangers in football have been greatly exaggerated. "Tackling," "blocking," and "being tackled" were most often listed as actions producing injuries. Fewer football injuries occurred among teams who played opponents "in their own class."
      (3) Insurance companies were initially reluctant to enter into the athletic insurance movement. Many state high school athletic associations developed their own plans to meet the cost of athletic injuries. Limited evidence suggests that athletic injuries receive better care when insurance covers the cost of treatment.

(4) It is quite natural to expect injuries in those activities in which body contact is involved.

(5) Physical examinations are essential for pupils participating in physical activities.

(6) "Constant supervision and instruction" and "frequent inspection of all apparatus and equipment" are the chief essentials of playground safety.

(7) Camping and outing activities have become an integral part of the total school program. Increasingly, colleges and universities are requiring leadership courses for students majoring in recreation or physical education.

c. *"SAFETY IN SCHOOL SHOPS."*

(1) Industry aided school personnel in building programs of safety in school shops. Although industrial assistance provided for building safety programs it does not follow that strict industrial standards are wholly applicable in appraising local school shop conditions.

(2) Methods of safety instruction in shops vary, and no one best method has yet been developed. Highly regarded methods were demonstration in the proper use of tools and machines, and the use of safety rules.

(3) The grade or age level for use of different machines in school shops rises in accordance with the degree of danger associated with each machine. Basically a student should not be granted permission to use any machine until he is 100 per cent informed regarding its use.

(4) "Pupil carelessness" was most often listed as the leading cause of school shop accidents. It is essential that shop instructors closely observe students for signs indicating unsafe practices; undue haste on the part of students should particularly be observed.

(5) Machine guarding, inspection of tools and machines, provision of personal protective equipment, maintaining good housekeeping practices, administering physical examinations, and a program of safety instruction are essential features of a shop safety program.

(6) Teacher training institutions were deficient in setting good examples for prospective shop teachers.

d. *"TRAFFIC SAFETY."*

(1) Although early research studies emphasized the importance of faulty attitudes as a major underlying cause of traffic accidents, it was not until the 1940's that much needed research in measuring driver attitude was reported.

(2) It is difficult to attribute traffic accidents to one specific circumstance or cause. The human factor (the inability of individuals to exert self-control and follow safe practices) is undoubtedly the major cause of traffic accidents.

(3) Traffic courts which hand down punishment in the forms of fines or short-term confinements do very little to correct faulty driving attitudes. Of more importance are traffic violator schools which aim at the correction of faulty attitudes.

(4) In driver education courses, those items pertaining to the driver's attitude should receive the most emphasis that time and circumstances allow. Whenever possible, both classroom and practice driving instruction be offered in accordance with state department of education rulings.

(5) Programs of high school driver education have gained public support. In some states students completing a high school driver education course are excused from all or part of the state examination for an operator's license.

SELECTED RECOMMENDATIONS

1. All prospective teachers should receive a general course in safety education.
2. Each school system should appoint one individual who: (a) coordinates safety activities within the school; (b) coordinates the efforts of community organizations and agencies interested in promoting school safety.
3. Safety instruction should be part of all academic subjects in which there is evident relationship. Specific courses in driver education should be included in the curricula of all secondary schools.
4. Directors of educational research at our colleges and universities should encourage graduate students to do research in the field of school safety. Actually, one must consider this field as still in its infancy especially in comparison to the number of graduate theses produced in other fields. For example, from 1930 to 1946 over 3,000 masters' theses and 420 doctoral dissertations were produced in the field of Health, Physical Education, and Recreation.
5. In pursuing this study it appeared that further studies were needed in order to allow for more efficient school safety programs. Recommended for future study are the following topics:
   a. The ways and means through which home and farm safety education can be promoted.
   b. Present practices and methods used to insure safety in specific areas (school shops, athletics, traffic, etc.).
   c. The values of one particular method of safety instruction as compared to another method of safety instruction.
   d. Accident experiences in schools having accident insurance plans.
   e. Whether court rulings on school liability hinder or promote safety activities.
   f. Pupil safety organizations which function at the college level.
   g. Uses of various terms designated as causes of accidents.
   h. The extent to which community organizations and agencies cooperate with the school in developing and promoting safety education.
   i. The kind and amount of safety instruction for handicapped pupils.
   j. The effect of legislation for school safety.
   k. The status of teacher certification in safety education.
   l. Safety practices in college dormitories.
   m. The techniques used to solve pedestrian problems in specific cities.
   n. The practices regarding the employment of bus drivers in the various states.
   o. The development of criteria to evaluate the school program, or any part thereof.

EFFECTS OF DRIVER EDUCATION ON DRIVER KNOWLEDGE, ATTITUDES IN SECONDARY SCHOOLS

by BERNARD L. LOFT

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The purpose of this study was to consider the effects of a high school seniors' driver education course essentially to discover differences in driving knowledge and attitudes between students who completed a driver education course and students without training in driver education. A further analysis determined differences between the groups with regard to students' accidents and violations.

The 14 high schools investigated were selected from high schools in Indianapolis and Marion county, Indiana on the basis of their offering a two-part program—classroom and behind-the-wheel instruction.

A personal interview was conducted with faculty members of both classroom and behind-the-wheel instruction at each school to determine the school's status based on standards established by the National Com-

mission on Safety Education of the National Education Association. The collected data were then placed on a master chart for further analysis.

Selection of the two testing instruments was determined for their adaptability to the trained and untrained student drivers. The Siebrecht Attitude Scale was used to measure driver attitudes considered significant in the attitude scale: passing situations on curves and hills, the privilege of driving, traffic regulation, enforcement, condition of the vehicle, accident responsibility, speeding, cooperation, license examination for drivers, courtesy and consideration, condition of the driver, knowledge, and skills.

CHECKED DRIVING COMPREHENSION

The American Automobile Association's general test on Traffic and Driving Knowledge was used to determine the students' understanding of traffic and driving problems. This test consisted of 25 multiple response questions with emphasis on those elements of traffic safety that should be familiar to all drivers.

The two tests were administered to a total of 2,442 senior students. In addition, a personal data sheet was completed by each student giving sex, age, frequency of driving, and other pertinent information.

In administering the tests the investigator adhered to standardized procedures at each of the schools. Initially, all the students were told the purpose of the study and the value of their contribution in completing the Siebrecht Attitude Scale. Then the General Test on Traffic and Driving Knowledge was explained in detail. The investigator emphasized the necessity for all students to do their best.

In the final analysis, only those students with a valid driver's license were included in the study. Of the 2,442 who completed the two tests, 1,607 were subjects for the study.

Records of the 1,607 students in the Indiana Bureau of Motor Vehicles, gave data on the number of automobile accidents and traffic violations. This information, along with the results of the General Test and Siebrecht Attitude Scale was transferred to IBM punch cards.

A total of 4,884 punch cards was prepared, two cards for each student. The final sample was reduced to 3,214 cards for the 1,617 students with valid driver's licenses. There were 491 males with driver education and 316 untrained males. The female students totaled 560 with driver education and 240 without.

Mean scores and standard deviations were computed for the General Test of Traffic and Driving Knowledge and the Siebrecht Attitude Scale for each of the following categories:

Boys, driver education, non driver education, both combined; *Girls*, driver education, non driver education, both combined; *Boys and girls*, driver education, non driver education, both combined.

Using critical ratio as a statistical measure, differences between the means on the General Test and the Siebrecht Attitude Scale were analyzed at the five per cent level of confidence to determine if the populations of students displayed similarities or differences.

The variable factors were then compared in all possible combinations for related or unrelated tendencies by using the Chi Square technique at the five per cent level of confidence. A total of 40 Chi Square values was computed for boys and girls classified as driver education and non driver education in the following comparisons:

1. Frequency of driving and driving knowledge test scores
2. Frequency of driving and attitude scale scores
3. Frequency of driving and traffic violations
4. Frequency of driving and traffic accidents
5. Knowledge test scores and number of traffic violations
6. Knowledge test scores and attitude scale scores
7. Knowledge test scores and number of traffic accidents
8. Attitude scale scores and number of traffic violations
9. Attitude scale scores and number of traffic accidents
10. Number of traffic violations and number of traffic accidents

Frequency of responses by percentages on the Siebrecht Attitude Scale was included in the study to compare the driver education and non-driver education students on attitudes.

FINDINGS FROM THE STUDY

On the basis of this study the investigator makes the following findings:

1. Nine of the 14 schools scheduled driver education on the same basis as other subjects in the high school curriculum.

2. All the participating schools included classroom and behind-the-wheel instruction for students from 15½ to 16 years old.

3. Academic credit ranging from one-sixth to one credit was awarded upon satisfactory completion of the course in 11 schools.

4. With one exception, driver education instructors in the schools were certified in secondary education.

5. One or more instructors in each of the 14 schools completed professional preparation in driver education.

6. Classroom instruction ranged from 15 to 45 hours, with only four schools offering the recommended standard of 30 hours or more.

7. Behind-the-wheel instruction in the 14 schools ranged from two to 10 hours, with four schools offering eight to 10 hours of supervised road instruction.

8. Classroom instruction was established as a separate course for one semester in 10 of the schools.

9. Classroom enrollment at eight schools was comparable to the other academic areas.

10. Behind-the-wheel instruction of one period a week for a full semester was the practice at 10 schools.

11. All the schools used a driver education textbook and supplementary classroom study materials.

12. Dual control cars were obtained by the 14 schools on a loan agreement from local dealers.

13. A testing procedure for evaluating student progress was used in all 14 schools.

14. The mean score for 560 driver education girls on the knowledge test was 79.10 with a standard deviation of 12.64.

15. The mean score for 560 driver education girls on the attitude scale was 161.15 with a standard deviation of 14.86.

16. The mean score for 240 non-driver education girls on the knowledge test was 77.00 with a standard deviation of 12.24.

17. The mean score for 240 non-driver education girls on the attitude scale was 159.77 with a standard deviation of 16.67.

18. A comparision of the 560 trained and 240 untrained girls on the knowledge test and attitude scale produced differences in means of 2.10 and 1.38 respectively, in favor of the driver education girls.

19. Driver education boys, numbering 491, had a mean score of 77.55 and a standard deviation of 11.45 on the knowledge test.

20. The mean score for 316 non-driver education boys on the knowledge test was 76.70 with a standard deviation of 16.43.

21. Driver education boys, numbering 491, had a mean score of 154.94 with a standard deviation of 18.38 on the attitude scale.

22. The mean score for 316 non-driver education boys on the attitude scale was 154.07 with a standard deviation of 16.79.

23. A comparison of 491 trained and 316 untrained boys on the knowledge test and attitude scale yielded differences in the mean scores of .85 and .87 respectively.

GIRLS BETTER DRIVERS THAN BOYS

24. Trained and untrained girls combined were superior on the knowledge test when compared with the driver education and non-driver education boys. There was a mean score of 78.42 and a standard deviation of 12.56 for the girls in contrast to a mean score of 77.22 and a standard deviation of 13.63 for the boys.

25. A comparison of the non-driver education boys and non-driver education girls yielded a critical ratio of .2463. Thus, there was little difference between the groups on mean scores for the knowledge test.

26. A comparison of the means on the knowledge test scores for driver education and non-driver education girls favored the trained girls with a critical ratio of 2.1981 at the five per cent level of confidence.

27. At the five per cent level of confidence, an obtained critical ratio of 2.2470 for the difference between the means indicated

the superior driving knowledge of driver education girls as compared to non-driver education boys.

28. Driver education girls were superior in knowledge when compared with the driver education boys. This is revealed by a critical ratio of 2.0830 for the difference between the means on the knowledge test at the five per cent level of confidence.

TRAINING SHOWED RESULTS

29. The difference between the means on the attitude scale for the boys and girls with driver education and the untrained boys and girls yielded a critical ratio of 6.1123, indicating better driver attitudes for those who completed a driver education course.

30. There was no great difference in the means of the attitude scale scores of driver education and non-driver education girls. A critical ratio of 1.9303 was just slightly in favor of the trained girls.

31. The driver education girls had significantly better attitudes toward driving than the driver education boys. The difference between the means on attitude scale yielded a critical ratio of 5.9654 at the five per cent level of confidence.

32. The driving attitudes of non-driver education girls were significantly more desirable than those of non-driver education boys as was reflected by a critical ratio of 5.6716 at the five per cent level for the differences in the means of the two groups.

33. A critical ratio of 4.0596 indicated that non-driver education girls disclosed better attitudes toward driving in comparison with the combined group of non-driver education boys and girls.

34. Driver education and non-driver education girls with high driving frequencies scored high on the attitude scale.

35. Driver education girls with high driving frequencies were involved in the fewest traffic violations.

36. Non-driver education girls having high driving frequencies were involved more frequently in traffic violations.

37. Driver education and non-driver education girls with high driving frequencies were involved in the fewest traffic accidents.

38. Driver education and non-driver education girls with high scores on the driving knowledge test were charged with the fewest traffic violations.

39. Non-driver education girls with high scores on the driving knowledge test also produced similar scores on the attitude scale.

40. Driver education an non-driver education girls with high driving knowledge test scores were involved in the least traffic accidents.

41. Non-driver education girls having scored high on the attitude scale were involved in a smaller number of traffic violations.

42. Untrained girls with several traffic violations were also found to have the higher number of traffic accidents.

43. Driver education and non-driver education boys with high driving frequencies were involved in the fewest traffic accidents.

44. Driver education and non-driver education boys with high driving frequencies scored favorably on the driving knowledge test.

45. Non-driver education boys with high driving frequencies were involved in the least traffic violations.

46. Driver education and non-driver education boys with desirable scores on the driving knowledge test were involved in the least traffic violations.

47. The relationship between attitude scale scores and traffic violations revealed that the non-driver education boys with high attitude scale scores were involved in a relatively small number of traffic violations.

48. Driver education and non-driver education boys having scored on the attitude scale had only a few involvements in traffic accidents.

49. The frequency of responses for 1,607 driver education and non-driver education boys and girls on the Siebrecht Attitude Scale revealed that boys and girls with training in a two-part driver education course consistently responded in conformity with the established responses.

CONCLUSIONS OF STUDY

● Boys and girls having completed a two-part course in driver education possess desirable attitudes toward driving and adequate traffic and driving knowledge.

● Driver education is particularly advantageous to girls in their acquisition of traffic and driving knowledge.

● Boys and girls without training have a similar understanding of traffic and driving knowledge.

● Attitudes related to driving responsibility are not materially affected by a driver education course for girls.

● Girls without training have established a relatively safe driving record.

● Driver education courses should consist of specific learning experiences for boys so that attitudes and adequate knowledge be a realistic outcome of such a course.

● Driver education is influential in reducing accidents and traffic violations for teenage drivers.

● Students in driver education should be required to take a screening test at the beginning of the course to determine their needs.

AUTHOR'S RECOMMENDATIONS

Based on the findings, the investigator recommends that:

1. The administrator and a faculty committee periodically evaluate the driver education program to ascertain the quality of instruction in all phases of the program.
2. The evaluation be based on the objectives listed by the National Commission on Safety Education of the National Education Association.
3. Driver education instructors place more emphasis on the development of desirable attitudes through both the classroom and behind-the-wheel instruction.
4. High school students possessing a driver's license but who have not completed a driver education course be encouraged to enroll in such a course.
5. Greater emphasis be placed on proper reactions when confronted with an emergency driving situation.
6. Additional behind-the-wheel instruction periods be scheduled for the boys.
7. Instructors of driver education refer to this study for information concerning factors considered to be important in efficient automobile driving.
8. The findings in this investigation be used by the sample schools in Indianapolis and Marion county as a partial evaluation of their driver education programs.
9. Schools administrators and driver education instructors in Indiana familiarize themselves with these findings prior to a revision of their driver education programs.
10. The results of this investigation be compared with the reports of the American Automobile Association in Chapter I concerning the effectiveness of driver education in various locations throughout the United States.
11. The findings of this study be used in teacher preparation courses to familiarize prospective driver education instructors concerning the significance of traffic and driving knowledge and desirable attitudes as related to driving frequency, traffic violations, and traffic accidents.
12. The State Department of Public Instruction consider a follow-up study with a state-wide survey to determine the effectiveness of driver education for the state of Indiana.
13. A study be made to evaluate the quality of instruction as related to the number of hours for classroom and behind-the-wheel instruction.
14. A study be made to determine if driver education courses should have any different content and/or methodology for girls and/or boys.
15. A study be conducted to provide data as to course content and procedures for high school students who have previously mastered some of the driving fundamentals.
16. A study be made to show how driver education courses may be organized and presented to provide adequate attention to developing desirable attitudes.
17. The findings in this study along with further research be directed at deter-

mining the extent to which responses on attitude tests are deflected in actual driving practices.

18. A study be made to determine the extent to which undesirable attitudes may be the direct cause of automobile accidents.
19. A standardized knowledge test be constructed which would be consistent with the standards established by the National Commission on Safety Education of the National Education Association.
20. A study be made to determine the special problems of teen-age drivers as indicated by traffic violations and accidents.
21. A study be made to determine the effectiveness of driver education by means of a pre-test and post-test of driving attitudes and driving knowledge.

RELATIONSHIP BETWEEN DRIVING RECORDS, SELECTED PERSONALITY CHARACTERISTICS AND BIOGRAPHICAL DATA OF TRAFFIC OFFENDERS AND NON-OFFENDERS

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In this, the concluding chapter, are presented:

1) a synopsis of methods employed in arriving at an answer to each of the four sub-problems posed in this study, along with a summary of the findings of each,

2) those conclusions which appear warranted on the basis of data revealed and statistical measures obtained, and

3) recommendations pertinent to the application of findings of this study, to the establishment and operation of driver improvement clinics, and to further research into driving performance.

The purpose of this investigation was to determine what personality characteristics and biographical data differentiate motor vehicle traffic offenders from non-offenders, and to relate any such differences to records of their driving performance. The solution to this problem was determined by answering the following four sub-problems:

1) What personality characteristics, as revealed by responses to the *Thurstone Temperament Schedule*, distinguish offenders from non-offenders;

2) What biographical data, as revealed by the subjects in planned interviews, distinguish offenders from non-offenders;

3) What personality characteristics and biographical data, individually and in combinations, are most significant for purposes of distinguishing offenders from non-offenders; and

4) How can these statistically significant scores of personality characteristics and biographical factors be related to the actual occurrence of accidents and violations?

TWO GROUPS STUDIED

The populations studied consisted of an Experimental Group of 763 traffic offenders who were resident motor vehicle operators of New Jersey and who had accumulated three or more traffic accidents and/or moving traffice violations since December 31, 1949. A Control Group of 195 resident motor vehicle operations of the same state whose driving records were free of accidents and violations during this same period was used.

The Control Group was equated to the Experimental Group in terms of estimated annual mileage driven, this item of information being obtained through a specially prepared questionnaire. These subjects appeared at the New Jersey Traffic Accident Prevention Clinic in Trenton over a 22-month period ending August 31, 1955.

In answer to the first sub-problem posed in this investigation; i.e., "What personality characteristics as revealed by responses to the *Thurstone Temperament Schedule*, distinguish offenders from non-offenders, statistically significant difference were found on three of the seven areas of this test device. Subjects of the Experimental Group were found to rate higher on the Impulsive and Sociable Scales, but lower on the Reflective Scale, then the Control subjects.

In analyzing biographical data obtained during the planned interview for purposes of the second sub-problem; i.e., "What biographical data, as revealed by the subjects in planned interviews, distinguish offenders from non-offenders," statistically significant differences were found on eight of the 13 categories investigated. The categories in which differences this great were obtained are: 1) age, 2) marital status, 3) education, 4) driver education indicated, 5) annual salary, 6) present occupation, 7) job turnover, and 8) reasons indicated for terminating employment.

EXPERIMENTAL GROUP TRAITS

The Experimental Group was characterized by younger, unmarried individuals. A greater proportion of this group had failed to complete high school or college and few were engaged in the professions or in managerial or official capacities. Moreover, they reported smaller earnings, higher job turnover, and termination of previous employment for reasons other than self improvement. More of the Experimental population indicated driver education; however, no investigation was made into the types or quality of this experience.

In determining the answer to the third sub-problem; i.e., "What personality characteristics and biographical data, individually and in combinations, are most significant for purposes of distinguishing offenders from non-offenders," the multiple cutoff method was employed. This technique necessitated the establishing of a critical score for each of the three statistically significant areas of the test device and for the sum of statistically significant biographical information.

Once these critical scores had been established, test and biographical data for each subject were assessed to determine the number in each group who would achieve a critical score on one or more of these areas. It was found that critical scores on the Impulsive Scale and on the Sociable Scale of the *Thurstone Temperament Schedule* in combination with a critical score on the sum of statistically significant biographical data provided maximum separation of the groups.

WELL-ADJUSTED—BETTER DRIVERS

The fourth sub-problem; i.e., "How can these statistically significant scores of personality characteristics and biographical factors be related to the actual occurrence of accidents and violations," was approached by selecting individuals of the Experimental Group who were likely to be representative of extremes of adjustment as indicated by test and biographical data. Subjects achieving a critical score on each of the four areas were considered as "well-adjusted," while subjects failing to achieve a critical score on any one of these areas were considered as "poorly-adjusted" for purposes of this phase of the investigation.

The "well-adjusted" group consisted of 24 subjects, each of whom achieved a critical score on each of the four areas. The "poorly-adjusted" group consisted of 112 subjects, each of whom had failed to achieve a critical score on any one of the four areas. Each of these two sub-groups then was compared with 1) the remaining members of the Experimental Group, and 2) with the other sub-group, in terms of their driving records as indicated by accident and violation experience.

The "well-adjusted" group was found to have a better overall driving record than either the "poorly-adjusted" group or the remaining members of the Experimental Group from which they were drawn. The "poorly-adjusted" group, conversely, exhibited a poorer driving record than either of the other two groups.

As an adjunct to the main portion of this investigation, 63 subjects, each of whom indicated a driving experience of 50,000 or more miles per year, were compared to the Experimental Group in terms of 1) test data, 2) biographical data, and 3) accident and violation data.

Members of this High Exposure Group were found to be more vigorous, more impulsive, more sociable, and less reflective than were members of the Experimental Group.

BIOGRAPHICAL INFORMATION

On items of biographical information, statistically significant differences were obtained between the groups on 1) job turnover, 2) present occupation, 3) annual salary, and 4) type(s) of vehicle(s) driven. Members of the High Exposure Group were found to have a higher rate of job turnover and higher annual earnings than members of the Experimental Group. Moreover, as might be expected, a large proportion of these high exposure subjects were professional chauffeurs or driver salesmen who drive various types of equipment in addition to passenger vehicles.

Inspection of driving records revealed the High Exposure Group to have a violation history considerably poorer than that of the Experimental Group; however, their accident experience actually was better than that of the Experimental Group.

On the basis of 1) data revealed during the planned interviews with each subject, 2) responses to each of the seven areas of the *Thurstone Temperament Schedule*, and 3) in the case of the Experimental and the High Exposure Group of offenders, traffic accident and violations records, the following conclusions seem warranted.

For purposes of distinguishing traffic offenders from non-offenders, impulsive, sociable, and reflective traits, as measured by the *Thurstone Temperament Schedule*, appear to provide for such differentiation, the offender group rated higher on impulsive and sociable, and lower on reflective than the non-offender group. However, the active, vigorous, dominant, and stable traits, as measured by the *Thurstone Temperament Schedule*, do not appear to be of value in distinguishing traffic offenders from non-offenders.

EIGHT VALUABLE ITEMS

The following items of biographical information appear to be of value for purposes of distinguishing traffic offenders from non-offenders: 1) age, 2) marital status, 3) education, 4) driver education indicated, 5) occupation, 6) number of positions held during the five-year period preceding examination, 7) reasons for terminating previous employment, and 8) annual salary.

The categories of biographical data which do not appear to be of value for purposes of distinguishing between traffic offenders and non-offenders are: 1) number of children, 2) languages written, 3) hospitalization, 4) types of vehicles driven, and 5) nature of driving experience.

The following combination of personality traits, as measured by the *Thurstone Temperament Schedule*, and biographical data appears to be of most value for purposes of distinguishing traffic offenders from non-offenders: Impulsive and sociable traits in combination with the biographical items of age, marital status, education, driver education indicated, occupation, number of positions held during the five-year period preceding examination, reasons for terminating previous employment, and annual salary.

The traffic accident and violation records of well-adjusted traffic offenders, as identified by a combination of test and biographical data, are likely to be superior to the records of poorly-adjusted traffic offenders as identified by the same criteria. Also, the driving records of these well-adjusted individuals are likely to be better than the records of traffic offenders who are considered neither well-adjusted nor poorly-adjusted. Driving records of poorly-adjusted traffic offenders, on the other hand, are likely to be worse than those of either of the other groups.

MILEAGE DOESN'T EFFECT ACCIDENTS

From a comparison of the driving records of traffic offenders whose driving experience was less than 50,000 miles per year with those whose driving experience was in excess of this amount, it appears that annual mileage has little effect on accident experience, but that violation experience seems to increase with driving exposure.

With the traffic problem as acute as it is, those active in traffic accident prevention

efforts may be interested in possible application of the findings of this investigation. Therefore, the following recommendations are presented for consideration:

- That those items of a biographical nature which were revealed to be statistically significant be among those items included on application forms for prospective drivers and license applicants. The purpose here would be, not that of selection, but the identification of individuals toward whom further investigation might be indicated. Likewise, it may be well to include these items on periodic inventories administered to driver personnel.
- That those areas of the *Thurstone Temperament Schedule* which were revealed to be statistically significant be included among the devices used in screening applicants for licenses or for positions as drivers with commercial, business, or industrial establishments. These areas of the test device may well prove of value with in-service drivers, and with traffic offenders as well, in assessing selected personality traits as an aid in establishing refresher and remedial activities.
- That the questionnaire on estimated driving experience, developed for purposes of this study, be used in an effort to obtain reliable estimates of driving experience among motoring populations.

IDEAS FOR DRIVER CLINICS

Since it is expected that several of the states will move in the direction of establishing clinics for driver improvement purposes, the following recommendations are advanced for the perusal of those individuals and groups interested in such activity. These recommendations, which are based upon 1) observations of clinic operation during the conduct of this study, and 2) a review of the literature on clinics, past and present, are:

1. That a thorough and effective accident reporting system, operating with equal effectiveness throughout the populations to be affected, be established if motorists truly representative of the offender population are to be reached. Ideally, reciprocity among the various states and the District of Columbia should be provided for the exchange of accident and violation information so that the driver's record may be as complete as possible.
2. That a point system be established for purposes of a) assessing the individual's driving performance, b) notifying him of this performance, and c) providing data to the Department of Motor Vehicles, the courts, and to persons associated with rehabilitative functions, including the clinic.
3. That the reported findings of other traffic clinic operations be perused and evaluated before deciding upon the procedure to be followed or the instruments to be used.

QUALITY PERSONNEL

4. That clinics be designed and evaluated by a group comprised of persons with preparation and experience in the fields of motor vehicle administration, law, education, sociology, psychology, psychiatry, and medicine. (The new clinic in New York State is being developed along these lines). Public or privately supported institutions of higher learning appear to be logical sources for obtaining such personnel and consultative services.
5. That personnel used to staff such clinics be of the highest quality and that they be thoroughly familiar with interviewing procedures and test administration.
6. That the keynote of the clinic as it operates in driver improvement situations should be experimentation. New devices, techniques, and processes should be introduced just as soon as practicable when research or rational grounds indicate their possible value.
7. That clinic findings (including those of other individuals and agencies to whom the subject might have been referred) be interpreted to the subject and that whenever possible specific suggestions be made as to how he might improve his driving performance.

8. That provision be made for follow-up study of subjects examined at the clinic, such a follow-up to evaluate, in some measure, the effectiveness of clinical procedure.

SUGGESTIONS FOR RESEARCH

In that considerable emphasis today is being directed toward the role of the driver in traffic accident causation, it is expected that additional research will be conducted in this general area. Accordingly, the following recommendations are presented for the assistance of those undertaking such investigation.

- That further research be conducted, using the *Thurstone Temperament Schedule*, on offender and non-offender populations where equating factors in addition to driving experience are considered.
- That further research be conducted on offender and non-offender populations, using devices which probe more deeply into those relatively stable personality traits of "Impulsive," "Sociable," and Reflective," as identified by the *Thurstone Temperament Schedule*.
- That data of offenders be probed further to establish the relationship between violations and accidents.
- That more extensive data of a biographical nature be obtained from subjects since this type of data proved more discriminating than any area of the test device used in this investigation.
- That test technicians, in cooperation with traffic safety specialists, develop test instruments which will probe more deeply into the impulsive, sociable, and reflective traits of personality as these relate to driving performance.

Through research such as that suggested and through the implementation of the recommendations advanced here, it is believed that those active in the field of traffic safety will improve their understanding of why drivers commit traffic offenses, and will be better able to initiate and evaluate driver improvement activities.▲

Submitted Paper

SIGNIFICANCE OF SAFETY ATTITUDES IN INDUSTRIAL ACCIDENT PREVENTION (Ph.D. Thesis, New York University, 1957)

by EARLE S. HANNAFORD

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The purpose of this research was to investigate the readily assumed relationship between safety attitude of industrial workers and supervisors and actual accident experience of the workers on the job. There has been a lack of studies on the validation of such relationships.

An increasing number of industrial organizations include accident prevention attitude as observed on the job and actual accident experience as factors in the appraisal of employees and management proficiency. The full and confident use of measures for the formation and revision of industrial safety attitudes has awaited the proper validation of the significance of such attitudes as they are reflected in the workers' actual accident history on the job.

Previous industrial safety research has dealt primarily with the relationship between actual accident experience and environmental and personal factors other than that of industrial safety attitudes. Many studies have been concerned with accident-prone individuals or groups and accident repeaters, although there is good evidence that the majority of industrial injuries occur to workers with no previous accident history.

MUST KNOW ATTITUDES

It was important to know the significance of industrial safety attitudes for the employee group as a whole. Similarly, it was equally important to determine the relationship between safety attitudes of supervisors and workers under their direct supervision.

There were two stages in the study. The first concerned the development and validation of industrial safety attitude rating scales for male workers and for male supervisors. The study and, therefore, the industrial safety attitude scales, were limited to male industrial workers and supervisors. This was done because of the wide variations between work activities for men and women and the differences in pyschological approach to industrial work operations.

The second stage of the study was the determination of the significance of industrial safety attitudes of male workers and of male supervisors as these attitudes relate to the actual accident experience of the workers themselves.

The industrial safety attitude scales were developed according to the procedures used by L. L. Thurstone and E. J. Chave as described in the "Measurement of Attitude." This provided conformance with the Thurstone Attitude Toward the Law scale which was used as a control and to determine any possible relationship between industrial safety attitudes and the testees' attitude toward authority. Both the employee and supervisory scales are one-page, 20-item rating instruments.

TESTED 5,000 MEN

Approximately 5,000 male employees and supervisors in 450 selected industrial organizations furnished anonymous statements of their attitude toward safety which were used in the development of the safety attitude scales. These attitude statements were voluntary and sent directly to the researcher.

The industrial safety attitude scales for male employees were validated using 300 employees with one or more lost time injuries during the five-year period, 1948 to 1952. The male supervisors' industrial safety attitude scales were validated with 150 male supervisors whose employees had had lost time accidents during the five-year period.

Chart I "Validation of Attitude Scales" summarizes the results. The bi-serial correlation (r_{bis}) was .35 for the male employee attitude scale and the standard error was .026. For male supervisors, the bi-serial correlation (r_{bis}) was .20 and the standard error .036.

Chart I

VALIDATION OF ATTITUDE SCALES

Test Scores vs Accident Experience

Group	Bi-Serial Correlation r_{bis}	Standard Error S.E.
Male employees—1 or more lost time accidents	.35	.026
Male supervisors whose employees had lost time accidents	.20	.036

RELIABILITY

Product Moment Correlation R Method

	Test and Retest	Split Half	Equivalence of Forms
Employee Scale			.88
Form A	.88	.72	
Form B	.86	.77	
Supervisor Scale			.86
Form A	.86	.76	
Form B	.83	.76	

Reliabilities were found by the product-moment correlation. The reliability was determined by three methods: test and retest, split half and equivalence of forms. As noted, the reliabilities by test and retest are in the .88 to .83 range for the employees' and supervisors' scales.

By the split half method, the range was from .77 to .72 which difference is usual between the two methods. Equivalence of forms was .88 for the employees' scales and .86 for the supervisors' scales. These results are considered satisfactory for scales of this type.

There were 769 male employees and 481 male supervisors from 54 industrial organizations with good, fair and poor safety records over the five years who participated in the second stage of the study to determine the significance of safety attitudes as related to accident experience.

The character of the relationship between industrial safety attitudes and actual accident experience for male employees was also determined on another chart. This plotting gives the graphic relationship between male employees' safety attitudes and actual accident experience during the five years. The

ordinates are test scores and the absicissae the number of lost time injuries. All 769 male employees are plotted and the straight line joins the means.

ACCIDENTS, ATTITUDES CORRELATE

As was seen, as accident experience worsens so does safety attitude. Of particular interest is the range of test scores for those with one lost time injury. It covers a much wider range of scores than those with two, three, or four injuries. This may well indicate that an injury tends, in many cases, to "set home" safety attitudes based upon previous safety training. In addition, it seems evident that employees who have had one injury should receive special attention when the attitudes remain poor to offset the potential for accident repetition.

Chart II shows the bi-serial correlation between male employees' safety attitude and actual accident experience. For male employees with one or more lost time accidents in the five years the bi-serial correlation with accident experience was .32. For male employees with two or more lost time accidents the bi-serial correlation was .43. In other words, the correlation between safety attitude and accident experience is significantly higher for repeaters.

Chart II

Male Employee Safety Attitude vs Accident Experience

5 yr. period 1948-52 769 employees 47 companies

Groups	Bi-serial Correlation r_{bis}	Standard Error S.E.
One or more lost time accidents	.32	.029
Two or more lost time accidents	.43	.02

Significance of Difference in Means

	Critical Ratio C.R.	Standard Error S.E. of D.
Accident-free group vs group with 1 or more lost time accidents	6.5	.36
Accident-free group vs group with 2 or more lost time accidents	6.0	.49

Both differences in means are real and significant at .01 and .05 levels of significance.

The significance of the difference in means for the accident-free group versus the group with one or more lost time accidents is real and significant at both the .01 and .05 levels of significance and the critical ratio was 6.5. For the accident-free group versus those with two or more lost time accidents, the difference in means is also real and significant at both the .01 and the .05 levels of significance and the critical ratio was 6.0. Thus there is a real and significant relationship between the safety attitudes of male employees and the actual accident experience.

In the relationship between the industrial safety attitudes of male supervisors and the actual accident experience of male employees they supervised, the chart shows that the range of safety attitude test scores is more limited than that for male employees.

The bi-serial correlation, Chart III, is .18 where the employees supervised had less than .1 lost time accidents per employee and .21 where the employees supervised had .1 or more lost time accidents per employee. The significance of the differences in means for both groups is real and significant at the .01 and .05 levels of significance.

Chart III

Male Supervisor Safety Attitude vs Accident Experience of Male Employees Supervised

5 yr. period 1948-1952 481 supervisors 54 companies

Groups	Bi-serial Correlation r_{bis}	Standard Error S.E.
Less than .1 lost time accident per employee supervised	.18	.035
.1 or more lost time accidents per employee supervised	.21	.038

Significance of Difference in Means

	Critical Ratio C.R.	Standard Error S.E.
Accident-free group vs group with less than .1 lost time accidents per employee supervised	4.7	.28
Accident-free group vs group with .1 or more lost time accidents per employee supervised	3.6	.42

Both differences in means are real and significant at .01 and .05 levels of significance.

Since it was impossible to select supervisors whose employee groups had not changed during the five years, it was somewhat to be expected that the bi-serial correlations would be lower than for the male employee groups. However, the correlations were comparable with those obtained for the supervisory scale "How Supervise" (Remmers and File) which included safety items among others used in rating supervisors as to quality of supervision.

The attitude toward authority and actual accident experience were not sufficiently related to have appreciably affected the relationship between the safety attitudes of employees or supervisors and the accident experience of the employees. Bi-serial correlations between employee and supervisor attitudes towards authority in the means of accident-free and accident groups were not significant at the .01 and .05 levels.

SUPERVISORY ATTITUDE SIGNIFICANT

Thus the relationship between male employees' industrial safety attitudes and actual accident experience during the five years is significant. Also there is a positive and significant relationship between the industrial safety attitudes of male supervisors and accident experience of the male workers supervised.

Industrial concerns can feel assured that the time, money and effort spent in developing and maintaining good safety attitudes are amply justified. The use of safety results as a factor in appraising employees' and supervisory performance for purposes of advancement is sound.

Moreover, the industrial safety attitude scales for male employees and male supervisors are satisfactory tools for determining the industrial safety attitudes of individuals and groups so as to give safety education and training where and when needed. Furthermore, the scales, each of which has alternate forms, should be valuable in maintaining and stimulating interest in safety.

A TRIBUTE TO H. LOUISE COTTRELL, 1893-1957
A Pioneer in Research for Elementary School Safety

by DR. HERBERT J. STACK
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Louise Cottrell was one of the early leaders in the safety education movement. As a teacher in the Stockton School in East Orange, New Jersey, she was a frequent visitor to the Education division headquarters of the National Safety Council, then located in New York city. She was a friend of Albert W. Whitney and tended to follow and interpret his philosophy in the articles and books that she contributed, as well as in her Doctor's thesis. During a 10 year period, she prepared the elementary school lesson plans for the Council magazine, *Safety Education*.

She wrote a number of articles for professional journals and, in 1937, collaborated with Florence Nelson in a workbook, *Safety Through the Years*, published by McGraw-Hill.

In 1938, she was awarded a teaching fellowship at the Center for Safety Education, and was a member of the first class to be graduated. While working on the Doctor's degree, she taught courses at the Center and during the summer months lectured at midwestern colleges.

WROTE THESIS FROM EXPERIENCES

Returning to her teaching position in East Orange, she worked to complete her thesis, *The Selection and Preparation of Basic Material for the Teaching of Safety to Children*. This thesis was in part developed from actual teaching practices in the classrooms of her school. The classroom became her laboratory, and most of the materials she presented in her thesis grew out of classroom experiences.

A strong advocate of integration, she was one of the first to present a body of subject matter and methods for including safety on a broad front. To her, safety was not a narrow concept but a way of life. There are some important points in her 540 page thesis that should be stressed.

In her attack on the problem, she used the survey technique, making studies of textbooks, readers, and courses of study in various elementary school subjects. From this, she developed certain guiding principles and content material for a safety program. The first part of her thesis is one of the

best reviews of the safety education movement that has been written. She showed how safety could be included in studies of world geography, travel, children of foreign lands, industry, and agriculture.

"LEARNING BY DOING"

She also pointed out the need for grade placement of materials depending upon the psychological, physical, and mental development of the child. This was followed by the three major steps in the preparation of a course of study.

She advocated the "learning by doing" method expounded by Dewey. Urging the importance of integration, she wrote, "As safety is a way of living rather than a separate subject to be learned, it is entitled to a place in every phase of classroom activity that can make safety facts or behavior meaningful. To be of value, such relationship and points of contact must develop naturally."

Several years after her thesis was accepted, she converted some of the findings into a guidebook, *Safety Education in the Elementary Schools*, which is distributed by the Center for Safety Education.

Louise retired from teaching and, with her sister, operated a gift shop in the summer at Basin Harbor on Lake Champlain, and in the winter at Palm Beach, Florida.

Louise was a woman of fine character and sentiments. She had many friends in the teaching profession, and everyone who knew her loved her for her kindly disposition and good humor. She did much to lay the broad foundations of the child safety movement in her teaching and in her contributions to the literature. She will long be remembered as one of the pioneers in safety education.▲

A CRITIQUE OF SELECTED RESEARCH STUDIES IN SAFETY

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Analysis and criticism of research from abstracts thereof are subject to a marked loss of reliability and validity. The present findings and suggestions are subject to this limitation. Since in most instances the authors abstracted their studies, it should be assumed, however, that the essentials would be given if they existed.

Several of the studies analyzed were in themselves *résumés* of the research literature on certain aspects of safety. Some good materials presented for consideration were strictly empirical essays and accordingly were omitted from this review.

LEVEL OF RESEARCH

For the purpose of comparison, the 55 studies were classified as master's theses (30), doctoral dissertations (10), and research projects (15). As a rule, the contributions of the studies seem to increase somewhat in that order. The research value of the average master's study leaves much to be desired for society and for the student.

These frequencies of master's, doctor's, and project studies are more artifacts of the process of collecting studies for this report and of availability.

Area of research. Seventeen studies were in the "safety education program" area. This, on the whole, was the most unscientific, illogical and inconclusive area. Oddly enough, most such studies were undertaken by the master's candidate. "Action research" might be more profitable in this area and the master's candidate might be guided into simple measurements, records, or documentary studies.

"Personal factors" involved in accidents ranked second and were somewhat evenly distributed over the research levels.

"Accident analysis" was third in frequency and these studies involved record analysis almost exclusively.

"Driver education," a rather well done area; "legality-liability," an area with marked agreement and similarity in the studies (usually done as private projects); "psychological and measurements" and "buildings and equipment" studies ranked about equally and lower in frequency.

SAFETY RESEARCH STUDIES BY AREA AND LEVEL

Areas	Levels: Master's	Doctor's	Professional	Totals
Safety Education Program	17	1	1	19
Personal Factors	3	2	4	9
Accident Analysis	4	2	1	7
Driver Education	3	1	2	6
Legality-Liability	0	1	4	5
Psychological-Measurements	1	3	1	5
Buildings and Equipment	2	0	2	4
Totals	30	10	15	55

Sponsorship. Similarly to "level" the frequency of sponsorship of the studies may well be opportunistic rather than social or statistical. However, of the over 38 sources, Indiana University (7), Iowa State College (6), safety organizations (6), New York University (5), and Yale University (3) lead in the contributions. Too much credence or importance should not be given to this ranking but these institutions are producing safety research somewhat outstandingly.

Techniques. The selection of the essential techniques for these studies indicated use of the criterion of "ease of application." While not of necessity related to the worth of the contribution, there is an almost complete relationship of ease of use to frequency of use. Witness: record analysis—18 studies, questionnaire or checklist—16, documentary analysis—13, philosophical—11, (It must be noted here that this category does not include the rigidly logical analyses. Quite the the contrary, it implies here the sloppy, sophomoric, disordered "term paper" approach.) measurement—9, and experimental —4.

EVALUATION OF THE RESEARCH

Findings. We have learned that motor vehicles are a high cause of accidents, that old age, adolescence, being a male, inattentiveness, the home, athletics, the physical education classes, the locker rooms, the playground, and crowded conditions are most frequently associated with accidents. We learned too that a *few* people incur far more than their share of accidents.

We have seen that wounds and bruises; injuries to the lower extremities, the head and the hands were most frequent. Falling, slipping, colliding, absence of guards, dirt surfaces, the giant stride, and being struck by thrown objects, such as balls, are the immediate causes.

Most of the activities surrounding the causes are essential and can not be eliminated. The immediate causes must be avoided. This requires better safety education programs. The preponderant group of research studies was aimed at this area but we sent children, so to speak, to do the job. Many or most of the research was inconclusive and unscientific.

Our best minds should be put at these administrative and curricular tasks. Apparently, the busy beginning research student is not the man for the job. The busy experienced and professionally mature workers, guided perhaps by the scientifically minded technician, should be a team to tackle these problems. The superior quality of the industrial and safety organization studies seem to lend credence to the concept.

Cooperative "action research" should at least be given a chance. The master's theses only consume time and energy and add confusion to the topic as a rule, if some of our samples are any criterion.

EIGHT GUIDES TO CRITICISM

Weaknesses observed. Lauer's eight tenents might serve as criteria to guide us as we launch with temerity into our criticism of the research in a field in which the author is a neophyte.

1. Problem defined. Many of the problems started with titles or purposes too expansive. In fact, there was a tendency of

"the smaller the research, the larger the topic."

One characteristic of the usual project type of study (non thesis) was its superior planning. Doctoral dissertations were also good in this regard.

2. Necessary assumptions made. The assumptions of randomness of sample, validity of measure, adequacy of the controls were innocently overlooked. A glaring and common weakness was failure to meet original purposes or hypotheses.

3. Sufficiency of data. Paucity of survey returns frequently injected biases into the findings which could have been far greater than criterion differences sought for. Some evidence was given that accidents were not fully reported or were incompletely filled out.

4. Appropriate research method. Particularly, in several safety program studies, no semblance of organization and analysis of data or planned attempt to close the gap between findings of accident causes to setting up the safety program could be seen. Exhortation replaced proof in several studies showing an ignorance of the nature of the research.

WAY TO CHECK DATA

5. Data statistically evaluated and tested. Frequencies were occasionally given without regard to the proportions in the sub classes in the sample. That is, *rates* (per 1,000 exposures, e.g.) rather than frequencies should have been used.

The statistical significance of the differences observed were rarely reported, if calculated. (Probably properly so, since samples were not randomly drawn or representative).

The percentages of response to questionnaires were not divulged occasionally. In one instance, a ridiculously low response was not tested (by follow-up) for its reliability.

6. Results presented in usable form. As represented by their abstracts, at least, several of the studies omitted the exposition of the techniques employed to arrive at their conclusions. There was a lack of definition of terms. At times, even the conclusions and recommendations were omitted. These omissions may be due in part to the exigencies of abstracting.

Particularly lacking in the abstracts were full bibliographical information.

A few studies *did* compare their findings with national norms or expectencies. The literature seems to be replete with normal expectencies, rates determined from large samples, *et cetera*.

7. Conclusions are limited to the data and properly qualified. A serious weakness was evidenced in starting conclusions unsupported by the evidence. This was more evident in the master's theses, again indicating naivete as to the nature of research.

8. The experiment so designed, described, and executed that it may be repeated and verified. In the first place, but few experiments are covered here, purposes were unsound in many studies, basic assumptions were unrecognized, randomness of samples was not assured. Statistical and other techniques were not revealed. Hence, many of these studies could not be repeated (nor should they).

SHOULD MEASURE VARIABLES

Needs. There appears to be a need for a better knowledge of sampling techniques.

Sharper, more discriminating personal factors and measures of known variables are needed for causal analysis and experimentation.

Better use of known variables in the control of experiments and record analyses is needed.

More universal uniform and complete accident reports and records are needed.

It appears that our health, physical education, recreation, and safety workers should become aware of the fairly complete information existing with regard to liability.

There is a need for personnel skilled in experimental and laboratory techniques.

This study has not touched the vital *"crash analysis" evidence from such sources* as Syracuse University. The retracted steering wheel hub, the safety belt, the safety door lock, and the padded front dash of the automobile have come out of these efforts.

MEASURE DRIVER EDUCATION

Values. There is evidence of vast stores of statistical, physical, and theoretical data in the traffic literature for use in safety education programs.

Studies are almost universally (albeit at times a bit optomistically) indicative of the values of driver education and of some of the mechanical substitutes for part of behind the wheel driving.

We are gradually accumulating tools of measurement of variables, psychological factors, and personality traits which can refine, and make more precise, our safety studies.

While there is some confusing disagreement in court decisions, in the main our legal status and liability with regard to accidents and nuisance is known and available.

There has been accumulated and documented a great deal, if not most of the important, research in the field of safety. This is due largely to the National Safety Council and is available through this organization.

MASTER'S THESES

Anderson, John W., *Safety Education in High School Machine Woodworking Shops*, M.S. Thesis. Colorado Agricultural and Mechanical College. No Date.

Replies of 83 checklists revealed most frequent machinery. Of these the table saw and joiner were the most dangerous. Lack of attention and non-use of guards were most frequent causes. More emphasis is needed upon safety program.

Baldwin, Josephine E., *Incidence of Accidental Injuries Occurring to Hospital Patients*, M. Ed., Marquette University, 1953.

Analysis of accident records for one year at a hospital. Older male patients, in daylight and in or near the bed, were more prone to accidents. Two per cent of the patients caused 67 accidents in six months.

Begnoud, Edward M., *A Recommended Safety Program for the Mabry Foundry and Machine Company and Iron Castings Incorporated of Beaumont, Texas*, M.S., Agricultural and Mechanical College of Texas, 1954.

A seven year study revealing 161 accidents. Dust is the most frequent agent and eyes the part of the body most frequently involved. Total bodily injuries were the most costly, however. No program was offered in the abstract.

Bowman, George W., *A Study to Determine the Areas in Safety Education that Require Emphasis in Secondary Schools*, M.A., University of Iowa, 1955.

One hundred students, randomly selected from driver education classes, were tested on three fields of safety: general safety, driver knowledge, and home safety with the results in decreasing order of knowledge.

Buse, August R., *A Survey of Procedures for Handling Student Cars Driven To or From High School Property in the State of Washington*, M. Ed., University of Washington, 1954.

Sixty-two Washington high schools were surveyed. Eleven per cent of the students drive cars; the trend is upward. There are no uniform practices of car control, but such are needed.

Carahan, James, *Cooperation Between Schools and the Colorado Patrol in the San Louis Valley*, M. Ed., Adams State College, 1957.

A survey was made to determine the wants, needs, and practices of selected schools. There was an intellectual jump from data to empirical suggestions as judged by the abstract.

Dettman, Ruth J., *Patterns of Health and Safety Education Programs in Connecticut Industries*, M.P.H., Yale University, 1956.

A questionnaire study of safety programs in 88 industries reveals similar practices regardless of type or size of industry. Safety programs, more numerous than health education programs, were the responsibility of the nurse. Departments are responsible to top management.

De Felice, Joseph, *The Trained Driver Versus the Untrained*, M. Ed., Buffalo State Teachers College, 1955.

Questionnaires to 600 former high school students obtained 100 trained and 100 untrained students. The former were superior *in accident records*, traffic violations, speed violations, and other records, such as injuries and property damage.

Derderian, William V., *Detroit Public Schools Driver Training*, M. Ed., Wayne State University, 1954.

Response of 30 per cent and 5.7 per cent to postal questionnaires to 300 high school graduates driver educated and 600 without revealed more untrained drivers had licenses

prior to driving. Half as many accidents occurred in the trained group. One hundred matched pairs revealed driver trained individuals were superior in accident records, traffic violations, injuries, and property damage.

Duckworth, Marian, *A Survey of Student Accidents in One Secondary School, 1949-1955*, M. Ed., College of the Pacific, 1956.

An analysis of 436 accidents over six years revealed that accident reporting was associated with better reporting under one responsible person. Accidents were associated with boys, shops and locker-rooms, unorganized activities, physical education activities, and crowded conditions.

Frey, Richard E., *Reaction Time Under Conditions of Preoccupation With and Without a Warning Signal*, M.C., Iowa State College, 1951.

An experiment in reaction time on 48 cases in which lighting, noise, length, and sequence were controlled and the instructions were standardized. Reaction time lengthened signficantly by preoccupation in 51 per cent of the cases. Proper control and statistical evidence seem to be available in the study.

Horton, Herbert D., *A Survey of the Safety Features of Expensive Items of Football Equipment Used in Texas High Schools*., M.A., Southwest Texas State Teachers College, No Date.

Questionnaires to 240 schools revealed that schools in higher classes spent more on equipment. Most was spent on protective equipment. Smaller budgets involved a higher percentage of shoulder injuries.

Kjerland, Reginald N., *Finger, Leg, Lip, and Voice Reaction, Time Under Two Experimental Conditions*, M.S., Iowa State College, 1953.

Forty subjects responded to foveal and peripheral stimuli with finger, leg, lips, and voice. Peripheral reactions were uniformally longer but foveal variability was greater except for vocal response.

Leo, Violette P., *A Survey of the Safety Education Program in the Secondary Schools of the United States from July, 1945, Through June, 1955, As Revealed By Periodical Literature*, M. Ed., Chicago Teachers College, 1957.

An analysis of a 10 year period of safety articles revealed that safety education should include all phases and teaching should be planned in advance. Pupil participation was emphasized and integration with other subjects preferred. Improved methods such as audio-visual aids and up-to-dateness were observed. There was a tendency to attibute common practices to exceptional instances in this study.

Long, Roy J., *Safety Measures for Woodworking Shops in Nebraska High Schools*, M.A., University of Nebraska, 1953.

Questionnaires sent to 78 shops revealed 323 injuries. All but one were caused by unsafe student practices. Sixty-seven accidents were caused by hand tools and 31 per cent were caused by power tools. No evidence was found in the abstract for the jump to recommendations based upon hortatory appeal to the emotions.

MacCollum, David V., *Reduction of Construction Costs by Use of Scaffolding*, M.S., Oregon State College, 1957.

Proper scaffolding saved production time and reduced accident risk. New savings were 3 to 12 cents per foot of panel surface. Techniques of the study were not revealed in the abstract.

McKeraham, D. Compton, *An Evaluation of Safety Training*, M.S., Oregon State College, No Date.

Twenty-four lost time injuries totalling 954 days five months prior to a safety program were analyzed. In five months following the safety program, three lost time injuries occurred involving 16 days. However, the following year, eight lost time injuries occurred involving 524 days. In general, safety education seems to reduce accidents.

Mangus, Glen V., *An Investigation of Safety Education in the Public Schools of Ten Mountain States*, M.S., University of Wyoming, 1953.

A questionnaire study of status and opinion in public schools in ten mountain states dealt with practices, fields, services, materials of instruction, agents, and responsibilities. There was some evidence of integrating safety in other subjects. There were rather inconclusive findings. There was a seeming lack of organization for safety education in the sample of data.

Meyering, John R., *Woodworking Safety —Needs, Values, Recommended Program for Medium Sized Plants*, M.S., Syracuse University, 1956.

The study deals with a reputed plan for accident prevention program based upon observation and published reports regarding woodworking plants. Suggestions are given for initiating building up and sustaining accident prevention programs. No evidence is given in the abstract for the conclusions reached.

Morrisy, William, *The Traffic Problem in America*, M. S., University of Wisconsin, 1955.

A source unit for introductory driver education covering the significance of the topic, topical outline, possible outcomes, possible activities, and suggestions for evaluation. Materials and recommendations conclude this philosophical curricular study.

Nicklas, George, *A Safety Education Program for the School Machine Shop*, M.S., Stout State College, 1951.

A documentary study by which features of a safety program were compiled. Accident record reporting was emphasized as was environment.

Recommendations involved what one might have expected from the present study.

Parrish, Henry M., *Causes of Death Among College Students*, M.P.H., Yale University, 1956.

Record analysis of 209 deaths at Yale University, 1920-1955. The leading causes of death were: motor accidents, suicide, heart, and circulatory system. The death rate was lower than expected except for suicide.

Pierce, Elwood P., *A Safety Program for the James Denman Junior High School*, M.S., San Francisco State College, 1955.

This is more a term paper than a research report. The title is misleading. The abstract gives little evidence of conclusions reached.

Rouse, Phillip, *A Study of Safety in the Oak Ridge Schools*, M.S., University of Tennessee, 1952.

Ten elementary and secondary schools in one system were surveyed for hazardous features. Abstract gives no conclusions regarding structural safety, fire resistance, fire protection, traffic safety, playground safety, and health factors.

Seker, Phillip D., *Survey of Student Accidents in Bowling Green University*, M.Ed., Bowling Green University, 1955.

A study was made of 725 accidents among 3,404 students in which 83.6 per cent had but one accident. The highest incidence was associated with Wednesday, 4-6 p.m., on campus, and among male athletes. The lower extremity was most frequently injured. Falls were the most frequent causes. Injuries were 6.1 per cent of the infirmary cases.

Steuck, Robert H., *Recommendations to Athletic Officials for Preventing Accidents in Certain High School Sports*, M.S., University of Illinois, 1954.

An analytical survey for determining means of preventing accidents in high school sports by officials indicates failure to fill out rating sheets on facilities and lack of planned program to improve safety by officials and administrators. Recommendable safe practices seem to be lacking.

Suhr, Virtus W., *Relationship of Personality Traits and Certain Psycho-sociological Factors to Driving Performance of Commercial Drivers*, M.A., Iowa State College, 1953.

A personality factor rating questionnaire, a driver performance inventory, and a background experience index were applied to 60 drivers paired by rating and accident records. Best scoring group had fewer doctors' visits, had consistency of opinion, had less Bohemianism, had fewer absences, and the individuals were born on a farm. Accident records showed similar results.

Susoeff, James S., *Recruitment, Training, and Retention of Student Safety Patrol Personnel*, M.A., San Francisco State College, 1953.

The abstract gives no findings of the 60 per cent response to questionnaires from 30 elementary schools in San Francisco.

Rosenblatt, Gerald, *A Critical Analysis of the Accident Proneness Concept*, M.P.H., Yale University, 1955.

This is essentially a philosophical résumé of literature on accident proneness as judged by the abstract.

Williams, Lloyd M., *A Study of the Extent and Importance of Safety Education in Selected Public Schools of Central Washington*, M.Ed., University of Washington, 1953.

The study deals with a 52 per cent response to questionnaires sent to 112 principals. Conclusions were quite general as to interests and need of instructors. Conclusions given seem not to be relevant to initial purposes and seem unsupported in the abstract.

DOCTOR'S DISSERATIONS

Freeberg, William H., *Law and Liability of Municipal, Charitable, and Private Corporations for Conducting Recreation Camps*, Re.D., Indiana University, 1949.

The author determines the liabilities of corporations responsible for camps. A documentary analysis and classification of statutory laws and court decisions concerning the many ramifications of recreation camps.

Hase, Gerald, *The Nature and Frequency of Accidents Among Elementary School Children in a Selected Sample of Schools in New York State*, H.S.D., Indiana University, 1956.

The study consists of record analysis in 92 elementary schools from 1954-1955. Accidents most associated with district schools, May and October, fifth and third grades, boys, eight-year-olds, wounds and bruises to head and hands. The last occurred most frequently on the playground and in the gymnasium. Free play and physical education activities were the chief source of injury; balls were the chief cause. Other pupils were involved most often. Class room teacher supervision had fewer accidents.

Heath, Earl D., *The Relationships Between Driving Records, Select Personality Characteristics, and Biographical Data of Traffic Offenders and Non-Offenders*, Ph.D., New York University, 1957.

Records and tests of 763 traffic offenders reveal that traffic offenders were signficantly higher in impulse and sociable scales and lower in reflective scales. Higher proportions of the group were in the 18-33 age group, unmarried, non-graduate, lower class jobs, earnings under $5,000.00 and indicated driver education.

Loft, Bernard I., *Effects of Driver Education in Driver Knowledge and Attitudes in Selected Public Secondary Schools of Indianapolis and Marion County*, H.S.D., Indiana University, 1950.

Driver attitudes and knowledge tests were given 2,442 students in 14 high schools. Driver trained girls were superior in both. Girls superior to boys in knowledge. Fewer accidents associated with trained boys with higher driving frequencies and better attitudes.

Mayshark, Cyrus, *A Health and Safety Attitude Scale for the Seventh Grade*, H.S.D., Indiana University, 1954.

Two 60-item forms of health and safety attitude test were validated by the interval consistency technique. Boys and girls were found to be significantly different in scores.

Myers, Frank H., *A Safety Attitude Scale for the Seventh Grade*, H.S.D., Indiana University, 1955.

Sixty items comprise forms A and B of a safety attitudes test for seventh grade students. The validity of the items was determined by the interval consistency technique.

Suhr, Virtus W., *Driving Efficiency Over a Six-Hour Period of Simulated Driving Performance*, Ph.D., Iowa State College, 1956.

Psychological, physiological, psychometric, and psycho-physical tests were given before and after six hours of simulated driving. No conclusions were given in the abstract.

Taylor, Harold T., *Administrative Implications of Health and Safety Records of Public School Children*, Ed.D., Indiana University, 1941.

Accident record analysis from 1938-1939 revealed that absence increased from September through March. White pupils had the most absences; girls more than boys and the fourth and eighth grades. Sickness caused 95 per cent of the absences; 40 per cent due to colds. Accidents occurred more frequently at the beginning of the school year and chiefly in the home. Boys incurred 67 per cent of the accidents.

Uhlaner, Julius E., *Relationship Between Two Dimensional and Three Dimensional Spatial Relations Aptitude*, Ph.D., New York University, 1946.

Standardized three dimensional performance scale was compared to the Minnesota Paper Form Board. The coefficient of correlation (r) was .27. The reliability of the former was found to be .80. The validity was not shown. The author advises the use of both tests jointly.

Yost, Charles P., *An Analysis of Graduate Theses in School Safety in the United States from 1925 to 1950*, University of Pittsburgh, 1956.

Identification and analysis of 307 master's and doctor's theses in school safety reveal no single source for identifying the studies. Errors were found in listing and many studies had misleading titles. The majority meeting research standards involved 63 different institutions, New York University being the highest. Techniques and topical emphasis were determined as well as the causes of accidents.

The findings are much like the present study in general.

PROJECTS

American Automobile Association, *Effectiveness of the Auto-Trainer*, Research report #62, June 20, 1957, 7 pp.

An experiment on 29 auto trainer and 21 non-auto trainer subjects resulted somewhat favorably to the auto trained subjects. Subjects favored auto trainer especially in shifting and starting.

American Automobile Association, *Seat Belts for Passenger Cars*, Traffic Engineering and Safety Department, American Automobile Association, Washington, No Date.

A national safety agency reports seat belts reduced seriousness of injury. Most fatalities in 130 auto accidents were caused by ejection through the door. Belts are more effective at a moderate rate of speed.

Ayers, Walter H., *A Survey of Automotive Seat Belts: Owner Experience and Non Owner Attitudes*, E. I. duPont de Nemours and Co., Wilmington, Del., July 18, 1956, 18 pp. plus 33 pp. in appendix.

A telephone survey revealed that more than three-fourths of the seat belt owners will buy again. Sixty-seven per cent of the non-owners and 90 per cent of the owners feel seat belts should be standard equipment. Nylon fabric is preferred.

Brody, Leon, *Personal Factors in Safe Operation of Motor Vehicles*, Center for Safety Education, New York University, 1947, 96 pp.

The related literature previous to the study was reviewed. Tests of various mental and physical traits were administered to each of 26 drivers who had been involved in at least three reported accidents between 1935 and 1940 and to 26 drivers whose records were unmarred. Systolic blood pressure, accuracy of reactions, side vision, and passing on the road were tests 92 per cent effective in separating repeaters and non-repeaters. Sixteen other factors proved inconclusive.

Cutler, William A., *Organization and Function of the Safety Department*, American Management Association, New York City, 1951, 31 pp.

Safety trained engineers were found to be superior to engineers supervised by a safety supervisor. Three-fourths of the safety personnel have had in-service safety education. Full time safety supervisors are in only 60 per cent of the firms.

Dyer, D. B. and J. G. Lichteg, *Liability in Public Recreation*, C. C. Nelson Pub. Co., New York City, 1945, 107 pp.

There is a review of technical terms, defenses against liability, proprietary and governmental functions, safe conditions and nuisances, and liabilities of municipalities, school districts, board members, and individuals.

Eno Foundation for Highway Traffic Control, *The Motor Vehicle Driver: His Nature and Improvement*, Eno Foundation, Saugatuck, Conn., 1949, 165 pp.

A synthesis of literature, not an original research. The study revealed 15-20 per cent of the motorists cause 80 per cent of the accidents. Factors studied included rural-urban, age, and attitude tests. Needs are cited for data on anxiety, fatigue, mental qualities, nature of roads, why drivers violate right of way, effects of diseases, and effects of habits on fitness to drive. Basic elements for needed higher licensing standards are not yet known.

Eno Foundation for Highway Traffic Control, *Personal Characteristics of Traffic Accident Repeaters*, Eno Foundation, Saugatuck, Conn., 1948, 64 pp.

The Knowledge Test for Automobile Drivers was administered to 122 repeaters and 137 accident free volunteers. The accident free drivers made significantly better scores than the repeaters. Similar results were found on performance and attitude tests.

Larson, John C., et. al., *The Human Element in Industrial Accident Prevention*,

Center for Safety Education, New York University, 1955, 114 pp.

An excellent digest of studies with glossary and bibliography; treating of selection, in-service education, environment, incentives, and hiring. There is some evidence that some of its sources are based on inadequate facts and poor controls.

Leibee, Howard C., *Liability for Accidents in Physical Education, Athletics, and Recreation*, Ann Arbor Publishing Co., Ann Arbor, 1952.

It is stressed that negligence must be shown by duty, a breach, close causal connections, and damage or injury. Defenses for liability are given as contributory negligence, assumption of risk, and immunity. Liability of various groups is indicated.

National Education Association of United States, *Who is Liable for Pupil Injuries*. Research Division, N.E.A., Washington, D. C., October, 1950, 32 pp.

Principles and legal decisions are cited. Fourteen examples are given of when an act is negligent. The relative liability of board and employees and certain bad legal spots is given.

Rhum, Gordon J. and Woodcock, Bertram L., *Effectiveness of the AETNA Driver Trainer in Driver Education*, AETNA Casualty and Surety Co., Hartford, Conn, July, 1956, 20 pp.

Six hours of driver training and dual control instruction were found to be as good as six hours of dual control alone. Criteria: Iowa Drivers' License Examination and Final Driver's Test.

Rosenfield, Harry N., *Liability for School Accidents, A Manual for Educational Administrators and Teachers*, Harper and Bros., New York City, 1940, 220 pp.

Governmental and proprietory functions of schools are discussed. Cited are duty, relationship claims to liability. Negligence and nuisance are defined and an explanation is given of the likely liability of the board, its members, and employees.

Sanders, J. Edward, *Safety and Health in Organized Camps*, National Bureau of Casualty and Surety Underwriters, New York City, 1931, 133 pp.

Over 600 camps cooperated in determining the most frequent injuries and their causes. Most frequent injuries were associated with boys, hiking, swimming, 14-year-olds. Illness occurred more frequently than accidents. Recommendation was made that camps maintain conditions, provide safety education, and reduce the camp program intensity.

Uhlaner, Julius E., *The Effect of Thickness of Stroke on the Legibility of Letters*, Iowa State College, 1951.

This is an experimental study in which 16 subjects and 1344 observations revealed optimal stroke to be 18.3 per cent of width or height for three inch block letter. Ratio can be generalized to any other size block letter.

REDUCING TRAFFIC ACCIDENTS BY USE OF GROUP DISCUSSION-DECISION

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This paper will present the results of an Air Force conference on the group discussion-decision method in traffic safety education. The conference sought to identify additional means for dealing with its highway safety problem.

This paper first will identify the Air Force problem. Evidence will be presented of the effectiveness of group discussion-decision as has been demonstrated by a number of experiments into means for changing behavior. It then will summarize the principle characteristics of the decision method and review some of the conditions necessary for its success.

The conference results concerning driving behaviors likely to be affected by the method, and the kinds of decisions which groups might make to the end of improved safety practices, will be presented. Finally the criteria will be reviewed which could be employed in experiments to test the application of method to the human side of the traffic safety problem. The general outline of the research design will be presented.

AIR FORCE PROBLEM

The educational, enforcement, and engineering phases of the USAF traffic safety program have demonstrated their efficiency in reducing accidents, particulary for government-owned vehicles at bases where the program has strong command support. The Air Force off-base vehicular accident problem differs in several respects from the national problem.

The average Air Force driver involved in a vehicular accident is young, under 25 years old an airman in the lower ranks. The accidents occur off-base in private vehicles within a radius of 50 miles of the base. Particularly dangerous are the evening hours between 9 p.m. and 3 a.m., and the weekends, Friday evening until Monday morning. Rates vary considerably between bases, and base rates have been made to change through command interest in the problem.

Most accidents are accompanied by excessive speeds, and frequently involve the use of intoxicants. Because of a cost to the government in 1955 of 632 deaths and approximately 25 million dollars, the problem of accident reduction in this area is one of major interest to the Air Force.

While the Air Force safety program has been effective in reducing other causes of accidents, it has not similarly reduced the off-base private vehicular accident rate of its personnel. Consequently, steps were taken to identify other means of reducing the accident rate. The success of the method of group discussion-decision in changing other behaviors suggested its possible application to the safety problem.

The conference assembled military commanders who had direct experience in reducing the accident rate of their squadrons and bases, of military experts in ground safety, and of civilian scientists and educators in the fields of safety education, social psychology, group dynamics, sociology, and related fields.

EXPERIMENTAL RESULTS

In 1942, Kurt Lewin and his associates at the State University of Iowa, conducted initial systematic experiments in the process of group decision in changing behavior. The concept, as Lewin expressed it, was that "a free interchange of ideas takes place and that in many respects the initiative lies with the group. No attempt is made to force a decision on the group or to use high-pressure salesmanship.

On the other hand, unlike a mere group discussion, group decision leads to a setting-up of definite goals for action. These goals may be set up by the group as a whole or by each individual in the group setting for himself. It is by no means simple to lead a group discussion within 45 minutes to a conclusion without 'manipulation'."

In one experiment, Ben Willerman compared the method of group decision with a method of request in an attempt to increase the consumption of whole wheat bread over white bread among men in eight cooperative dormitories. He concludes: "The group decision method seems to create a more favorable attitude; the individuals are more eager to succeed; and their wish to cooperate is more dependent of their personal likes and dislikes."

INFLUENCE ON HOUSEWIVES

Another experiment compared the lecture and group discussion methods of inducing 120 housewives to cook and serve kidneys, brains, and hearts to their households. A check-up after seven days found that lectures led to the desired action by 10 per cent of the housewives, while the group decision procedure led to 52 per cent of the housewives following the suggested action.

These were discussions which led to a decision. Methods were not direct attempts at group manipulation nor high-pressure sales talks. The approach to the individual was through a group setting. The group setting gives the incentive for the decision, and facilitates and reinforces it.

Radke and Klisurich tested the different effects of individual instruction and group decision methods upon infant feeding practices of mothers of new-born infants. Four weeks after leaving the hospital, 100 per cent of the mothers who were given the group decision "treatment" on feeding orange juice were following the recommended instruction, as opposed to 53 per cent for the group who received individual instruction. Similar results are displayed for the same mothers in the feeding of cod-liver oil: 88 per cent (group decision) as compared witht 53 per cent (individual instruction).

The same authors compared lecture with group decision in an attempt to increase fresh milk consumption among low income housewives. Fifty per cent of the housewives increased consumption of milk when the group decision method was employed, compared with only 14 per cent who increased consumption under the influence of lectures.

GROUP DECISION SIGNIFICANT

In both experiments, "the group decision method was significantly more effective in leading mothers and housewives to action than were either individual instruction or lectures."

The results from activating group forces through securing participation of group members in designing a new job were significant.

The productive level of a *control group* after the job of hand-pressing was changed decreased. The change only required that the finished product be stacked in boxes in half-dozen lots instead of on flat cardboards. Management set the new price rate, explaining that it was necessary because of competitive conditions.

A more intimate atmosphere was established in the *experimental group*. Each operator was given a chance to participate directly in the design of the new job. The time study man studied each operator. The group approved the plans. After the change the experimental group rapidly recovered its previous level of production. However, the control group did not.

These results are more striking when one considers that individuals in the two groups were the same, the experiments having taken place at different periods of time.

OVERCOME BIAS TEST

Levine and Butler demonstrated the greater efficiency of the group decision method by inducing supervisors in a factory to overcome the bias in their performance rating of the factory workers whom they supervised. There was no difference in the ratings at two points in time by the same group of supervisors before training.

The tendency to give higher ratings to workers doing "higher" grades of work was reduced after the decision sessions. The supervisors who received lecture sessions continued to "bias" their ratings in favor of the "higher" grades of work. This experiment reaffirms the group decision process as a method of overcoming resistance to a change in behavior, even when the individual acts alone as an individual.

Lawrence and Smith repeated the Harwood experiment in another plant with greater control of potentially influencing factors. They demonstrated that discussion with a decision to set a production goal results in significantly greater increases than discussion only.

More recently, an experiment by Edith Becker Bennett demonstrated that the process of coming to a decision regarding future action increases the likelihood that the decision will be carried out. The decision was to volunteer to serve as a subject in psychological and sociological experiments.

Betty Wells Bond has demonstrated that group discussion-decision is more effective than the lecture method in getting women to practice regular self-examination for breast cancer.

GROUP INFLUENCES UPON BEHAVIOR

The results of these experiments in altering behavior have been decisive. But the conditions of the experiment have not been simple to meet. They have concerned relatively small groups. The leader has created a friendly, permissive, democratic atmosphere, wherein a free exchange of ideas has been possible.

A unifying element, if not an already existing group sprit, has been present in each instance. Information has typically been presented, and discussed, particularly discussed with reference to its implications to the behavior of group members.

Decision groups were invited to come to a decision concerning a goal, and were provided freedom to choose or not to choose a goal. The goal was set as a definite and attainable objective. A follow-up was made to determine the result, sometimes with fore-knowledge by the group and sometimes, not. Subsequent goal-setting sessions were held in some experiments.

While there is clear evidence that the group discussion-decision method is capable of changing attitudes and behavior, at least four factors appear to affect the outcome. These require careful consideration in any experiment:

1. Some individuals respond more favorably to influence attempts than do others. All, however, are affected by a general tendency to conform.
2. Involvement in the group process is important in influencing the individual's subsequent actions. Involvement includes participation in the group discussion, identification with the goals of the group, and acceptance of the group-determined goal as his own: that is, accepting the decision.
3. Greater involvement is achieved in more cohesive groups, especially those which function cooperatively in achieving their goals. Cohesive groups appear to provide more effectively rewards and sanctions than less well-constructured groups.
4. Participation is facilitated through assembling smaller groups in which the individual has the greater opportunity to express himself than in larger groups.

GROUP MOTIVATES MEMBERS

One important basis for influencing the individual's behavior rests upon the power of the group over the group member. The group functions to provide a basis for the individual to compare his own judgments and beliefs with those of others. The group provides motivation through supplying the member with acceptance, security, and rewards. These group benefits tend to exert control over the individual's behavior.

Informal groups influence their members through the power which peers exercise over one another. Self-determination of means and ends results from participation and self-expression in groups. The individual expands his sense of achievement through sharing in the group's accomplishments. In the group setting, the individual becomes conscious of and responds to group norms; these, in turn, affect his behavior.

The inter-action between individuals in a group results in a patterning of behavior along specific courses of action. Finally, the group influences the individual's behavior through providing a rewarding therapeutic release from repressions and other inhibiting conditions. An overriding condition for the group to exercise influence through these means is free and uncoerced participation by the individual, along with conditions of self-determination in decision making by the group.

SAFETY DECISIONS

The conference was concerned, of course, with the kind of decisions which would result in changes in driving behavior of Air Force personnel. The conferees early decided that individual adjustments in driving and attitudes relevant to driving situations might be altered through the group decision method.

Several kinds of group decisions were suggested. The conferees assumed, generally, that the group process would extend over a period of time long enough to enable a series of decisions, each relatively limited and capable of achievement.

The decision should concern a specific which the group proposes to adopt, which behavior, in turn, is clearly related to the general goal of highway safety. It should be observable and clearly identifiable by the individual. The decision should be consistent with legal and other regulations. It should be capable of being attained within a few weeks. Objectivity in determining whether the decision has been carried out is important since the participants will most likely be required to report on their own accomplishments.

Examples of the subjects of decisions which various conferees suggested are:

—Restriction of driving hours and length of time at the wheel, to limit the effect of fatigue;
—Decisions concerning the non-use of alcohol while driving;
—Decisions concerning speed with attention to devaluing speed as a norm.

CRITERIA

The ultimate criterion is the accident rate. However, this rate may not be an immediately sensitive and useful criterion for a field test of the group discussion-decision method, since for any group the incidence within a short period of time is quite low. Consequently, the following suggestions were advanced for criteria:

1. Reports by participants of the traffic violations of which they were guilty —non-official, non-incriminating reports.
2. Reports of risks or near-accidents.
3. Official reports of violations, accidents, etc.

DESIGN OF THE TEST

The general design of the field test consists of randomly assigning squadrons of approximately equal safety records to experimental and control groups. Control groups would receive the customary safety education program only. Experimental squadrons, in addition, would be divided into smaller discussion groups. The design would be structured so as to check differences in effects of natural groups and randomly assigned groups, to check the differences resulting from meetings two a month versus eight a month, to check differences resulting from variations in group size. Approximately one year would be required to accomplish the study.

In conclusion, a group of administrators, traffic safety experts, educators, social psychologists and sociologists reviewed the convincing evidence that the careful application of group decision in the learning process effectively alters behavior in a desired direction. They set forth the basis for a test of the method in traffic safety education and proposed that the experiment be conducted.

They thought that the test, even under the best of conditions, might not provide an unequivocal determination of the utility of the method, particularly the initial experiment. But they thought the method sufficiently promising to warrant the test. The experiment itself has not been performed, but it is hoped that the findings here presented will interest others in testing the group decision method.

MEAT, POTATOES AND DESSERT IN YOUR SAFETY MENU

by L. VAUGHN GAYMAN
publicity director, Loras College, Dubuque, Iowa

Of the meat and potatoes of safety, the solid ingredients which go into the scholastic safety diet, all of you are well informed and skillful cooks. However one final course is missing for a complete and satisfying meal. That is the dessert, the topping . . . the flash . . . the *eye and ear appeal*, the proper publicity for the product which brings more compliments on safety cooking than all the basic essentials.

Top your satisfactory safety menu with the attractiveness of an unforgettable publicity dessert and you will accomplish two things. You will show the older generation what you have done for the younger, and indirectly urge the older one to take better care of itself. Many of you parents have stood with one food on the curb and one in the street as your better educated child made you wait for the light to change!

Today's automobile advertising is "dessert minded." Nobody tells us what makes 'em run, or the price. Just load the story with whipped cream, top it with cherries, chopped nuts and plenty of syrup.

The advancements of science have given to modern man more leisure time than any people on earth. Everything has been done to shorten, speed up, condense, concentrate, capsulize, everything we do.

Nobody bothers to read the news any more. We have canned news. We read our favorite columnist and agree with whatever he says simply because it takes too much time to disagree and discover our own reactions to the news he presents.

THE COMPRESSED, PUSH-BUTTON AGE

Digests have become the rage of our time. We look for the shortest articles on subjects we already understand to give ourselves a layer of information we call knowledge. The digests have become shorter and shorter. Now they are filled with pictures because pictures are easier to gulp and quicker to digest.

The radio has been forced into this mad current of public haste. Having compressed fifteen minute news periods into five, radio is now forced to give out a one minute capsule "on the hour" simply because we can't wait.

Televisic.. further reduces our social self-propulsion. I can remember when a visit to a friend's home might include some card playing, a raid on the refrigerator, and a dash of stimulating conversation. Nowadays, this social event consists of a whispered "hello" or "would you clear the picture up a bit as you pass the set?" Even "good night" can not be uttered unless the commercial is on.

Certain Eastern universities now offer summer school courses which consist of tape recordings of the professor's winter time lectures.

Some inventors and scientists even hope to train the students to wear earphones while asleep, with knowledge being piped directly into the subconscious. Thus we reach the ultimate in this frenzy of predigestion . . . we could transfer tape-recorded knowledge from a professor who wasn't there to a labor-saving student who wasn't even awake.

A generation ago we made significant progress in preparing a meal, including dessert. Unlike grandmother who cooked with nothing more advanced than a sharp knife and a large stirring spoon, mother learned to keep the family quiet witth the quick opening of a half dozen cans.

So, today we have constructed a push button paradise . . . one package meals, one package newspapers, one package minds. We are busy saving time, saving effort, saving money. We successfully save everything but one . . . Man himself.

This is a resource which can only be strengthened by self interest in its own preservation. The human body is not as capable of preserving itself as it once was, and is drastically dependent on the inventions and services of science in maintaining an equilibrium of life.

Thus, very suddenly, very undramatically, without glamour, assistance, appreciation, or applause, you and I come in. The schools, the universities, the teachers . . . yep, we're tagged again! For as long as you and I can remember, we've seen articles and heard speeches saying, 'Education, that's the thing. Education will solve it!"

Two things we can do . . . sit and gripe about the job, or, with an inner sense of real pride in the confidence placed in education and our part in it, we can accept the total responsibility and dig into the largest task facing mankind today . . . saving him from himself and the push button machines he has created. Some of you do that on the health front. Others watch for carelessness with chemicals, firearms, and slippery hallways, or a poorly cooked piece of meat in the school cafeteria.

Educators always look for "motivation" to propel people toward desired goals. I have a deep personal motivation in the field of safety, in doing whatever I can to assist its cause wherever found, and I have a purpose in telling it to you, to "motivate" you.

TRAFFIC KILLERS BEGIN ON BIKES

As radio news editor, I covered the city hall, police headquarters, and sheriff's office. For 20 years, I saw the "come and go" of a city of 50,000 as it expresses itself back of a wheel, in the home, on the job, at school and play. I have come to a stern opinion that ANY safety education promotes ALL safety education.

In the city and area, either by visiting the scene in person or reading all official records, I have covered some 30,000 accidents.

May I tell you of a recent few . . . within the past year and a half. At the beginning of each research shows a small deviation from normal, educated behavior. For example, in almost all serious traffic offenses, a check of the offending driver shows him

starting his record with a violation of the bike ordinance.

There was RJB . . . 18, whose record shows: bike violation, bike larceny, motor car larceny, violent assault, back to the reformatory. There was RH . . . one bike violation, next violation . . . dead at the wheel. He was 16.

How about the record of the 26-year old who started at 13 with a bike violation? His story went . . . bike violation, three break-ins including a safe job, disturbing the peace, intoxication, four traffic accidents, 12 moving violations. He has already destroyed more property than he will ever own.

And we'll never forget SC . . . whose first traffic ticket didn't look like much, except that his father and three uncles had notoriously bad records, "attitudes" you call them. When SC's first notation went into the file, officers and reporters alike wondered what was next. We didn't have long to wait; 60 days later, he smashed his car into a hillside cliff well within the city limits, doing 90 on a curve. He burned to death.

This old, old pattern known to every police file clerk isn't just for the highway. Six months ago, DJD didn't show up in police court to answer a routine arrest . . . loud muffler. He drowned the day before the hearing in the careless operation of a motor boat on the Mississippi river below town. The judge listened to the boy's name read . . . and the charge. Then, without any attempt to be dramatic but burdened with the ever-present problem of personal safety, he wiped his eyes and said . . . "Decision referred to a higher court."

NOBODY BOTHERED TO TEACH THEM SAFETY

All of the accident victims had one thing in common . . . they had attended school, years of it. Below the level of these documented cases come thousands of home, school, industrial and business accidents, all happening to "former students" of someone . . . so many of which could have been prevented by a safety minded population. Somewhere along the way, education has so far missed its chance to tell ALL the message of universal safety.

When you teach a girl to handle a stove in home economics class, when you conduct a class in life saving, when you teach boys to look out for oily rags in a closet, when you get children to observe regulations for the safe riding of their bikes, then you have made the big start on teaching all of them to be safe . . . in all ways, at all times.

General Walter Stewart of the National Safety Council in May said at Purdue: "You school people have the individual at the time you can teach safety in all its forms. A college student who is taught to be safe will carry that safety message all his life." The safety director who sees to it that chemistry labs have the best possible protection for eyes and body, the man who insists on relentless fire inspection of off-campus housing, the hard-headed chap who won't give in to student resentment when he enforces campus traffic codes, all are partners in the great campaign.

SPREAD YOUR SAFETY WORD AROUND

There again is where we come in . . . the schools, the universities, the colleges, with the safety problem in their hands, where they can do as they are expected to do by those who say . . . "Education, THAT'S the remedy!"

Since the teaching of safety in one field can lead to an increased awareness of safety in all fields, let us then *multiply* the TOTAL EFFECT of any safety lesson or example by telling thousands more people about it. Pyramid your purpose with publicity.

Your school may already have a publicity department capable of carrying much or all of the load. Your total problem may consist of building a gasket-busting fire under these scribes and lens hounds.

On the other hand, you may find yourself telling your story to an editor. In view of the daily diet of every news editor in the country, as described a moment ago, where do you and your story fit in?

Do you realize that YOU are the only possible bearer of good news? YOU are a person or group "doing something about it." Whatever your safety work or program, tell an editor about it . . . the nearest one will do for a start, your school paper editor. Then, look for a neighborhood paper, a trade paper, a union paper, church bulletins, then your city newspapers, radio and TV stations.

There are forms and ways of doing everything . . . and you'll learn most of them in 60 days. Build up a mailing list, use address plates if you have the machinery, the need, and the area to bombard. At no time will all of the news media respond to your cries, but someone always will. Then the others may feel that they have missed the boat.

If you can't get in print or before the public in any other way, start your own "scoop sheet." There is a marvelous "Do It Yourself Kit" in the safety publicity field. It consists of a ream of paper, a pound of erasers, a sturdy typewriter, and a pair of *well-fitted walking shoes.*

Notice that I said *"You"* are going to tell an editor . . . the same old George or Georgia who did the safety work, the same old teacher, the self same educator on whom the parents and all of society depend.

You are going to sit on the corner of the editor's desk, bombarding him with information in all forms. YOU are going to get the turn downs and the brush offs, the bob-tailed news stories and mangled rewrites.

Meat and potatoes make a meal . . . but Dessert, Publicity, make it an OCCASION!

ADVANTAGES AND DISADVANTAGES OF THE AETNA DRIVOTRAINER AND MULTIPLE CAR PLAN FOR DRIVER EDUCATION

Panel Moderator — CECIL ZAUN
supervisor of safety, Los Angeles Public Schools, Los Angeles, Calif.

Panel Members—PRICE E. CLARK, educational consultant, Accident Prevention Dept., Association of Casualty and Surety Cos., New York City.; PAUL B. CULLEN, superintendent, Public Education Dept., Aetna Casualty & Surety Co., Hartford, Conn.; JOHN B. DENNY, driver education instructor, West Waterloo High School, Waterloo, Iowa; INKS MABARY, director of safety education, Public Schools, Springfield, Mo.; ROBERT O. NOLAN, instructor, Highway Traffic Safety Center, Michigan State University, East Lansing, Mich.; RONALD D. PATTERSON, supervisor, Safety Education, Public Schools, Detroit, Mich.; ERNEST G. PRIEST, supervisor, Health, Physical Education & Driver Education, Escambia County Schools, Pensacola, Fla.

The session started with an over-all view of the driver education problem as it faces schools and the nation today. Mr. Clark gave the following figures:

DRIVER EDUCATION IN THE NATION'S SCHOOLS

Potential schools that could offer driver education	19,848
Schools offering driver education	11,273
Potential enrollment for driver education courses	1,706,500
Students having, presently, classroom training only	473,279
Students presently having practice driving also	649,885

TIME DEVOTED TO DRIVER EDUCATION ACCORDING TO CLASS PERIOD

No. of Schools	*Time Devoted to D.E.*	*Per Cent*
177,419	10 or more class periods	27%
186,050	7 to 9 class periods	28%
263,881	3 to 6 class periods	41%
22,535	1 to 3 class periods	3%

Ronald Patterson—One of the answers in a large city school system is a 200 foot by 300 foot practice driving area containing as many traffic situations as possible. One teacher can then train 12 or 13 students at one time. The cost is relatively low and the student gets more experience behind the wheel. You can also give additional time to those who need it, and students get an opportunity to drive on different types of cars. Skills are practiced more easily on this type of practice driving area than in the street.

Paul Cullen—The Aetna Drivotrainer trains in attitudes, skills and judgment. It is not meant to eliminate but to reduce on-the-road training. Advantages are: training at less cost than using cars; training in actual road situations that could not be duplicated in a few hours on a street near the school: one teacher can train up to 25 students at one time. In a car, only one, two or three students can be trained at one time by one instructor.

PANEL ANSWERS QUESTIONS

Does the teacher have to have a background in electrical engineering to handle the Drivotrainer equipment?

No, the ordinary teacher can perform first echelon maintenance. Otherwise, the school can use its own electrician. If the electrician can't handle the repairs needed, Aetna will service.

The wiring blueprints and all other installation data can be obtained from Aetna at the time of installation. Installations and repairs are now being handled for Aetna by the Automatic Voting Machine Company.

What is the initial cost for Drivotrainer equipment for the average classroom?

Each car can train 60 students a year. A Drivotrainer costs $900. The control tower is priced at $3,000. The films are $500. Delivery and installation charges are additional. At Ventura, Calif., an eight-place unit cost $12-15,000. Schools may finance the plan so that the price can be spread out over several years.

What is the time of delivery after an order has been placed?

Two months.

Are there a series of lesson plans which go along with the equipment to aid instructors in using the equipment?

Yes, a teacher's manual is issued with the equipment. Aetna also will train teachers at a training center, and check back later to see that the equipment is being used properly.

When is a school large enough to justify the purchase of a Drivotrainer?

Before the Drivotrainer can be economically profitable, 200-plus students should be enrolled in the driver education class. At least 600 students should be enrolled before a 15-place Drivotrainer is advisable, according to a study made by Bert Woodcock at Iowa State Teachers College. The maximum number of units is 25. There are no installations of less than five Drivotrainers, except in research installations.

Several schools in Long Island share their Drivotrainer. The Drivotrainer is located in a truck and moves from place to place every day so that various schools are served every week. In another area, Drivotrainers are taken in a truck from place to place and installed for a semester at a time.

What is the teacher supervising in the Drivotrainer? How do you know what your students are doing?

A score-sheet comes with each unit, and the teacher can check the score-sheet. However, the unit can be switched to automatic, so the instructor can circulate around the classroom to observe, and the machine automatically marks the score-sheet for future use of the instructor.

How does the teacher go about correcting a bad habit which may have developed?

Any errors are immediately indicated on the score board. By keeping an eye on the board, the instructor can see which students are having trouble and give those students individual instruction.

What about films?

There are 17 films available now. Thirteen deal with standard transmission, and four with automatic transmission. They are from seven to 20 minutes long.

What is the maintenance cost per unit per year?

Approximately $40 for the first year, after that under $100 for four years.

Doesn't the Drivotrainer tie up two classrooms?

Yes, in Springfield, Mo., we have one room containing Drivotrainers and one room for classroom purposes. Other areas of the curriculum, however, also take up two or more classrooms.

Some schools use the Drivotrainer room as the classroom, and the students sit in the equipment to carry on their class work.

What are the disadvantages of the Drivotrainer?

1. Visual habits — Student watches the driver in the film do everything and doesn't remember to do it himself.

2. The lack of advanced films. It is felt that time is wasted on fundamentals. Aetna is working on this, and five new films will be out in a short period of time.

In Springfield, Mo., the driver education course runs like this: 54 hours in the classroom, 20 hours in the Drivotrainer and six on the street, three of these in observation, and three in driving. The Standard First Aid course is also given as a part of this course.

Do students memorize the films?

They might show up better the second time. We hope so. After all, it's the experience in meeting these situations that we're after.

What is the cost of an off-street practice driving area?

The cost varies according to the size and type of a practice driving area you plan. In Detroit, the cost ranged from $40,000 to $76,000. However, if you use your school parking lot, the cost may be as low as $10,000. In the latter case, of course, cars would be left outside all the time. In general, the cost is from $35,000 to 60,000 and up.

What is the per student cost of the multiple car plan?

In Detroit, at School A, it was $33.24. At School B, cost was $28.33. At School C, per student cost was $22.21.

How is Detroit offering driver education to all boys and girls under 18 in the city's high schools?

Fourteen of Detroit's 22 high schools are taken care of between 8 a.m. and 3:30 p.m. The students in the remaining schools, and those in the parochial schools get their driver education courses between 3:30 and 9:00.

EDUCATION MUST REDESIGN THE "NUT" BEHIND THE WHEEL

by E. R. ABRAMOSKI

coordinator, Safety, Civil Defense and Health, Public Schools, Erie, Pa.

The rapid advance of science has added many new technological devices to everyday living. In the short span of a century, power has replaced muscle to do man's work. But with each new power, and each device man's genius creates, a concomitant hazard is also created.

At one time life was simple and comparatively safe. Today, man's ingenuity has created thousands of technological machines and gadgets to serve mankind. These necessitate a new vocabulary which, in many instances, only the expert understands. At the same time thousands of new hazards have been created that we must learn to control if we are to survive.

We, as Americans, pride ourselves on our high standards of achievement in a highly mechanized nation. But our education has not kept pace with our inventive prowess, and, therefore, we have one of the worst accident rates in the world.

One cannot pick up a paper without reading of an appalling number of persons maimed and killed in industry, in the home, on the farm, and most of all, on our highways. Of all the nations reporting accidents, our country ranks near the top of the list—

40,000 killed on highways
28,000 killed at home
15,000 killed in industry

This record excludes the millions maimed and hospitalized each year, a needless slaughter and waste of our most precious resources. How long can we stand by and see this human and economic waste drained *from our nation?*

SCHOOLS' RESPONSIBILITY

None will deny that engineering and enforcement have made a great contribution to the cause of safety, but education must eliminate this evil. Schools are dedicated to teach our nation's children.

Educational research shows that we must teach the whole child, and logic shows that education is useless unless the child lives. Therefore, the schools must place safety education in the curricula and give it the same prominence as reading, writing, and arithmetic, and all subjects we deem fundamental.

Education teaches skills, habits, knowledges and attitudes, all of which are integral parts of safety education as well. A child learns to live in a safe way through safe living. The challenge to the schools is to give the pupils a safe environment in and about school. Instructional materials should be used to instill in each child an awareness of existing hazards and a method to cope with them.

We are obligated to teach a child moral responsibility toward *himself* and his fellow beings, to avoid useless destruction of life, limb, and property. In other words, we must instill in each youngster an attitude of safety. This means that all our schools must teach safety, and the school boards in making up the budgets must recognize the importance of safety in the curricula. Safety cannot be considered a frill of education. Safety must be an integral and important part of the educative process.

Driver education is merely one phase of the total safety program, and though first conceived by educators, it is fostered by non-school organizations. The program first grew as a fringe activity and was merely tolerated by school administrators. However, driver education received support from outside agencies when the highway death tolls rose to more than 35,000 killed annually.

The first impetus to driver education came from automobile manufacturers and dealers in loaning cars to schools. Education then proved it could do the job. Statistics on the youthful driver was gathered and it was proven that students taught in accredited schools had better highway records than the untrained drivers. Immediately, insurance companies reduced rates for *the trained drivers, and the* driver education program got its booster shot.

However, the educator with vision sees beyond the single phase of safety—driver education—and looks at the whole picture. *He sees the need for safety in the home,* shop, farm, and school, for he realizes that each takes its toll in lives and resources.

SAFETY—A KINDERGARTEN LESSON

He sees that schools must meet every challenge and teach safety as a subject matter from kindergarten through driver education in the high school. To teach the skills, habits, knowledges, and attitudes necessary for safe living, schools must start, not with the driver's permit, but with the birth certificate.

In many of the better schools, safety is taught as subject matter from kindergarten to grade six, from teachers' guides developed by teachers' committees. The instruction includes such phases of safety as—safety on the way to and from school, safety in the home, safety in the school, safe play, safety from atomic attack, pedestrian safety, bicycle safety, safety in the snow and on the ice, hunting safety, safety in the water, safety in the shops, and a myriad of other safety lessons that fit into a year-round safety program.

Although class time for safety education *is in the curriculum, some of the best* teaching is done on the spot. Safety is also integrated into other subjects, such as social studies, vocational education, physical education, science, health, and school activities and games. Thus, the program will differ in each school for the hazards of that school, and still will have general material to serve the child in any situation.

The worth of a safety program in any school is determined by the administration's attitude toward safety education. A safety program functions best when someone is directly charged with the responsibility.

What person in a local school system is better qualified than the driver education teacher?

The driver education teacher has an interest in safety. To qualify for his job, he has had courses in general safety, safety administration, or the psychology of accidents. It is his job to sell himself and his program to the administration.

He may get the objection that the cost is prohibitive. However, safety education is cheap when one considers the man hours lost in industry, the cost of fire protection, the insurance rate of the automobile policy and accident costs of more than $10,300,000 annually.

A well-informed public knows that safety is not a frill of modern education but an integral part of the educational system. Schools must expand their educational horizons. Driver education teachers must supply the leadership for this expansion, for to education has fallen the task to redesign the "Nut" behind the wheel. ▲

An Experiment in the Use of the Smith-Cummings System

"TRAINING YOUR EYES FOR EXPERT DRIVING"

by ELBERT HUGUNIN

motor vehicle administration specialist, Northwestern Traffic Institute, Evanston, Ill.

Last year the Traffic Institute conducted a field experiment to evaluate the Smith-Cummings system of training eyes for expert driving. The evaluation was to determine how the system applied to beginner driver examinations, licensed drivers with bad records, applicants for truck driving positions, remedial and refresher driver training for armed forces personnel, and similar categories of drivers.

The Smith-Cummings system develops a driver's powers of observation and concentration, and lessens the danger of accident-causing distractions. The system teaches beginner drivers to practice expert seeing while driving and aids driver educators. It also checks seeing habits of experienced drivers by a road test.

This system was developed by Harold L. Smith, an experienced driver trainer, and John J. Cummings, a traffic research director in the automobile industry. Both men joined Dr. Reuel A. Sherman, an optical industry authority, and organized the Institute of Driver Behavior, 1380 Penobscot Building, Detroit 26, Michigan.

The Traffic Institute also made a study of "commentary driving," a technique of instructing and testing used successfully by the London Metropolitan Police Driver School to reduce traffic accidents among police drivers. In commentary driving, the driver speaks aloud, giving an impression of his observations, thoughts, and intentions of the car he is driving. Smith and Cummings use a similar technique in training fleet drivers.

WHAT IS THE SMITH-CUMMINGS SYSTEM?

Every driver THINKS he sees correctly in traffic. However, the Institute of Driver Behavior reported four out of five drivers do not use their eyes correctly and can't recognize a traffic hazard soon enough. They are distracted and have accidents, even when driving conditions are safe. In fact, most accidents occur when driving conditions are normal because a driver becomes distracted takes his mind off driving, and operates his vehicle by habit alone. Under these circumstances the expert driver with good seeing habits is protected; but the driver with *faulty seeing habits could* have driving troubles.

The Institute stated five common distractions in driving. One or more distractions generally is present when a driver makes a wrong move in traffic.

1. *Route problems.* More than half of all traffic accidents occur when drivers are con-

centrating on route problems such as heading into or out of a parking space, turning a corner, or looking for a road sign or street address. They fail to see that they are crowding or blocking traffic.

2. *Mental disturbances.* Drivers look with their eyes and see with their mind. Unless everyday seeing habits are good, they error when hurrying, worrying, or are irritated, bored, tired, or not feeling well. Being slow to see a traffic conflict can cause a driver to swerve blindly or stop in panic and set up another conflict. The hurry habit—a desire to avoid delay in traffic—is another reason for errors in seeing.

3. *Scenery.* This covers anything that excites curiosity and holds a driver's attention too long. At night many drivers fix their eyes on roadside lights too long.

4. *In the car.* A driver sees an insect in the car, turns his head toward passengers, or is distracted by children's actions in the car.

5. *Unfamiliar driving tasks.* Any time you drive above normal speed your normal seeing habits can trap you. City and rural driving, day and night driving, expressway and icy-road driving all take practice. Driving in states where traffic signs and driving customs are different, also can bring distractions.

KEY DRIVING HINTS

The Institute established five key seeing steps for driving. If practiced until they become a habit, they will eliminate the distractions which set up a traffic conflict.

1. *Aim high in steering.* Correct steering is simple. A quick glance ahead to the center of the intended driving path—not the center line—eliminates the tendency to hug the center line. For correct seeing the driver must be behind the steering wheel, sitting erect, back well supported with an adequate field of vision available.

2. *Get the big picture.* Most drivers watch the car just in front of them. This is small picture viewing. Get the big picture habit: see the car ahead as a tiny part of a big roadway scene.

Watch nothing in sharp detail. Never focus on any one object, because your fringe vision makes all judgments of speed, distance, and direction.

With the big picture habit you instantly see any car's changes in speed or direction, and the problems facing other drivers so you can anticipate their actions.

At night this viewing habit tells you whether oncoming cars are staying in their own lanes, and whether the red tail lights are moving forward, standing still, or backing up. In doubt, slow down until you get the full picture.

3. *Keep your eyes moving.* Unless you have the big picture viewing habit you are fixed-stare driving. Your eyes freeze on a conflict you were slow to see and you head blindly for another one. Develop the habit of scanning areas in the rear, near, far ahead, and on both sides. In driving, seeing should be done in quick glimpses.

4. *Leave yourself an out.* After you master the first three steps this is almost automatic. You adjust your pace so you have "an out"—a stopping margin ahead, and an open space—at least on one side—to swerve away from sudden danger.

When you acquire the habit of keeping an out, you pick the line of least resistance in any doubtful traffic situation. You avoid impulsive and hurried moves. You blend well in traffic, which is the acid test of ability to drive. Keeping a safe distance behind the car ahead will not delay your progress in traffic.

5. *Make sure they see you.* Never assume that the other driver will not do something unexpected. Never count on traffic laws to guard you. Give an early warning and be prepared to stop if necessary. Tap your horn or flick your headlight beams.

These are the five steps in expert driving. They may be seen in a film, "The Smith System," an eight-minute, 16 mm, black and white sound film loaned free from the Ford Film Library, American Road, Dearborn, Mich.

WHAT IS COMMENTARY DRIVING?

The driver speaks aloud, giving listeners in the car an impression of his observations, thoughts, and intentions to control the car he is driving.

Four years ago Scotland Yard's deputy commissioner for traffic gave the Traffic Institute staff a successful plan used in the London Metropolitan Police Driver School.

Under this plan, termed commentary driving, either student or instructor behind the wheel describes observations and contemplated actions of operating the vehicle.

The Metropolitan Police Transport averaged one accident every 8,000 miles before the training school for drivers opened in 1935. In 1939 the average dropped to one accident in 35,000 miles; in 1946 one in 63,000 miles; and in 1952 one in 71,300 miles. Evidently drivers learn a lot by talking about what they see, how they evaluate the situation, and what they will do about it. This is an excellent teaching and learning technique.

To teach or test with commentary driving, the driver (individually or in a group) is told how the procedures will be applied. He comments on the things he sees: signs, signals, pedestrians, other drivers, and intersections. For instance:

"I am about to leave this parking space. I have checked the controls. Now I am looking in the rear-view mirror, no cars coming. Now I am turning my head to check. The way is clear, so I am pulling out of the space.

"I am coming to an intersection — no signs. Looking left, right, left again. Way is clear. Sign on right says 25 mph speed limit. My present speed is 30 mph so I ease up a bit. Looking in rear-view mirror. Car coming up behind very close, ease over to let him go by.

"Pedestrian about to step off curb. Letting him go. No cars behind.

"Traffic light block ahead is green. Probably will not stay green long, so I should be prepared to stop if the light changes to red."

The procedure is equally applicable to teaching or testing. Short, unpolished phrases are used to cover the situation before the fact, not after it. These comments indicate what the driver sees and how he evaluates the traffic situation in advance. His statement regarding the possible action indicates his knowledge and driving skills.

Commentary driving can answer these questions for the instructor or tester: Does the driver use his eyes? Can he recognize traffic situations and act accordingly in time? Has he absorbed his training?

The Traffic Institute evaluation project was arranged in cooperation with the Wisconsin Motor Vehicle Department for a series of special examinations of regular licensed drivers. The procedure consisted of a driver test course 1.7 miles in length with traffic lights, stop signs, regulatory signs, turns, unmarked intersections, and other items required on a driver's test.

The drivers were briefed on the Smith-Cummings system and commentary driving, told that an unscored observation of their driving habits would be made, advised the nature of the test route, and instructed to comment on their driving. They were given a brief demonstration of the comments expected.

TEST COURSE SET UP

During the drive, distractions were introduced, such as, the route, comments on the baseball world series, and other matters of mutual interest or pertinent to the observations being made.

During the test the driver was asked the traffic sign just passed, the color of the traffic signal light, or some other item the driver neglected to mention. An attempt was made to determine why the driver missed essential items during the drive, since some could have contributed to an accident, congestion or violation.

Instructions given the drivers were simple maneuvers of normal driving, such as:

"Now drive out of the parking lot, turn left, proceed to High street and turn left, continue on High street."

"Continue straight ahead to Wilson avenue, turn left and park at 1704 Wilson avenue."

After the special examination each driver was briefed on his performance and could ask questions. His comments were encouraged. Whenever possible, the tested driver rode during at least one test. Most drivers remarked that they saw more from the back seat. Obviously, they had learned a lot from the one test experience.

The two Traffic Institute staff members who gave the special examinations did not use a scoring form. Notes were made during the test for later comments. However, a regular scoring form may be used or adapted. A special scoring form for the Smith-Cummings system can be found in the booklet, "Training Your Eyes for Expert Driving."

SURVEY CONCLUSIONS

These specific conclusions were reached from the preliminary survey:

1. Most drivers do not see traffic signs and situations. Along a given route, they can't describe the signs they should have seen. Pedestrians and bicycle riders were not always observed. Many drivers did not watch their speedometers or use the rear-view mirror while driving.

2. Even experienced drivers can't concentrate on the overall requirements of driving without practice. When asked to comment on their driving and at the same time find a street and turn into it, many drivers either turned before the street sign, or missed the sign completely.

3. Experienced drivers do not clearly understand traffic rules and regulations. Several drivers did not know speed limits in urban areas and many could not explain right-of-way laws.

4. Driving of those tested improved by observations and tests. Most drivers believed that they acquired an awareness of more requirements of driving. They had not realized what they were required to do while driving. They never thought in terms of solving driving tasks, overcoming distractions, and practicing good defensive driving.

5. The test is more applicable to experienced drivers than beginners. The driver must have some experience before he can be measured; Smith and Cummings recommended at least 10,000 miles of driving before testing.

6. The Smith-Cummings system and commentary driving could train drivers. Driver education instructors could use the techniques to create an awareness of many problems involved in driving.

7. The test points out inadequacies of inexperienced or unqualified drivers. It could help older drivers who never really learned to drive or have lost their former ability.

While these tests are preliminary and additional development is necessary, commentary driving and the Smith-Cummings techniques could improve driver training and testing.▲

EVALUATING STUDENT PERFORMANCE IN DRIVER EDUCATION

by EARL D. HEATH PH.D.

assistant professor, Education Center for Safety Education, New York University, New York city

In the past several years, considerable attention has been focused on evaluating the driver education program in various sections of the country. A major finding was the lack of recorded information at schools where driver education students received their instruction. About all the information available was that a particular student had taken the course and, where a grade was awarded, his rating for the course.

Naturally, more information is needed on an individual before anything which approaches research can be initiated. For example: Was the course elective or required; what was the teacher-pupil ratio for practice driving instruction; what type of transmission vehicles were used and in what sequence; did the student possess a license prior to enrolling in the course? Other questions are: was there a car available at the home of the student; what physical defects had he and were these remediable; what was the nature of the classroom instruction and the practice driving instruction and in what order were various phases of this instruction presented? These, and many other questions about the student, the course, and the instructor should be answered before investigating to determine the post graduate or continuing values of driver education.

STUDENT RECORD

To provide a minimum of such information for the researcher and the teacher, while still recognizing the time limitations of the average instructor, the *Student Record in Driver Education* was developed. Here are a few experiences reported by teachers who have used the device with several thousand students.

One of these reports relates to the ability to re-arrange the order of presentation of the content of practice driving sessions in accordance with the readiness level of the student. Such re-arrangement was made on the basis of a study of the session-to-session profile maintained on each student.

Another asset of the device for teaching purposes was the support it gave the teacher when a student was not recommended for the licensing examination. In conferences held with parents, the student's record, including anecdotes recorded during or immediately after each session was discussed. Most parents were pleased with the thoroughness with which the student's performance had been evaluated.

Still another value reported had to do with using the profile as a basis for conducting a critique and review prior to recommending the student for the state license examination.

In many schools, the record is retained in the individual student's personal file in the guidance department and is available to enforcement and education officials for research and improvement of instruction purposes.

Each driver education class should develop and use a system of this or another type for recording student progress and achievement, for you cannot operate a program effectively without one.▲

EVALUATING OBSERVATION TIME AS A PART OF DRIVING INSTRUCTION

by LOREN D. CAMPBELL

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A few years ago the Columbia University Metropolitan School Study stated that 50 years elapses before a new subject gets within the fringe of a school curriculum and another 50 years to get established. Yet the growth of driver education in our school programs in the past 24 years has been amazing.

Due to that rapid growth there has been little time or opportunity for research. Consequently, most of the techniques, materials, and methods we use are based on judgment not research, opinion, not proven facts.

Of all the activities in driver education, practice driving instruction in the dual control car has been the most criticized. That is true because parents still conceive of the school as a place where 30 to 40 youngsters sit at desks in orderly rows while a teacher fills their minds with important information.

When youngsters are moved into laboratories, gymnasiums and studios, critics become disturbed. When they are taken away from the school building and grounds out on field trips, art tours, outdoor and camping education programs and conservation projects, the eyebrows raise even more and the voices become louder in protest.

PROTESTS ROAR

Consequently, practice driving instruction has been open to criticism. When the instructor takes three or four students away from the school building in an automobile on to public streets and highways, criticisms cannot help but be heard. Furthermore, 90 per cent of the cost of high school driver education courses is attributed to the practice driving instruction.

However, in teaching practice driving under normal traffic conditions there's no way to increase the number of students and reduce the costs of the program.

One area of practice driving instruction with many unanswered questions is back seat observation. No one knows scientifically how much observation time or what number of observers is the optimum number for best results.

The National Commission on Safety Education published "Policies and Practices for Driver Education" and said about observation: "The purposes and objectives of driver education are the same in the classroom as in the motor vehicle. Practice driving instruction refers to learning experiences in driver education provided for the student as an observer and student driver in a motor vehicle. Additional time for learner observation in the car is advisable."

NO RESEARCH ON OBSERVATION

In the 1956 publication of the National Commission on Safety Education "Research Needs in Traffic Safety Education" only a very slight mention is made of observation. A publication of the Center for Safety Education entitled "Research in Safety Education" said one item needing experimental research was "What are the values and limitations of 'observation' in behind-the-wheel instruction?"

No bit of research has been done on back seat observation in practice driving instruction. The answers to such questions as, "How many observers should there be in the back seat? What length of time in observation will give best results? What are some of the best methods to keep observers' attention, develop interest, and build a challenging situation?" are still being answered by opinions, beliefs, impressions or experiences, rather than by experimental research.

We believe we should have at least two or three observers in the back seat, if, for no other reason than to quiet criticisms of fellow teachers and tax payers who would become vociferous if we rode around with only one student in the car. However, many of us believe there is a value in back seat observation. We would have observers even if no critics existed. Under normal conditions usually the number four student driver in any given lesson does a better job than the preceding three. Consequently, we rotate the positions from lesson to lesson to distribute equally the opportunities.

TEACHERS NEED DOUBLE TALENT

To gain the most for observers in the back seat requires special teaching techniques which unfortunately some teachers do not possess. Under such conditions the values of observation are lost and even certain anti-social actions and attitudes can develop which can harm the program and fail to develop the type of highway citizen we want.

Such actions include inattention, outspoken criticism of the student driver, damaging the interior of the car, throwing refuse out of the windows, horseplay or yelling remarks to passersby. The good instructor realizes his major concern must be with the student in the front seat, but is well aware that he has obligations in the back seat as well. In fact, the better he and the observers meet those obligations, the better the job of each student behind the wheel.

Most instructors believe there should be observers in the practice driving automobile. However, there is disagreement on the number of observers. Two observers in the back seat and one student behind-the-wheel is often mentioned by proponents who feel these two can see better and have more freedom of movement than if there were three observers.

A third observer decreases the practice driving time and increases the observation time with possible results of boredom and lack of interest. Most teachers of driver education feel that beyond 40 to 60 minutes the maximum span of attention and interest is reached and the benefits of observation are lost.

Those persons advocating observers point out that a student can learn by observing the mistakes and correct techniques of others, especially if this learning is guided by a clever teacher. It is necessary to set up this plan as a definite learning situation with record keeping, questions and problems, written criticisms of the driver to show him at the end of the period, a written summary of the things learned during the lesson, and a mental game of making believe you are driving for each driver. Similar procedures are followed in many school classroom techniques in other subject areas. Students recite, explain, demonstrate, and report while the group watches and listens.

Repetition is one manner of learning, and observation provides opportunity for repetition. Properly motivated, each student realizes his responsibilities to observe closely for his turn behind-the-wheel.

TEACHERS' TECHNIQUES

Many teachers feel that too few observers are a waste of teacher time and energy since teachers must repeat the demonstrations, explanations, and criticisms several times. With observers in the car, individual and group questions and comments can be shared by all.

Here are some of the techniques and tricks of driver education teachers use to improve their teaching procedures and learning process, and to make the back seat observation more meaningful.

Homogeneous grouping is important. As near as possible car groups should be formed with students alike in their interests, skills and experience. After a period of two or three weeks, adjustments can be made when necessary and possible.

Develop a glossary of common terms to use in the car. These terms should be given to each student so the instructor and the students talk a common language.

Remember that most of us understand better when we can see it. Therefore, the instructor should demonstrate maneuvers and skills, and also use the blackboard or driving pad to illustrate his points.

The instructor should not concentrate his attention on the student in the front seat excluding those in the back seat. Establish good car group rapport. Teach to all, not just to one.

KEEP OBSERVERS BUSY

Try to improve the observational skills of the observers. Timely placed questions to the group in the back seat will improve the perceptual skills of the group.

Keep observers busy in the back seat by having them keep records, mark check lists, write criticisms, keep notes for after class outlines, and similar activities. Many instructors place the entire responsibility of keeping all car and individual records on the number four observer in the back seat. Also included would be the individual time record of each student driver's time behind-the-wheel.

Limiting the number of observers and the length of observation time prevents boredom and gives freedom of movement. Some people believe that learning by observation has only limited application. Having four students in the car is more economical, but teacher-pupil ratio must be considered in terms of the amount of time each pupil spends behind-the-wheel.

Save time, confusion, and delay by having:

A. A definite system of who is first, second, third and fourth each lesson. Naturally situations arise to change the system.

B. A definite system of seat rotation as each student moves to his turn behind-the-wheel. There are three methods of doing this:
   a. As each driver is through he moves into the left side of the back seat and does not move again during the period.
   b. Similar to one above except that the group in the back seat slides one place to the right each time. The incoming and outgoing students and the instructor step out of the car with the outgoing driver each time stepping over those left in the back seat.
   c. The outgoing driver moves to the left position in the rear seat each time but all back seat occupants move out of the car before he enters. Even though such a plan consumes slightly more time the advantages outweigh the extra time:
      1. Breaks up the monotony
      2. Increases the amount of activity
      3. All receive the benefit of a new and different seat for observation
      4. Better control of the group in discipline and interest.

With so much seat changing, it is important to observe two safety measures. One is to develop the habit never to touch a door handle until the parking brake is fully engaged. The second is to develop the habit of carefully closing all doors to be sure no fingers are caught in the door.

Of course only the curbside doors should be used—never the suicide doors.

Nothing should be placed on the back shelf. This is a safety measure and permits better visibility. Students can either place their books and pocketbooks in the trunk or on the seats behind the observers, thus acting as a detriment to restful in-attention.

Back seat observation can be evaluated in the knowledge gained, habits developed, and the skill shown when performing behind-the-wheel. Many have opinions on the subject, but practically nothing has been done in experimental research. Some of the following questions still must be answered through sound research:

1. Is back seat observation valuable?
2. If observation is valuable, how many observers is the best number?
3. How long should driving lessons be for the student driver? for the observers in the back seat?
4. What are the best methods to hold the interest of the group?

What is needed most in driver education is progress—progress based on research and expert advice rather than change for the sake of change or innovation based on speculation. Unless driver education employs sound educational methods and unless the claims made for it measure up to its avowed objectives, we may find that driver education is not a part of our curriculum any more.▲

DEVELOPING A SUMMER DRIVER EDUCATION PROGRAM

by JOSEPH G. PAWLOWSKI

director, Driver & Safety Education, Maine Township High School, Des Plaines, Ill.

When developing a summer driver education program, several aspects must be taken into consideration: how can it be worked into a summer session program; can the course operate or run like an average school year course; are the proper facilities available for the summer course (cars, classrooms, etc.); is the demand for the course as great as during the regular school year?

The driver education program at Maine Township High School in Des Plaines is integrated into the regular summer session so that a student can take one or two other subjects. Driver education is not a separate course, but is part of the regular curriculum.

To receive state aid we must also meet the requirements set up by the Illinois Department of Education. This means we must give each student 30 hours of classroom instruction and six hours of behind-the-wheel training. Formerly we gave each student approximately 15 hours of classroom instruction and 5 hours of behind-the-wheel training. Each summer course in driver education formerly lasted four weeks; now it lasts five weeks. We found the shorter course to be fairly satisfactory since our percentage of failures was very low—around three per cent.

$30 PER PUPIL

However, under the state aid program, the State of Illinois reimburses the school $30.00 per pupil for each student who has completed 30 hours of classroom instruction and six hours of behind-the-wheel training. That is the standard which we now use at Maine Township High School.

A well run summer driver education program must have adequate facilities to operate properly. At Maine the same facilities are available in summer as in winter. We have a large parking lot which we use for beginning behind-the-wheel instruction when we feel a student should not be allowed on a public street. We have adequate classrooms, visual aids material, cars and instructors.

And we certainly have enough students. The course in driver education has been so successful at Maine that in four years the program has grown from one instructor and one car full time (8:00 a.m. to 3:00 p.m.) to three instructors and three cars, full time. Next summer we plan to use four instructors and four cars full time to meet the demands of the students.

SELECT ON AGE, PRIORITY

The students' demand for driver education is so great that we have had to set up standards for making our selections so that more students have an opportunity to take the course. The minimum age limit is 16. Seniors have first chance, then juniors and so on. Those who need a driver's license to hold a summer job have priority.

We also try to arrange a student's course so that it will not interfere with his parents' summer vacation plans, that is, he has a choice of the first five weeks or of the last five weeks. If after all these requirements are met, there are still a few vacancies in the course, the remaining students are chosen on the basis of who registered first.

We have found that developing a summer training program differs very little from the regular winter program. The total number of students trained is smaller because of the shorter period of time, but each student receives the same number of hours training, and the same careful consideration as those in the regular school year.

I believe this lack of difference is due to the fact that the driver training course is just another unit of the regular summer school curriculum as a whole and is not treated as a separate part.▲

USING THE DUAL CAR PLAN

by J. A. GIBSON

safety coordinator, Clearwater High School, Clearwater, Fla.

School people are constantly trying to find ways of increasing the teacher-pupil ratio in practice driving classes.

One such plan is outlined below:

PURPOSE:

1. To increase teacher-pupil load and
2. Number of hours "behind the wheel" training per student

EQUIPMENT:

1. Minimum number of cars (2)
2. Enclosed area or blocked off street

CAR AND STUDENT ASSIGNMENT:

1. Four students each period
2. Five periods per week
3. One hour periods
4. Each student 30 minutes "behind wheel" each period
5. Each student in car once a week
   a. 90 periods per semester
   b. 30 "in class" periods (30 hours)
   c. 12 "in car" periods (6 hours)
6. Teacher can handle 100 students per semester

PLAN:

1. Instructor checks out each student in car for purpose of grouping. Each group needs two advanced students
2. All lessons at beginning of course are taught on enclosed area or "blocked off" street.
3. Students are taken for road test as soon as they are old enough and ready.
4. (Only one student at a time in the "following car"

ADVANTAGES:

1. Student solo drive is under supervision.
2. Teaches safe following distances.
3. Plan can be used in traffic.▲

The Elementary School Section's Viewpoint

ON SAFETY EDUCATION

by JAMES W. MANN
principal, Hubbard Woods school, Winnetka, Ill.
chairman, steering committee Elementary school days, N. S. C.

Let me review some possible approaches to teaching safety. Consider, for example, what might be called the "*horrible example*" approach. A child is hurt. We use the accident as a proper lesson in safety. This, we maintain, is the only *real* safety teaching. All else is trite and artificial.

Then there's the *controlled environment* approach. The child's surroundings should be so safe that there is no opportunity for accidents. This is our responsibility as adults. If an activity has potential dangers, cancel it. If a piece of apparatus is likely to cause an accident, get rid of it.

Or perhaps we should be *scientific* in our approach. Make a careful and thorough study of all accidents everywhere. From this construct a check list which will constitute the "curriculum" in safety education. Arrange by grade levels, and when each item has been "taught" our responsibility has been discharged.

SEASONAL APPROACH

There are those who believe that all good teaching is *accomplished through precept*. They construct a full list of "thou shalts" and "thou shalt nots." These commandments, memorized by each child, will prepare him to face the future.

Then there's the organized person who believes that safety education must have a *formal place* in the school curriculum. They favor a 15-minute period daily. Definite requirements for the year at each grade level are in a written outline and each teacher is required to complete the outline.

As a variation to the above, let's consider the *seasonal approach*. This takes less time than the daily requirement and utilizes the opportunities presented by well-understood events in the children's lives. We will then observe fire prevention week in October, followed by Halloween which is rich in teaching opportunities. Christmas has its well known hazards, and ice and snow can be stressed in January. After a brief respite we go into spring and early summer with multiple warnings about the dangers lurking in outdoor play, picnics in the woods and the hazards of water and heat.

At this point you may feel I am trying to be cynical about these various approaches to safety education. I have not meant to disparage, but rather to infer that in each one there is something vital lacking in terms of good teaching.

Good teaching of safety education is the same as any teaching we do. The central figure is the child—a growing, developing, experimenting human being. He is not necessarily interested in "learning" about safety. But he can be interested in living safely if we follow the fundamental principles of good teaching.

To teach a child we must first know him as a whole being—we must know his physical self, his mind, his emotions. Then we must involve him physically, intellectually and emotionally in a continuous program of doing, thinking, appraising, revising, and doing again. This must be accomplished using the knowledge that children learn best when they seek to satisfy their inner searchings. This we must recognize as a process of growth, with each stage in the process presenting a new kind of need and seeking a new fulfillment.

GOOD SCHOOL FACTORS

Following is excerpts from some of the literature of our group, published under the title "Desirable Experiences in Elementary School Safety." This document says:

1—Good schools provide safety instruction to *meet the needs of the pupils*. This includes examination of the environment, analysis of accident records, attention to the hazards of special days and seasons and consideration of the individual pupil's problems.

2—Good schools provide for *active participation of the pupils*, including such activities as inspecting and correcting hazards, patrols, monitors, committee work, and pupil evaluation of safety programs.

3—Good schools provide for *a well-rounded program*, covering all safety areas of importance to the child, utilizing suitable materials and fitting the program to the particular school and community.

4—Good schools provide *realistic opportunities for supervised practice* in meeting hazards. The practice of helping a child to identify himself personally with a program of learning is basic to good, modern education.

5—Good schools *keep safety foremost* in the minds of pupils, parents and teachers. This means, of course, that everyone is engaged in safety, not just a committee or safety supervisor or the principal. It means that safety becomes a meaningful part of the life of the school.

6—Good schools *cooperate with other community agencies*. This is civic training in a realistic setting.

7—Good schools provide for *safe environment* and for continuous improvement in the total program. Good education suggests that children have a part in this improvement, for what they share in, they will not destroy.

This philosophy of yesterday is sound today. Perhaps in practice, however, we have relegated that philosophy to second place in our concern of "how-to-do-it." Perhaps in our concern for techniques, we have forgotten to give attention to the personal development of each individual child and to the effect this or that plan will have *on him*.

We have the opportunity to take a fresh start now. The contribution of the Elementary School section will be to help ourselves and other teachers aid boys and girls to gain experiences which will produce safer boys and girls, safer men and women, safer citizens.

This section agrees that we should focus our thinking on a little child, a physical being who must be active, who must sometimes experiment in order to learn, who must live out his aggressions before he can become a mature person, who thinks rationally only after he has had experience to form grounds for rationality, and who must be a child before he can be a man. We must make safety for him, not a series of items to be learned, but the challenge of a life to be lived. ▲

THE CHANGING WORLD IN WHICH OUR ELEMENTARY SCHOOL CHILDREN ARE LIVING

by MRS. CLIFTON M. UTLEY
NBC Commentator & Director, Midwest office, Institute of International Education, Chicago

This past year has seen a dramatic change that has moved us farther into the missile age. The Sputnik circling the earth at more than 18,000 mph and sending its radio messages to the earth marks the beginning of a new era. This earth satellite points up the contradictory aspects of our world and our adjustment to it.

We have adjusted to the fact that the Sputnik is there. It is rapidly becoming as commonplace as an alarm clock. As a people, we are only now facing up to cold reappraisal of what the whirling orbit projector really means. It is a tremendous scientific achievement, but already it has lost its novelty.

But such contradictions seem to be a characteristic of our society today. We have our highest level of physical comfort, but we are full of insecurities. We move from one place to another with the greatest ease, but we are thereby creating problems of health—and even life—that did not exist when we lacked the conveniences. We work a shorter week and a shorter day, but we have difficulty in using our new leisure.

IGNORANT IN USING SCIENCE

We have science as our servant, but we carelessly do not learn how to use it. We create more and more desires for the comforts of home, and send Mother out of the home to earn enough money to help buy them, frequently losing the very characteristics that make home a warm, focal point for the children. We build better homes filled with more comforts and conveniences, and we are the most mobile of all people.

Our social and emotional roots barely have an opportunity to go deep into the neighborhood soil before they are pulled up and replanted to a new spot. The physical dangers and the emotional insecurities of such a life are obvious.

I could go on and on with examples of our pattern of living that show the contradictions. We cannot expect balance and equilibrium in all things. Life would be exceedingly dull if we did and we would probably become as dull intellectually as we become sluggish physically if we live for a long time in a mild climate never frequented with marked changes.

TRAINING SCHOOL CHILDREN

You people are working with elementary school children. You have the most exciting and challenging task in the world. Upon how you and your colleagues help train their mind and bodies and, yes, their spirits, depends the future of our society. This is a bewildering world for these children. The contradictions between word and deed will puzzle them.

The complexity of the decisions to be made will require not only a mastery of facts but also a mastery of self. Let me consider in greater detail some aspects of "The Changing World in Which Our Elemenary School Children Are Living.":

(1) Ballistic Missiles

We have an earth satellite.
Next step—orbit to the moon—25,000 mph.
Then, platform on earth satellite.
Then, platform on moon (un-manned).

(2) Atomic Power

a. Military use.

b. Peaceful uses (fissionable by-product).

(3) An age that is becoming more industrialized and motorized.

a. Learning a trade or profession, we must know something about machinery. It is almost impossible to work at something that does not involve machinery or a motor.

b. Home—electricity and gas equipment. We must learn something about it to operate it safely. I can never understand why people persist in looking for a gas leak with lighted matches.

We live with chemistry, physics, electronics. Even if a child does not plan to be a scientist or a mechanic, as a citizen he will need to know some science, for without it the world he lives in and reads about in his daily paper will have no meaning.

UTILIZE LEISURE HOURS

(4) With this industrialization, and especially with automation, comes more leisure. To you goes the challenge of giving these elementary school children the resources for using that leisure. I hope that you can help them know themselves so they can enjoy being alone, reflecting, or enjoying books, poetry and music. I hope they can find pleasure in a garden of growing things.

Of course there is the necessary vogue of "do it yourself" furniture, gadgets, and even houses. I say "necessary" because the cost of the finished product is often too expensive for an average budget and because it fills the leisure hours that might otherwise be spent in boring idleness. I shall not dwell on the importance of safety procedure in these tasks. That is for you to pursue later.

(5) Another aspect of the changing world in which our elemenary school children are living is the home. The fact that the home has so many modern conveniences means that the mother and housekeeper has more free time. She can use that time for her self-improvement, for civic work (community improvement) or for financial gain.

In ever increasing numbers, women are choosing the latter. This is partly because the pattern for women working in business and industry was extended during the war years when every hand was needed. Both the women and their employers found the result satisfactory.

WOMEN WORK FOR FINANCIAL AID

But usually the force that pushes the woman to work outside her home is financial need. You may not think she needs to buy a piano so Mary can take lessons, a luxury that father's check won't pay for. Or you may not consider it essential that the family have a television set, an electric washer, a new car and furniture, all being paid for in installments at the same time. Whether you agree or not, they made the decision, and Mother works.

In trying to meet inflated prices, they work to buy things and thereby increase the inflation. Sometimes the Mother works because she is the sole support. We are shockingly neglectful in the way we permit husbands and fathers to abandon their families, cross jurisdictional boundaries, and evade any financial responsibility for their families.

No matter what the reason for their working away from home as wage earners, a great many women do it. The impact on the children is obvious. They return to empty homes. They need good judgment, self control. Or they are locked out of their homes after school until a parent returns.

Then the child is faced with a need to know the community and how to defend himself in a variety of situations, from playing in his own street to getting to and from a neighborhood park. Even if Mother is not working but is at a PTA meeting instead, many of these same problems and needs for personal resourcefulness and good training exist for the child.

(6) Another aspect of our changing world that confronts the elementary school child is the mobility of our families. I was recently talking with an American Fulbright student who had returned from a year's study in Austria. He said one of the things that impressed him was the way the Austrians planned and financed the building of a new home.

There were no loans that permitted building the house and then living in it while you paid for it. Instead, they saved enough money to build the foundation one year. The sides would go up the next year, and perhaps the roof. The third year the remaining parts would be added. Then the family moved in to stay a lifetime.

When the Fulbright student explained how we financed our homes, and when the Austrians learned how we would buy a house, then change our job and sell the house and move to the city of the next job, they were incredulous. They could not believe a people would be so mobile.

"WE ARE NOMADS"

But mobile we are. Sometimes I think we are almost nomads. We move from place to place in search of work or health or comfort. Sometimes we move to escape boredom. Sometimes we move to escape facing up to reality. Ask Travelers Aid sometime about the many people they help who are running away from their homes to a new place—any place—where they will not have to face their own weakness, where they can pose in a new setting as the persons they pretend to be rather than the persons they are.

This mobility gives to many of the elementary school-age children a lack of security. No place can they become established before their family moves on. Perhaps it is only from one part of a city to another, but in large cities that can mean new friends, new surroundings as strange as a new town would be.

We can't keep our people from moving, even if we would. But perhaps we can give to the children an inner resourcefulness that will give them self-confidence and composure in a changing scene.

It is a very delicate line you tread as educators. How can you help give the elementary school child self-confidence without a self-deceiving cockiness? As a nation, we are now suffering from the blow of learning that the Russians have surpassed us in

the science of rocketry. We are making all kinds of excuses—all of them based on the premise that our bigness and ability will eventually win.

To readjust to the knowledge that we do not always win will be difficult. Adult Americans are not making the transition easily. It will be equally difficult for our children to understand. For these scientific and psychological changes mean we are entering a new world.

I trust that for the children who are our responsibility, it will be a world where they can enjoy the thrill of new knowledge and the satisfaction of applying it. I hope that it will be a world where science will advance and its basic precepts be generally understood.

But I pray that we will advance, too, in the social sciences of learning to live together in friendliness instead of mutual destruction, and that in this rapidly changing world the dignity of the individual and the human spirit will never be debased.

WHAT ARE THE FACTS OF POPULATION MOBILITY TODAY?

CHANGE OF RESIDENCE

by SCOTT A. GREER
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People in U. S. cities are on the move. In one year, the average (median) of all people who moved in the cities was 16 per cent. The range was from six to 34 per cent. Some cities have relatively low rates. Among these are Scranton, Wilkes-Barre, Johnstown, and New York. Cities with higher rates are Dallas, San Diego and Miami.

St. Louis represented a fairly average city in 1950 with 13 per cent of its population on the move. In 1957 15 per cent moved and there is no indication of a decline. Los Angeles was near the top in relation to mobility with 25 per cent of its population moving. In 1953 the following figures were found for four middle-class residential areas: in one area 28 per cent had moved in one year; 27 per cent in another area; 28 per cent in another and 15 per cent in another.

The percentage who had moved within three years was 56 per cent in the first area, 52 per cent in the second, 45 per cent in the third and 59 per cent in the fourth. It is noted that whereas the fourth area had a relatively small per cent of those moved in one year, it had the largest percentage of those moved in three years. The median time in residence for Los Angeles was slightly less than three years.

Among the reasons for this mobility is inter-urban migration. In a Los Angeles study less than 25 per cent of those investigated were born in Los Angeles. Only 32 per cent of the Detroit area residents were born in Detroit.

There is also an intra-urban movement. Forty-three per cent of the suburban population in St. Louis, lived previously in St. Louis.

One reason for movement within the metropolitan area is congenital mobility, that is there are some people who are just always on the move.

In other cases it is an adjustment to change: in-migrants to the cities have not yet found or been able to afford homes in the neighborhoods they prefer. There is also migration which comes as changes in life cycle. Whereas schools and playgrounds are extremely important in the selection of a home at one age level, they are not at another. Changes in social or economic level and income also may furnish a reason for mobility within the metropolitan area.

Populations flow to the cities and between them and selection of residence within the city is related to urbanization, ethnicity and social rank.

From 1950 to 1955, the population of metropolitan areas increased by 11,500,000; that of the rest of the country, by 300,000. The increase was almost entirely due to suburban growth: the central cities increased by 3.8 per cent, the suburban area by 19 per cent. Almost all (but a negligible part) of the tremendous population growth forecast for America in the next few decades will be (1) metropolitan and (2) within the metropolitan areas—that is, suburban in nature.

AGRICULTURAL MIGRANT WORKER

by NAOMI HIETT
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Agricultural migrant workers move so frequently in following the harvest they have little chance to improve their own conditions. Therefore, many migrants each year find themselves, through community neglect or indifference, having to work and live under unfortunate and even deplorable conditions. There are numerous communities and individual employers representing marked exceptions to this pattern, but unhappily, there are many others to which this statement is only too applicable.

Our whole country's economy is tied up with a bountiful harvest. A bountiful crop wouldn't be of much value if it couldn't be harvested and processed. Because agriculture is such a big and important business more workers are required for harvesting and processing crops than are locally available. Therefore, migrant workers are recruited from states which have a surplus or from states where the harvest season differs. When they finish with the crops in one place they move on to crops in another.

REPORT ON MIGRANTS

This places a moral as well as an economic responsibility on citizens, employers and official agencies to make certain that our harvests are not reaped at the expense of the migrant laborer and his family—that they be afforded the same protection, opportunities and responsibilities as are afforded local residents.

In a report given by Paul E. Blackwood, specialist of Elementary Education, U. S. Office of Education, he reported there are more than 875 counties in the United States in which at least 100 agricultural migrants reside at peak seasons. The counties are widely scattered. For instance, 157 counties are in 10 east coast states; 401 counties in the central states; 139 counties in Texas and 181 counties in 11 western states.

Hundreds of these counties have from 500 to 3000 migrants. These people are absolutely necessary to our economy but when it comes to providing services for them, too frequently the remark is "They don't pay taxes," "They aren't here long enough," "They aren't our responsibility," or, "Why doesn't the place where they come from take care of these needs?"

These same people fail to realize that the money which these migrants make for the growers and the canners is what helps pay for the schools, the hospitals, the parks and the social services with which the local residents are provided. But the migrant, whose labors are necessary to provide the money to these land owners or large employers, do not realize any benefits from them. In addition, the migrants spend a large amount of the money which they earn in the community while they are there.

The United States Office of Education recently referred to these migrants as the largest single reservoir of illiterates in our nation today. They have estimated that 600,000 of these children are being denied the privileges of a public school education.

Many of these children are retarded from two to four grades. In a spot check of

children in one area in Illinois, 18 of the 28 children were educationally retarded from one to four grades.

In a survey made by the Wage and Hour Contract Division of the United States Department of Labor, an analysis was made of 4,182 of the 4,285 children their investigators found working during school hours. Forty per cent of these children were migrants. Sixty-two per cent of them were educationally retarded.

In many places the children were not accepted in school. In others, provision isn't made to accommodate them or to plan for them. Sometimes they have a language handicap. They may be in a community for 2 weeks or for 3 months. Frequently local leaders express the opinion that it isn't worth the extra effort or expense to get these children in school.

On the school's side is the problem of additional children in an already full load; having children added to a class at a late date when they have not accomplished the earlier year's work and the lack of records as to what the child's level of attainment and school history has been. Experiments have been attempted on the east coast and in other areas to develop an accumulative School-Health Card for the family to carry with them.

MIGRANT HOUSING PROBLEMS

In addition to education there are housing problems. In some places employers have gone to great expense and made special efforts to provide good housing. But in other places they move the farm machinery from a barn, pitch tents or have shacks or converted farm buildings, at times even converted chicken coops.

The problems of sanitation and personal cleanliness are overwhelming. In one sample 20 of the 30 migrant families had no bathing facilities except a nearby pond. In discussing with the father what he saw as one of the biggest needs, he mentioned bathing facilities for the three year old—it seems he was too little for the pond and too big for the dishpan.

In health the family and the children are rarely included in local health preventive services unless the community happens to have a special "health drive" such as for polio. Even in these situations the child is likely to receive one shot and not any of the subsequent injections.

Several children in one camp had tuberculosis and were placed in a sanatorium. The harvest season ended but the children were not ready for release. The dilemma was the family had to move on without them—or stay without any income—or take the children with them and risk the chance they might die.

In another instance, a youngster died because none of the migrants in a particular crew knew how to use a dial telephone. By the time the father went in from the farm to obtain a doctor and the doctor arrived, the child was dead.

MEDICAL CARE NEGLECTED

These children also work in fields, many times with dangerous implements. For instance, a child's finger was almost whacked off with an onion knife.

A pregnant woman on the move is not likely to bother with prenatal care as long as she doesn't feel badly. If a baby is born with some deformity or handicap, it is difficult for him to get adequate medical care in order to avoid permanent damage, not because it isn't available, but because it takes time and many operations with careful planning and spacing, and careful aftercare.

If a mother works in a field, she takes the baby with her, and may lay him in a convenient shady spot. There he could be the dinner for insects, exposed to rats or run over by farm equipment. Or if he has older sisters and brothers, they take care of him, as best as they are able, during the mother's absence.

Nutrition is another problem as it is often difficult to secure balanced food, plus the time it takes to cook, and the cooking facilities are the open fires built by the migrants themselves. The milk supply and safe water is also a problem.

TRANSPORTATION DIFFICULTIES

A problem which lately has been given much consideration is the transportation of these workers. There have been no laws covering the vehicles, the number of people who could be crammed into a truck and the length of time that they could travel, including the driver, without sleep or rest.

A law has been passed in the last session of Congress which regulates this. It is Public Law No. 929. The Interstate Commerce Commission has just released a pamphlet setting forth regulations on the new law. It is entitled "Title 49 Transportation Motor Carrier Safety." There will be much opposition to this law and much resistance to compliance with these regulations. This is a place where concerned and informed people may do a good job of interpretation and support, if they so wish.

These people are a part of our country, of our citizens. They not only have a contribution to make in our economy, but they are essential to it. Therefore it would seem that we have a moral responsibility—and even a selfish interest in helping these people better their living conditions, their educational opportunities and their general well being.

"Wisdom is knowing what to do
Skill how to do it
Virtue in doing it."

THE MILITARY FAMILY

by BRIGADIER GENERAL ROBERT W. HALL USAF
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The military family is probably the largest family known to man. There are approximately 3,015,400 dependents of military personnel throughout the world—slightly more than one dependent for each military person on active duty. Of these, almost 521,000 are located in oversea areas. The remaining two and one half million are scattered widely over the United States.

The dependents of military personnel include wives and children, as well as mothers and fathers who receive more than half of their support from service members, and, in rare instances, even husbands who are in fact dependent upon their wives. There are roughly 1,632,700 children in this large family—enough to create headaches for a number of school teachers not to mention baby sitters!

Since you are particularly interested in the school age children of military personnel, I shall discuss three main points—where these offspring receive their education, the numbers involved and an outline of the migratory nature of the families to which, in military jargon, the children are assigned for logistic support.

EDUCATION SIMILAR TO CIVILIANS

Children of military families are exposed to education in much the same manner as those of our civilian friends. Here at home, the children of military personnel attend schools—generally the public schools, although many attend private institutions—in the areas where their parents are stationed. In localities where there are insufficient school facilities, schools are operated by the Armed Forces on the military reservations.

The Army operates 10 such schools throughout the States and Puerto Rico with a total enrollment of approximately 13,000 children. In addition there are 39 schools built on Army reservations with Department of Health, Education and Welfare funds which are operated by local school jurisdictions.

The Navy, including the Marine Corps, operates four schools in Virginia and North and South Carolina with a total enrollment of 2,973 children.

In Alabama, Florida and Puerto Rico, the Air Force operates seven schools with 3,615 students enrolled. Like the Army, they too, have schools built by Department of Health, Education and Welfare funds on their reservations.

Thus, there are 21 schools operated by the Armed Forces on military reservations and 60 built with Health, Education and Welfare funds on military reservations but operated by local school jurisdictions.

In the overseas areas there are 276 schools run by the Department of Defense—144 by the Army, 21 by the Navy and 111 by the

United States Air Force. The teacher-pupil ratio in schools located outside our country and its possessions varies from a low of one to 10 to a high of one to 50. The average is probably in the order of one teacher to 25 students.

Lest you draw the conclusion that we are too well off in this respect, may I point out that conditions in overseas areas are, in many cases, most difficult. The shifting of military personnel and the age spread of children at the smaller installations are two of the important considerations. The schools are found in the areas of American military concentration and vary from quite small units to those comparable with our schools here in the States.

Sometimes supplies and equipment are difficult to obtain at the far end of the pipeline. A very insignificant number of the children who attend the oversea schools are dependents of civilian government workers or those of other civilians on a fully reimbursable basis.

MARRIED SERVICE MEN

Now, as to the numbers involved, you may be interested in the distribution of the married male military personnel by number of direct dependents. There are 1,221,091 married males in the Armed Forces, 424,804 have no children, 325,906 have one child, 266,726 have two, 132,999 have three and 70,655 have four or more little income tax deductions.

The 1,632,700 children I mentioned previously are divided by service in the following manner:

Army	569,992
Navy	326,501
Marine Corps	78,910
Air Force	657,293

Geographically 1,326,833 are located within the United States and 305,865 are outside the continental limits.

Included in the foregoing figures are children of all ages. We do not have figures separating out only those children of elementary school age. These would be most difficult to obtain because of the difference in local school systems. However, here is the breakdown by age groups:

In the United States—

Under 6	776,258
6 but not to include 12	402,720
12 but not to include 18	125,978
18 but not to include 21	16,081
21 and over	5,796

Overseas—

Under 6	176,409
6 but not to include 12	96,956
12 but not to include 18	28,443
18 but not to include 21	2,944
21 and over	1,111

If we take the elementary school ages to be six to less than 12 we find that there are overseas about 96,956 and in the United States 402,720. If we subtract those in schools operated by the military in the United States, it may be concluded that about 388,220 are attending schools even as your children are.

INCREASE IN ENROLLMENT

An Army report said the Army schools overseas show a 20 per cent increase in secondary school enrollment this year, while reporting a total enrollment increase of seven per cent per year for the past several years.

The national estimate in the United States has been a four per cent increase in total school enrollment. This year the Air Force schools overseas have 423 students in the twelfth grade and 5,797 in the first grade. It would appear from these facts that the World War II baby boom is now reaching high school while that of the Korean War is just now entering school.

I am sure that my final point does not come as a surprise—that the military family is quite transient. This is caused by many factors, the most important of which are an annual turnover rate in excess of 20 per cent; the increase and decrease of the active forces to meet the changing times; the requirement for all to share the not-so-good as well as the choice assignments; and formal professional education and experience as one progresses throughout a career.

FAMILIES UPROOTED

A normal tour of duty would lie somewhere between two and four years, although there are examples of much shorter duty—such as schools, or much longer—such as professors at the military academies which sometimes extend for many years.

One result of this constant shifting of the military family is the frequent uprooting of the dependent child from his social and educational environment. Although the military departments make reasonable efforts to avoid moving personnel with school age children during the school year, you can see that military considerations must always take precedence. Many people must be moved at inconvenient times. Consequently, the children must adjust and readjust to changing educational standards and practices.

In addition, there is one facet of military service which is not very prevalent in the non-military. This is the matter of family separations. There are literally thousands of families which are "fatherless" for months—even years. There are places—such as Thule Air Force Base in Greenland where dependents are not permitted.

In other areas there may be no housing available—either government or on the civilian economy. Sometimes the cost of living is so high in a particular place that the "little woman" takes the kids home to Mother until her husband gets another duty assignment where she can join him.

But, whatever the cause, frequent change of duty station or family separation, much to the credit of the service children, they by and large make the adjustments required. ▲

RESPONSIBILITIES OF COLLEGES FOR SAFETY PREPARATION

by EVA M. DRATZ
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"We do our best only when we are doing our best," says Lincoln Lippincott of Yale. Are we doing our best when we find that of the 42 Departments of Education in the 411 colleges, which offered courses in Safety Education, only six colleges stress methods? These figures are taken from 1956 "Safety Courses for Teachers." Forty per cent of the 768 courses were in safety and driver education. Relatively few teacher-education curricula require students to take a foundational course in safety education.

However, in a number of instances, students may elect such a course. Tremendous progress has been made in preparation of safety specialists. The college student who does not expect to teach or major in a field which must stress safety techniques is exposed to very little safety education.

A number of colleges include safety knowledges and skills in the regular courses. There is no definite procedure and the results can be attributed to pre-college experiences or to supervision.

Driver education is 303 of the 768 safety courses offered by 411 colleges. The students in the ninth grade are given a six weeks course in driver education before taking the driver's test. Yet, the cross country study of accidents, showed that the accident total for the first six months of 1957 was 11 per cent higher than the comparable period of 1956. Speed and the related evils of drivers in a hurry are the principal causes of highway accidents. Has education failed? No!—the percentage could have been 90 per cent.

The community must have united action in developing a sound safety program. Have the safety programs been cooperatively evaluated?

TEACHERS SHOULD KNOW SAFETY PROBLEMS

Industry asks why college students are not alert to safety procedures when they enter the productive world. Yet, how many workers in the productive world have attended college? The instructors in elementary and high schools must stress safety in service courses or work shops and be required to attend the National Safety Congress to realize the problems in the industrial world.

Pedestrian safety regulations must be established. Chicago, which has an unenforceable anti-jay walk ordinance that conflicts with a more liberal and superseding state law, has recently cut its accident toll more sharply than any other city except Detroit.

In New York city studies show that 78 per cent of the 18,363 injured in 1956, were "normal" cases. "Normal" means that their cure was not obstructed and the individuals were not handicapped or pronounced.

The pre-college safety program begins in kindergarten with the usual major emphases on "living together in the school and in the home." The problems are more where the child is first in school. He already knows mechanical devices at home, in transportation and recreation. How have the parents aided in teaching Johnny? For three weeks, I conducted an informal Gallup poll to see how young mothers, who are college graduates, protected their children from dangers of electrical appliances.

The answers were varied and enlightening. None of the 60 adults interviewed had ever heard of a safety course in college. Their majors were education, nursing, art, theater, science, business, English and psychology. I observed some "safety" procedures with their children, and only once did I hear a quiet "no" from the mother which was understood. An explanation followed. In other situations the word "don't" was loudly voiced and when the Mother's attention was diverted, the child experimented and was burned.

GRADE SCHOOLS STRESS SAFETY

At the beach, the "don'ts" were many and without reason. The five year old must learn the safest route to and from school, how the school patrols protect him, how he is helped by traffic signals, what he does in a fire drill—and why and how he can be a cooperative member in a large group. Has every kindergarten child mastered these objectives? No. The backgrounds are too varied and the personal desires for recognition are too prevalent.

In the first grade, the objectives of the kindergarten continue and the needs of this age are recognized. Each needs special guidance in working with the school patrol. On the playground, new problems arise for a safety code must be in play as well as work.

In the second grade, the teacher knows the experiences of a child's first two school years. She observes which objectives need stressed. This group learns the work of the policeman and fireman. They learn how they can be real helpers in the community. (Some teachers can profit by reading Disney's Jiminy Cricket.)

The third grade emphasis varies. Usually their area expands beyond the immediate neighborhood to include the many communities in the city and its environs. The pupils are often introduced to the city health department and to the various safety devices in the industries. In the fourth grade, the curriculum includes understanding the state and its various physical regions. For the first time, the pupils compare work and recreation with activities in world communities and appreciate the advantages the usually took for granted.

The emphasis in the fifth grade is the United States. Understanding the nations health and safety program and appreciating our nation's contributions to the safety of other countries are discussed.

Life in the Western Hemisphere and Western Europe is the theme for the sixth grade. These pupils appreciate their environment more when they realize how much more secure the Americans are because of the many departments in the nation which emphasize safety.

Every elementary child has six years of safety education. Every ninth grade pupil is required to take a course in driver's training. Why should one eastern county have 4,528 serious traffic accidents and 28 fatalities?

At Western College for Women, safety is a "must" in every department. Even English majors emphasize safety procedure in their department. Articles are presented to the Student Government association which acts on the safety measures suggested. The student head of each dormitory selects a committee which decides what safety "laws" should be enacted.

The civic clubs and the PTA's should participate in a safety campaign and every adult should set a good example for youth.

All educators must continually evaluate their programs to see if they keep pace with the demands of the age. Teachers should use the services of the National Safety Council.

OCCUPATIONAL SAFETY—A CHALLENGE TO THE COLLEGES

by WALTER A. CUTTER

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We have a normal human tendency to departmentalize experience. At one time we are drivers, with one group of associations; at another workers, voters, swimmers, or students. In each of these activities, we consider the one we are performing at the moment as preeminent, and we do not always think of the constant threads running through all of these and other activities performed in our waking hours.

Take the college commencement, for example. We were accustomed in earlier days to think of the commencement as the time when living began. There was the implicit suggestion that for four years the students had been on ice, and now the thaw had set in and they were melting into living experience.

A cartoon in the New Yorker not long after the war showed the silliness of this viewpoint. At an outdoor commencement, the students in caps and gowns were grouped in a center section. Surrounding them were their wives, each of whom was holding one or more children on laps, or shepherding them in prams. The orator was saying, "You are about to step out into life's problems, etc., etc." Both students and wives looked a little flabbergasted.

The fact is that each day is a commencement. We are always in the midst of living experience. Our task in this paper is to appraise safety experience in the collegiate institutions, and the relationship of that experience to contemporary or later experience, away from the institution.

COLLEGE'S CONTRIBUTION

The major contributions the college makes to the continuing thread of human safety are threefold.

- To add the college experience to former experiences directed at the development of a positive attitude towards safety in everyday living.
- To assure that in the total college experience, classroom, laboratories, shops, recreation, athletics, and normal traffic, safe standards are known and followed.
- Insofar as the specific college experience permits, to prepare the students for later specialized experiences as, for example, industrial.

Numerous studies reinforce a fact of observation that, as safe and unsafe behavior are part of the whole problem of human behavior, attitudes play a conspicuous part. It is hardly necessary to dwell long on this point. A person performs an unsafe act. Why? He may not know how to do the particular task.

This means that his attitude was not oriented to wanting to learn to do it right, or that someone's mind was not oriented to teaching him. In both cases there is evidence of faulty attitude. Or he might know, but might not do it right, or he might be indifferent to how it was done, or most anything else.

In any case the attitude is deficient, and the attitude, right or wrong, will direct the action. Actions are symptoms of deeper functions within the mind, and it is in this deeper area that education must be effective. Attitudes dictate not only opinions and verbal expressions, but actions.

This means that wherever in the college curriculum, subject matter lends itself to the inculcation and fostering of constructive safe attitudes, the occasion should be used. There are few subjects which do not lend themselves to such an emphasis, and, where the emphasis can be introduced adroitly, there is one more stimulus provided. This suggests a further step which must be taken to make these emphases and applications meaningful.

A course in economics could well use the information given in *Accident Facts*, for example, the publication of the National

Safety Council, and develop the significance economically of the immense personal and property losses. In the attitudinal aspect of the college experience, there should be an organic wholeness to the student's experience.

The student should be convinced that intelligent safety is a good thing and he should conform, as an intelligent person, to its requirements. Stress should be laid on the fact that safety is the intelligent reaction and practice, and further, that does not mean a series of don'ts or prohibitions. Rather, attention to the requirements of safety, frees the person to do what he needs to do, or wants to do, without the threat of injury or property damage.

The actualities of the college experience itself should convey a sense of the importance which the college administration attaches to safety.

The proper attitude toward the concept of intelligent safety and safe practices is the essential basis of safety.

TOTAL COLLEGE EXPERIENCE

Some years ago, I wrote a pamphlet in a series which the Center for Safety Education developed for the public schools entitled *The School as a Center of Safety.* What was said about the public school may be said with equal force about the college, the technical school, the school of engineering.

The college is a community, with a government, a staff, (faculty, administration, building and grounds supervision and maintenance), traffic movement, dining and cooking facilities. The college has varied equipment, laboratories, shops, and many places of student assembly for both curricular and extra curricular activities.

Safety in this total environment and these numerous activities is as essential as in motoring, plant work, or doing anything else. Instead of dwelling on the many inadequacies which we find at present in the colleges, let us consider certain suggestions as to programing related to the student's present experience and later industrial experience. These suggestions are applicable to an arts college, an engineering or technical school, an agricultural school, or chemistry or physics courses, and premedical education.

When we factor out the elements common in accident causation and accident experience, we find we are left with only the superficial qualities of a given activity, and of the particular environment in which the activity is carried on. There are more common elements, insofar as types of accidents and safety are concerned, in a college and an industry than there are different elements. True, the difference in environment is frequently dramatic, but movements and actions of the person are sufficiently alike to give us a common ground of action, as well as a period of preparation for later experience.

DIRECTOR OF SAFETY

It is quite essential that one person be designated, whatever his title, to assume the leadership and responsibility for coordinating the safety program. Even though the institution may have a safety committee, it is necessary that one person be designated to spark the program.

Without aggressive leadership, a committee may become an organized attempt to evade individual responsibility. An important point, in relation to this person, is that he is not appointed to make the institution safe himself. He is to coordinate the efforts of all departments, activities and personnel in keeping themselves safe.

Safety is literally everybody's business and the heads of all the departmentalized activities, as well as the special and normal activities, must see to it as a continuing and normal responsibility that persons under their control know the safe ways of performing all their tasks and assignments. Safe practices must be taught as inseparable from the concept of true efficiency.

A final important consideration is that, by appointing a director of the safety program, the head of the institution should not feel he has now "taken care of" safety. One of the most potent and indispensable factors in successful accident prevention is the knowledge that the head of the enterprise is sincerely and actually interested, and maintains a posture of continuing leadership.

This visible leadership is worth a thousand directives. There is no less reason to view the absence of such "top management" leadership in our colleges as a weakness than there is in industry. In fact, the strength of such industrial leadership can be discussed when industrial representatives visit the institutions to speak to faculties and students.

SAFETY COMMITTEE

The most effective method of coordinating an institutionwide safety program, exemplifying both good institutional practice and good industrial practice, is to form a safety council (committee).

The committee membership is easy to determine. Whoever is responsible for the safety of personnel, faculty, students, office, service and maintenance personnel including student representatives, should be on the committee. If this would result in too large a committee, committees can be formed by departments and major activities, with a smaller executive committee functioning at the top.

However, as safety programing must be comprehensive, it is much better to have one committee, so that everyone can see the problems as a whole, can see where he fits in, and, moreover, can make useful suggestions from his own experience.

It is the major function of such a committee to oversee, through the specific accident prevention activities of its members, the complete safety program.

Major General G. C. Stewart (U.S. Army Retired) stated in his paper, "Applying Industrial Safety Practices in Colleges and Universities," given at the Fourth National Conference on Campus Safety, almost the complete list of activities for such a council. The list is practical and comprehensive.

- The top levels of management, starting with the senior official, must be personally determined to prevent accidents—make this determination evident by use of authority, support and personal participation.
- There must be a qualified safety engineer (in institutions, where this is not practicable, such assistance may be had from insurance companies and industrial safety personnel) to direct the efforts of management and supervisors.
- There must be a delegation of authority and responsibility for safety at all levels of management and supervision.

There must be safe places to work.

- There must be every practicable safeguard on the tools and machines employees use.
- There must be training in safe procedures.
- There must be enforcement of practices and methods established to prevent accidents.
- There must be accurate determination of conditions and acts that cause accidents.
- There must be developed a record of causes of accidents to direct intelligently correction action.
- There must be a correction of conditions, attitudes, habits, and causes of accidents.

The successful functioning of such a committee will be related directly to top leadership interest, definition of functions, and discharge of same. A suggested agenda for such a council meeting will suggest both the importance and the scope of its functions.

1. Reading and approval of minutes.
2. Review of accident experience since the last meeting. Trend of accident experience and reasons therefor.
3. Review of outstanding recommendations (for corrective action) on which action is incomplete, and why.
4. *Major* accident investigations made since last meeting. The purpose is to show major hazards, reveal possible effects of such accidents, and indicate the direction of corrective action.
5. Major inspections made, and conditions and actions rated.
6. Has any "safety" training been given? Is any needed?
7. What promotional activities have been carried on during the period? What is planned? Is attention given to publicizing hazards in new activities, seasonal hazards, recreational hazards, shop, laboratory, gym, swimming pool?
8. What new recommendations for greater safety are necessary? These may take the form of physical modifications, engineering revision, guarding, new procedures.
9. New activities planned. Type and scope of cooperation needed from council members.
10. Appointment of individual council

members, or committees to make studies of hazardous situations which need fundamental study.

11. Any general relevant discussion.
12. Adjournment.

THE INSTRUCTIONAL PROGRAM

When discussing the instructional program which will keep the college community safe, and prepare its students for later experiences, certain fundamental viewpoints must be restated and reaffirmed.

● The first is that we are dealing with a continuum of experience. The individual is an individual, doing certain things. If the college has been successful, for example, in developing an intelligent attitude towards the many things that people do, and has implanted the idea that there are standard methods by which we perform these various activities, more than half the battle is won.

● The second consideration is that courses should be related directly to present experience, while preparing insofar as is practicable, for the specifics of later experience. While it is true that experience is continuous, it is also true that intelligence permits men to anticipate experiences which they have not had.

Therefore, the course program can stress the elements common to both college and later industrial experience, and anticipate elements specific to subsequent industrial experience. To what extent this latter function can be discharged will depend upon the presence of elements in the college program which are industrial in nature, and on including in the college program, visiting lecturers from industry, slides, exhibits and demonstrations, which will enlarge understanding of the industrial climate.

THE GENERAL COLLEGE, ARTS AND SCIENCE

Here, the most that may be hoped for is a course in general safety, a type of survey of the general accident areas. It may be possible also to include an optional course in driver education because of the immediate participation of all in traffic, and because of the dramatic and public nature of this problem.

This course is designed to provide an overview of the field of accident prevention in its several divisions, industrial, traffic home and farm, public accidents (other than motor vehicle) and recreation, and to show the role of safety education both broadly and specifically conceived in meeting the accident problem.

A. *The Philosophy and Aims of Accident Prevention Education and Practice*

1. The nature of accident prevention and safety.
2. The significance of the accident problem.
3. Aspects of the problem of importance to education.
4. Social values, moral imperatives, and self preservation.
5. Industrial and technological efficiency.
6. Socially desirable manpower utilization.

B. *Major Accident Areas and Problems*

1. A brief history of the major accident divisions: industrial, traffic, transportation, public (accidents) and home and farm.
2. Nature and extent of the problems today in each of these major divisions.

C. *Special Problems in Our Consideration of Accidents*

1. Inadequate recognition of the depth of the problem.
2. Inadequate understanding of the nature of the accident and the preventability of accidents.
3. Uneven emphasis on one or another of the major corrective measures.
4. Inadaquate evaluation of the role of education in meeting the problems of accidents.

D. *Accident Facts, Their Collection, Analysis and Use*

1. The nature of accident facts.
2. The value of accident facts.
3. Their collection: accident investigation, inspection, observation (sustained) of operations, job methods study, analysis of past accidents, and discussion with personnel.
4. The uses of accident facts.

E. *Accident Investigation*

1. The purposes, methods and values of accident prevention.

2. Inadequacies in accident prevention.
3. Desirable standards for investigation.
4. Illustrations from the major accident divisions.
5. Near misses, first-aid cases, injuries.
6. Analysis of investigation data.

F. *The Nature and Application of Corrective (Preventive) Measures. The "Hazard Through Track."*

1. Techniques: engineering revision persuasion, appeal, instruction, personnel adjustments and discipline.
2. Illustrations of the application of these methods to selected examples in industry, traffic, transporation, and the home.

G. *The Major Corrective and Preventive Measures (Organizational)*

1. The nature and scope of the concept of organization to the accident problem.
2. The implementation of the safety program through application of the techniques of organization with illustration from industry, traffic, recreation, and farm.

H. & I. *The Role of Education in Meeting Accident Problems*

1. Education in knowledge, skills, attitudes.
2. The significance of education throughout the educative process, beginning with the first school year.
3. The public schools—primary, junior high, high school, colleges and universities.
4. The place of safety education in the curricula of colleges and universities.
5. Special university centers.
   a. Yale University—Bureau of Highway Traffic. Traffic Engineering.
   b. Northwestern University. Traffic Institute. Enforcement.
   c. New York University. Center for Safety Education.
6. Educational programs of special groups.
   a. Association of Casualty and Surety Companies.
   b. National Safety Council.
   c. Local Safety Councils.
7. Industry: types of training and educational programs in industry.

J. *A Survey of Leading Organizations Concerned with Accident Prevention*

Department of Labor
National Safety Council
National Commission on Safety Education
National Fire Prevention Assoc. and National Board of Fire Underwriters
American Society of Safety Engineers
American Museum of Safety
American Industrial Hygiene Association
American Mutual Alliance
American Automobile Association
Association of Casualty and Surety Companies
Presidential and Gubernatorial Conferences

K. *Some Psychological Considerations Related to Accident Occurrence*

1. The role of attitudes.
2. The specific problems of: the accident repeater, "accident proneness" and the chronic violator.
3. Rehabilitative education. Traffic court schools.
4. Rehabilitative education. Adult Training.

L. *The Evaluation of Safety Programs*

1. Establishing a check list for Appraising the efficiency and comprehensiveness of safety programs.
2. Supplementary material: "Appraising the Quality and General Effectiveness of the Safety Program."

M. & N. *A Survey of the Present Status and Future Outlook in the Accident Prevention Field*

1. Industry.
2. Traffic.
3. Home.
4. The outlook for increased education participation.

O. *Examination.*

● A third phase of the instructional program has been suggested, namely the inclusion of pertinent aspects of the accident problem in certain courses. This is essential . . . and feasible.

Here are some examples of accident prevention areas which lend themselves for inclusion in various fields of study.

Economics: effect of human loss on production level, purchasing power, standard of living, "double losses" of accidents.

Engineering: physical layouts of plants for maximum efficiency (safety); inplant traffic of men, goods and services; ventilation, illumination, noise control, color dynamics, biomechanics (the relationship between man and machine) and others.

Medicine: accident prevention may be considered a form of preventive medicine; the physician can advise parents on child protection as well as counsel his patients on activities during convalescence or while under medication; moreover, he can be of invaluable aid in rehabilitation of the handicapped worker.

Management: the values of a sound accident prevention program can be stressed and loss control can be developed as a major objective of management programs.

The Sciences: relating individual capabilities to demands of various tasks, tolerance levels for individuals on various tasks, problems of selection and placement.

Personnel Administration: a study of preemployment, hiring and post-employment practices designed to assure maximum efficiency in selecting and placing workers, problems of employee morale and communication.

Education: the establishment of training and re-training programs including the psychology of learning and problems of motivation for various age groups.

AGRICULTURAL, TECHNICAL SCHOOLS

In such schools, there are a number of interesting instructional possibilities. The first is the introduction of the broad survey course. The second option is the inclusion of a basic course in industrial safety presenting the basic philosophy and methods of industrial accident prevention and applications made, through specific examples, to agricultural accident causes and controls, and industrial.

In such schools, the same type of safety director, and safety organization should be included. Particular attention should be paid to shops, laboratories and other hazardous exposures. Regular inspection schedules should be established. Operating methods should be studied so that usual hazards in operations may be anticipated and controlled.

The instructor should have the same responsibility for the safety of personnel, machines, equipment, layout, movement, handling and storing of tools as an industrial supervisor or foreman.

The aggregate safety experience of any institution will be the sum of the experience of the different units. Each teacher, supervisor, shop or laboratory instructor must understand safety as a normal and inseparable part of his responsibility.

As far as is possible, the types of conditions, hazardous exposures and practices which students will face in work should be anticipated and discussed as part of the whole educational experience. Above all, the safe standards observed in educational institutions of any type should compare with the best industrial practice.

THE ENGINEERING COLLEGE

Many institutional shops, laboratories and other exposures could serve best for the study of hazards, rather than for the study of safe practices. It is rather less than convincing to emphasize safe practices and conditions in an unsafe climate.

As a peculiar aspect of their work, agricultural schools have a special opportunity to teach and further safety through some cooperative relationship with this country's largest adult education enterprise, the agricultural extension service of the U.S. Department of Agriculture.

The engineering college has an unusual opportunity to qualify students for intelligent participation in industrial safety. The question of precisely how safety instruction is to be handled in the curriculum is a complicated one. If engineering students are to be qualified as safety directors, a much broader training than the basic engineering curriculum is suggested. Here are other suggestions:

1. A *required* course for all engineering students, preferably in one of the early years. Such a course has been developed (1949) by the Committee on Cooperation with Engineering Colleges of the American Society of Safety Engineers.

The course outline is as follows:

		Time Allotment
a.	Introduction to course	1 hour
b.	History of industrial safety	1 hour
c.	Accident costs	1 hour
d.	Appraisal of safety performance	1 hour
e.	Circumstances of accidents	1 hour
f.	Fundamentals of accident prevention	3 hours
g.	The physical plant	2 hours
h.	Plant inspection	1 hour
i.	Job safety analysis	2 hours
j.	Preventive maintenance as related to safety	1.5 hours
k.	Handling and storing material	1.5 hours
	Fire prevention	
l.	Hand tools	0.5 hours
m.	Low-voltage electrical hazards	0.5 hours
n.	Machinery safeguarding	3 hours
o.	Health hazards	3 hours
p.	Personal protective equipment	1 hour
q.	Employee placement, training and education	2 hours
r.	Sources of technical information	

2. Such other courses as may be indicated: industrial safety management; industrial safety directors and other full-time personnel: their training, responsibilities and duties.
3. Integration of safe practices in all appropriate courses.
4. A full-scale college (safety) council on the discovery and control of hazards in the entire plant and all its parts, in operating methods and job analyses, in teaching and student practices.
5. A systematic program of plant visits for observation, and, conversely, a series of special lectures by industrial safety, and management personnel.

The engineering student should, by the nature of his training, be a leader in industrial safety.

There are specific activities which can condition the student for industrial experience.

1. The similarities, i.e., the basic common hazards and preventive measures, between the institution and the industry can be emphasized.
2. The industrial-type activities of the institution can be discussed.
3. Classes can be taken to industries to study the methods of hazard detection and control.
4. Specialists in operating methods, where hazards are named and control methods indicated; specialists in accident prevention procedures; industrial hygienists; in short, numerous "titles" from industry can be brought in for special lectures.
5. Class assignments can take the form of studies of various phases of the industrial safety program.

What can be done in these directions is limited only by the imagination and ingenuity of instructors, coordinators of safety, and institutional safety councils. Both basic and specific conditioning for industrial experience can be given the modern student.

All types of educational institutions and systems are being reminded constantly of their responsibilities. There is a constant drive from many quarters to push material into the schools.

SAFETY COVERS ALL AREAS

Accidents are in a very special category. A student may be of the caliber of a valedictorian, yet if he flunks safety, all his accomplishment, all the expense of his training, all his aspirations and his family's hopes are needlessly and tragically destroyed.

The majority of men and women must work, and so this paper has dealt chiefly with conditioning the student for industrial experience. It could as well have dealt with traffic safety, home safety, recreational safety. We need the whole person safe whatever he may be doing. We cannot, in the deepest sense, departmentalize safety. A safe swimmer may fail as a worker. A safe home dweller may fail as a driver.

Of course, it is impossible to reproduce all these experiences in our colleges and universities. We can, however, and we should recognize the moral imperative which says that training a man's mind is only part of the total task of education. Training that mind in the methods of survival in a world filled with hazards, is of equal importance. No body—no mind.

When the colleges and universities recognize their responsibility for the efficient adaptation of well-trained minds and well-developed bodies to all the conditions which must be faced, and faced successfully, we will have progressed not alone in industrial safety but in the total safety of men and women.▲

PROPOSED ASSE PROGRAM FOR COLLEGES AND UNIVERSITIES

by **FRED R. TEMPLE**
chief safety engineer, Convair, Fort Worth, Tex.

Safety education conditions our attitudes, interests, and motivates us to safe performance with good social results. For example, a courteous driver is the product of proper safety education. Secondly, safety training is a specific and limited function with known objectives. Through safety training we can make a skillful driver. Safety education may produce courteous drivers, but a courteous, skillful driver must also have adequate safety training.

Safety education is a process which begins shortly after birth and continues through all of life. Here are the objectives of safety instruction and the major influencing agencies of each arbitrary age group:

	OBJECTIVES	INFLUENCING AGENCIES
Infancy to Age 6	Avoid pain, suffering, suffocation, falling, fire, water, other environmental hazards.	Mother Father, members of family, neighbors.
Age 6 to 12	Traffic hazards, water safety, simple tools, poisons, sanitation, foods, heat, cold.	Family, school, organized groups such as Scouts, Camp Fire, Red Cross.
Age 12 to 18	Fire hazards, chemicals, impact, speed, power tools, life saving, introduction to vocational preparation, team work in fire, water rescue.	Family, junior and senior high school, newspaper, magazine, protective agencies.
Age 18 to 25	Formal vocational preparation, apprenticeship, special courses. Non-college "on the job" trained.	Trade school, colleges, industrial plants, commercial organizations, safety agencies.
Age 25 through adult life	Economic and social value of safety conserving property, life, health, time; aid to others, social benefit for family group and the community.	Organized safety agencies, industrial organizations, community and state protective agencies, clubs, press and public opinion.

The organized safety agencies include the National Safety Council prominent in elementary and secondary school education. The 65 local chapters of the American Society of Safety Engineers also assist in their local areas.

The principal concern here is with group 4, the college or young adult group, and what the American Society of Safety Engineers proposes for their training. The typical 1957 young adult has many characteristic traits. Here are a few:

1. Full of energy, can't wait.
2. Likes to live about twice as fast as the clock turns.
3. Knows more, been more places, seen more things.
4. Feels new freedom (not tied down by family).
5. Not easily convinced by adults.
6. Suspicious of advice by experienced.
7. Is less secure and more emotional.
8. Enjoys limelight—sometimes seeks it poorly.
9. Is less aware or concerned about public opinion.
10. Often lets group control actions.

The curriculum and physical plants of all colleges and universities are terrifically taxed, and likely to get worse. However, courses in safety education, industrial accident prevention and safety engineering are badly needed to prepare college graduates.

COURSES FOR COLLEGE GROUP

1. Safety education for all students, preferably in the first two years of the curriculum.
2. Fundamentals of accident prevention for all technical, engineering and science majors. This is in addition to specific safety training required in some courses.
3. A major in safety engineering should be available in more colleges for safety engineering as a profession, or for the major in engineering or science who feels he needs further safety preparation in his field.

SAFETY EDUCATION

1. Present day college or university is big business.
2. Needs a safety organization within its own administration.
3. Needs the organized mechanics and means of evaluating its own safety performance.
4. Through participation, student, faculty and non-faculty employees can learn value and results of safety efforts.
5. The general course in safety education:
   - A. The safety movement.
   - B. Causes of accidents.
   - C. Developing safety attitudes.
   - D. Using safeguards.
   - E. Safety inspection.
   - F. Accident reports and records.
   - G. Fire prevention.
   - H. First aid.
   - I. Personal protective equipment.
   - J. Safety in the community.

ACCIDENT PREVENTION

Basic industrial safety courses now being taught in the United States:

1. History of industrial safety.
2. Toll of accidents in the United States.
3. Circumstances surrounding accidents.
4. Fundamentals of accident prevention.
5. Accident analysis.
6. Job safety analysis.
7. Safety inspections.
8. The mechanical-physical hazard.
9. Mechanical safeguards.
10. Health hazards.
11. Personal protective equipment.
12. Safe use of hand tools.
13. Material handling.
14. Employee placement, training and education for safety.
15. Appraisal of safety performance.

COURSES FOR SAFETY ENGINEER

1. Basic industrial safety (industrial accident control).
2. Industrial safety engineering.
3. Industrial fire prevention.
4. Design of industrial safety program.
5. Engineering control of health hazards.
6. Design of machine safeguards.
7. Industrial safety standards.
8. Safety administration.
9. Casualty and liability insurance for industry.
10. Research problems in safety engineering.

A recent survey of the National Safety Council indicates 54 colleges and universi-

ties teach industrial accident prevention and safety engineering. Many other colleges and universities have a safety course in their curriculum. At least twice this number teach some form of safety education. Some emphasize specific areas such as first aid. Of the colleges and universities in the survey, nine offer degrees with a major in safety engineering. The degree is usually in the industrial engineering or mechanical engineering school. Our 6,500 professional safety engineers in the United States believe:

First, a basic course in accident prevention should be in all colleges and university curricula, particularly those having science, engineering or other technical fields of instruction. An insight into industrial safety will aid in getting safer tools, machines, vehicles, homes, schools, commercial plants and highways in America.

Secondly, such a course will significantly increase the safe use of all the good things in America in this age of abundance.

All students, faculty and non-faculty members should have an active interest in accident prevention in their local plants and their campus safety problems. There should be available at least one course in safety education for all students, and for our technical, engineering and science students, a basic industrial safety course. Finally, a major in safety engineering should be available in a limited number of colleges for professional preparation.▲

WHAT ARE THE STANDARDS FOR OFF-CAMPUS HOUSING?

by WILLIAM J. HOLLAND
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Problems in student housing have existed since the first institutions of higher education. In some instances protectiveness in residential colleges approaches the level of parental solicitude. By the same token student housing has also been the object of complete disregard.

Today, large enrollments, high construction costs and the increased desire of students to select their own housing have made it impractical to house all students in university residence halls. This underlines the importance of off-campus student housing.

Such housing will remain an integral part of the college community. However our society will not tolerate a disregard of the social, health and safety implications of this mode of housing.

Student housing should provide an environment in which the student will not merely survive his four years of college but will thrive physically, morally and intellectually. In other words, a sound student housing program is necessary. The components of such a structure are many, but its cornerstone is strong health and safety standards.

SURVEY TAKEN

The Environmental Health Department of the University of Michigan Health Service sought information on health and safety standards from several national agencies and associations. Among other responses was a request by the American College Health Association and the School and College division of the National Safety Council to combine this information with standards used by other colleges and universities. The following are brief comments from the survey. These comments are not to set precedent nor to judge what standard is correct, but rather to organize the information and stimulate interest in this field of college community life.

Survey data in this report were obtained from 39 university and college housing administrators, deans, environmental health, housing and safety officials. Also utilized was information from the American Medical Association, the Michigan Housing Law, the National Fire Protection Association "Building Exits Code," the National Safety Council, the New York State Building Code, and the Proposed Housing Ordinance of the American Public Health Association.

No law, code or ordinance reviewed specifically stipulated all the safety items listed in the questionnaire. In several codes and ordinances requirements were implied, and some referred to other codes that covered the item thoroughly.

Few states have a housing law, and therefore only a small percentage of schools have the benefit of such a tool. State building codes are prevalent, but mostly relate to new construction. The value of building codes in off-campus housing is decreased because most of this housing is in older homes.

The standards utilized by the majority of the schools are a combination of state building codes, city housing ordinances and university or college standards. When the housing standards are of university origin only, they are not actively enforced. However, when they are a combination of state or city codes and college standards there is active enforcement. Less than one-third of the institutions reported active housing programs, but several will be initiated in the near future.

STRUCTURAL REQUIREMENTS

For the purposes of this report problems of building location, availability of fire protection and related factors are ignored. Wooden structures are usually restricted to three stories high and about 50 per cent of the schools are striving to use fire walls and fire resistant materials. Little attention, however, is given to the location of garages relative to the house. In most cases if the garage location was considered they were permitted to be attached, often without a fire wall required.

Wiring in compliance with the National Electrical Code is required by about 50 per cent of the institutions. In most instances if complying with the Code is not specified there is no wiring requirement. A small percentage of the schools do require one convenience outlet plus one overhead light in each room.

A few institutions specify the number of required convenience outlets as a function of the area of the room. Electrical wiring warrants strong consideration for safety due to the tremendous load from the many electrical appliances used by students.

Less than one-third of the universities have minimum lighting standards for the various areas of buildings.

BASEMENTS AND CELLARS

Requirements for both basements (50 per cent above the outside ground level) and cellars (50 per cent below the outside ground level) are much the same. Most of the institutions recognize the potential fire hazards in these areas, and specify safeguards. They also agree however, that study and recreation should be permitted in basements and cellars.

More than half of the standards permit sleeping in basements and about one-third permit it in cellars. As a rule if sleeping is permitted in basements or cellars, two independent means of egress are required.

A high per cent of the institutions specify two independent means of egress from each floor. Safety features of these means of egress however take many different patterns. Less than 50 per cent of the schools require lighting on inside stairways, varying between five and 10 foot candles. There is also disagreement whether or not inside stairways should be enclosed, and if so at what floor levels. Only a very small per cent require the undersides of staircases to be covered with fire resistant materials.

Three-fourths of the returned questionnaires said outside fire escapes are required, mostly the metal stair. Next most popular is the vertical metal ladder. Wooden outside stairs, wooden ladders and ropes are permitted to some extent. Only a small per cent require fire towers, however, no distinction was made between new and old construction.

FIRE PROTECTION DEVICES

Fire warning devices are required by less than one-third of the institutions, and few require the automatic type. All institutions require fire extinguishers at least one for each floor with several schools specifying additional ones for the kitchen and furnace rooms. For the most part, problems in-

volved with the use of carbon tetrachloride extinguishers are recognized, and most prohibit such extinguishers.

Fire drills are required in less than one-fourth of the standards and less than 10 per cent require the presence of the fire chief or representative at fire drills.

A definite space requirement for each individual student is specified in most standards, ranging widely in the amount of space required. Few of the standards establish a specific distance requirement between bunks, single or double. The safety problems from the students use of his room as a study, living and sleeping room and perhaps even as a laboratory need investigation.

Although a high per cent of questionnaires indicated that special storage areas for combustible materials are required, few specify that these areas be fire resistant. Requirements for storing poisons and dangerous tools have been neglected.

MARRIED STUDENT HOUSING

Answers received from the few questions allocated to married students' housing indicated that consideration of safety is necessary in this field.

In indicating whether a provision was felt essential, desirable, or not desirable for inclusion in a housing standard, opinions were mixed. Desirable was checked twice as often as essential. These opinions indicate a degree of enthusiasm for the importance of the item. Most respondants feel these safety provisions are necessary in off-campus housing standards.

A student spends more time in his room than any other place while at school. His room is his home, his study and work area. Our safety standards, actively enforced, can protect him physically and educate this future community leader to the importance of health and safety in housing.

RECOMMENDED OFF-CAMPUS FIRE PROTECTION PROCEDURES

by FRANCIS J. QUINLAN

fire inspector, Cornell University, Ithaca, N. Y.

To dwell under the same roof with others has always been economical and has become widespread, both as a transient and permanent mode of living. But with the benefits of economy, we must have certain assurances of safety. There must be sufficient light, ventilation and sanitary facilities to safeguard our health. Even more important are the precautions to minimize hazards of fire. Therefore, the most important elements which determine the desirability of an off-campus property are those which involve the personal safety of the occupant.

Each spring 2,000 Cornell men must find living accomodations in private rooming houses. Many men are prior off-campus residents and merely recontract for their rooms. However, approximately 150 freshmen and 1,000 upperclassmen in dormitories must, with little or no experience with off-campus housing, seek such accomodations annually.

The ever increasing number of married students, both graduate and under-graduate, many new to the community, find themselves with a similar problem in apartment house hunting.

This situation has led the university to maintain contact with off-campus housing through establishment of the administration of housing policy, as the responsibility of the Off-Campus division of residential halls. The responsibility for the program concerned with fire and safety has been delegated to the safety division.

INSPECTION PROGRAM

Our inspection program started on a limited scope in the early 1950's and our first objective was to cover a number of the larger rooming houses in an area adjacent to the campus called "Collegetown." Due to limited time and personnel, it was possible to inspect only 68 dwellings. Each succeeding year the number of inspections has increased and at the present time we cover not only rooming houses, but apartment houses, as well as single family units.

Our most recent inspection program began in April of 1956 and to date has covered more than 1,000 dwellings not inspected previously. Even with this greatly expanded program, we covered only Ithaca proper and the areas adjacent to the city.

Preceding our initial inspection of every private dwelling, unless it is an immediate family dwelling, an explanatory letter is sent by the Off-Campus housing division to every owner, tenant, or lessee. This letter states the reason and purpose of our proposed inspection and also encloses a small mimeographed form to be filled out and returned.

This form gives the owner, tenant, or lessee an option whether or not they desire to be inspected, and if so, their preferred time and date. This formality absolves the university of any liability during the actual inspection. If the person fails to return the form, or states they do not desire inspection, the dwelling is removed from the housing list and is not re-listed until they are inspected.

QUESTIONNAIRE FORMS

The returned forms are surveyed by both divisions with regard to location, preferred time and date of inspection. A more adequate inspection can be made if experienced inspectors from both divisions operate as a team, and if the maximum number of inspections per day does not exceed 12 units.

The preliminaries completed, the inspectors can now begin operations. We use a single page mimeographed fire inspection report sheet to compile the information. The following eight major items are covered:

1. Construction
2. Occupancy
3. Egress facilities
4. Inside protection
5. Light and power
6. Housekeeping
7. Heating system
8. Observations and recommendations

The inspectors have proper identification and most important, are neat, courteous and prompt when making the inspection. Many conditions can be corrected while making the inspection—if a little time is spent explaining the hazards. It is not a good policy to make statements on the possible rating of the building at this time. After the inspections, we go over the forms for corrections, additions, or deletions. Only then are the ratings attached to the form. Here is our rating system:

A—Designates approval by both divisions and immediate listing.

A Qualified—Partial approval by both divisions but no listing, until minor hazardous conditions have been corrected. A re-inspection is usually held in 30 days and if corrections have been made, an A listing is given.

B—Designates disapproval and no listing given. Buildings in this category do not have two means of egress from the third floor, have poor housekeeping, major electrical hazards, or are structurally unsound. The only time a B listing is re-inspected is by request of the owner subsequent to all corrections. They too, are then listed as A.

The off-campus housing division maintains an up-to-date approved list in the office of residential halls and a mimeographed copy of the list is mailed to all incoming upperclassmen and graduate students by the Admissions office.

It is still permissable for students to live in buildings not inspected and approved but two serious fires in off-campus apartment houses not inspected may help to correct this condition. It was fortunate that no lives were lost in either fire and I would like to describe briefly the most serious one.

OFF-CAMPUS FIRE

A number of years ago a small frame hotel, just beyond the incorporated city limits, was converted into a six unit apartment house. On April 29th at 11:30 a.m. a student occupant in a second floor apartment smelled smoke and found the hallway heavily charged with smoke. He only had time to call the fire department and evacuate the building.

The fire department was confronted by an intense interior fire, propagated throughout the building, and could do little but protect the surrounding property. The building and contents were a total loss and the gutted shell was torn down. Investigation showed that the owner had failed to provide even the mihimum fire or safety standards, and had allowed inadequate wiring to become heavily overloaded, which had finally caused the fire. I dread to think of what might have resulted if this were only 12 hours later.

The fire and safety program in all of Cornell's fraternities, sororities, associations, and cooperatives has been the responsibility of the safety division for the past 10 years. Each September, we mail to each house two copies of our fire service contract, which the house president signs and returns to our office. The cost of the contract varies for each house, and is based on the number and type of fire extinguishes which our fire service men service and recharge.

In addition to servicing first aid fire appliances, we provide the house with fire prevention literature, conduct fire drills when requested, advise on plans for new construction or remodeling, and inspect the building in the fall and again in the spring each year. We always follow-up on the correction of a hazardous condition.

Our fall inspections usually begin about the first of October, and again, we use a single page mimeographed fire inspection report designed especially for this type of building. We cover not only the eight major items for off-campus housing, but also vertical and horizontal openings, fire prevention activities, fire drills, and others. Whenever possible an officer of the fraternity and the head resident of each sorority accompanies us while we make the inspection.

PERSONAL CONTACT SUCCESSFUL

This presents the opportunity to discuss, first hand, any hazards. We have found that the correction of most hazards is much faster when explained to a responsible person. Upon completion of inspection, the forms are returned to the office and are checked similarly to those of off-campus housing. Copies of the completed form are sent to the house, to the Inter-Fraternity council, Pan-Hellenic council, and the Alumni advisors. The inspection conducted in the spring is practically the same except it is more of a follow-up.

Buildings on or off-campus occupied as dormitory units are inspected monthly. We are still making changes and alterations to comply with the State of New York Multiple Residence Law. We work very closely with the local authorities, especially the building commissioner who has the final jurisdiction on the compliance of that law.

A look into the future is still not a happy one. The inspection program is a never ending problem, but this is no time to sit back and rest on our laurels. At almost every college and university in America, thousands of new students will have to live off-campus, and every effort must be made to have safe housing for them.

SCHOOL RESPONSIBILITIES FOR SKI SAFETY

by WILLIAM R. JUDD

director, National Ski Patrol System, Denver, Colo.

A public address system echoes across the crisp mountain air: "Patrol on Trail 8, Patrol on Trail 8!" Seconds later, skiers wearing bright rust-colored parkas and a badge with a blue triangle and orange cross, grab the handles of an unusual-looking toboggan, swish downhill and halt near a prone figure crumpled in the snow. In less than one minute, the patrolmen have their skis off, and quickly but carefully examine the crumpled figure. Then they unstrap first aid belts from their waist and less than 10

minutes later renew their downhill run, this time cautious and bump-avoiding as the toboggan bears precious cargo!

This scene is repeated several thousand times in more than 350 ski areas in the United States, Alaska, and Southern European U. S. Army Command each winter. For within these geographical limits the Ski Patrol, officially known as the National Ski Patrol System, operates. The slogan of this group of 5,000 professional and voluntary, men and women is "Service and Safety."

The first concern of the N.S.P.S. is to evaluate the size of the ski safety problem. Therefore, it is necessary to establish accident rates. Each ski area reports its accidents and the number of skier man-days for the season ("skier man-days" are the number of skiers using the area during the season). Generally, the magnitude of area use is important in analyzing safety problems. Therefore, with the man-day as a base, the areas were grouped and their accident rates per 1,000 skiers computed. Rates are indicated below each area grouping; these figures are the number of accidents expected per 1,000 skiers on the slope.

ACCIDENT RATES ANALYZED

The lowest rate occurs at the areas having more than 100,000 man-days. The large areas generally have well-maintained chair lifts, excellent ski schools, well-manicured slopes (free of rocks and stumps and often planted in grass), voluntary and professional ski patrols well-supplied with equipment, and their skier population generally stays two or more days at a time. The intermediate areas may have similar facilities but depend on voluntary patrols only on weekends. Finally, the ski business being what it often is, these areas must hold expenses to a minimum.

This means use of modest cost ski lifts such as T-bars, pomas, or ropes. Here there's a potential hazard because (1) these move great numbers of skiers rapidly, and are built close to the snow and (2) the skier can obtain more uphill rides and acquires more muscle fatigue from the frequent downhill runs. Because manicuring slopes is expensive, these smaller areas may manicure at inadequate intervals, and, to cut the payroll, the size of the operating staff may be below safety standards. In addition, the majority of skiers at these areas are there only for one or two days and therefore in poorer physical condition. Also, the lack of sufficient downhill facilities may result in over-crowded conditions on the slope. These reasons cause the relatively high accident rate of 5.2 per 1,000 skiers for the small area.

THE VICTIM IN SKI ACCIDENTS

Age. Our crumpled body could be a boy or girl although records slightly favor the male sex. This boy is between 10 and 17 years old—with odds being closer to 17. However, the results from sampling about 7,000 average skiers showed an average age in the middle to late twenty's. Therefore, there is a higher percentage of accidents in teen-age groups than in the majority age group on the hill.

Experience. Usually it is the skier's first winter on skis. Probably, he had skied six or eight times and was just beginning to consider himself a member of the 1960 Olympics! If accident statistics had been available to him sooner, he probably would have realized that skiing is not as easy as it seems. Another accident-prevention lore is that lessons from qualified instructors reduce his chances for injury.

However, the beginner leads the accident ratings by only a slight margin. Nudging him for first place is the skier with at least two full seasons of experience and several ski lessons. We expect the beginner to be more accident-prone, but why are a higher and higher percentage of injuries occurring to the experienced skier? A tentative answer: "Too much confidence in his ability, and too little safety knowledge." But, there are other contributing factors to the problem.

Equipment. Proper equipment is essential to the skier's safety and his proper enjoyment of the sport. Of most concern is the contraption that keeps the skis on the skier's boots, a "binding." Equipment manufacturers have developed various types of bindings with safety valves that release when the pressure gets too high and before the pressure is transferred to a leg bone.

Because it is not foolproof, this type is correctly termed a "release" type binding, or sometimes erroneously and disastrously referred to as a "safety" binding. A con-

siderably lower percentage of accidents occur to skiers wearing release-type bindings.

One binding termed "long thongs" deserves its own niche in the hall of accidents. This was developed primarily for competitors to fix the ski firmly to the boot; the rigid connection provides the split second control of the ski for high speeds, or hairline control required in the intricate weaving of a slalom. The recreational skier, in an attempt to emulate his idols, ignores the fact that he lacks the physical condition and the ability of the competitor. When he falls the "long thongs" keep his boots—and feet—firmly implanted in his skis, and the Ski Patrol uses more first aid supplies.

The conventional binding, while not quite as "binding" as "long thongs," does a pretty good job as far as the manufacturers of plaster are concerned! Incidentally, the ski boot fit is of prime importance also in accident prevention. Too loose a fit results in lack of control of the skis. For example, the skier may try to turn, but when only the foot turns in the boot without a resultant movement in the ski, an accident can result.

TIMES OF SKI ACCIDENTS

Most accidents occur about 3 p.m. when traffic is heaviest on the slope. At one time we thought that because most accidents occurred in the late afternoon, fatigue was a major factor. But, considering traffic density and the short amount of time the average victim was on the slope, fatigue does not appear to be an important cause. In fact, records show the skier was on the slope less than an hour when he needed the Ski Patrol. In addition, the percentage of accidents actually decreases with an increase in time actually skied, so fatigue is not the cause.

Type of Injury. The first thing the Patrolmen examine — providing there is no blood on the snow or the skier's clothing— is the condition of the victim's legs. The chances are nine out of 10 that a leg or ankle was injured. Furthermore, he had a 50-50 chance of having a sprained ligament. These guesses were based on logic as well as statistics. After all, what part of the body is under the most strain in skiing?

Secondly, what is most likely to give way first under the strain? If the boot does not release from the binding in the fall, the entire body weight pulls against the skis firmly held in the snow. This pull is focused in the legs where most flexibility is at the ankles; the ankle joints will bend until the stretching or tensile strength of the ligaments or tendons is overcome by the pull. If this pull is so severe or in such an awkward direction that both the ligaments and the bones are overstressed almost simultaneously, then a fracture will occur.

Secondly, 1.3 per cent are impaled on their own ski pole. This often could be avoided by proper pole length, holding the pole strap loosely so the pole flies free in a fall, or if the pole points were blunted and slightly bent. The Ski Patrol Manual, for example, points out that if the snow is so hard that sharp points on ski poles are required, then your skis should be replaced with ice skates!

Or, what about our third largest category of accidents, the 10 per cent that tried to determine whether their hide was tougher than the steel edge of their skis? This injury is increasing, and the reasons are more evident. For one thing, there is an ever-increasing use of offset edges on skis. (An offset edge is a steel edge protruding on the outside of the bottom of the ski for better turning control.)

The increasing use of release-type bindings has brought with it "flailing" skis. That is, when the ski comes loose in a fall, it flails the air and the skier before coming to rest. The skier can reduce this 10 per cent rate if he adopts an "Arlberg" strap, a long leather strap wrapped snugly around the ski boot and the binding. When the binding releases, the ski is kept close to the foot to prevent the sharp edges from flailing around. Unfortunately, many skiers wear a long and very loose strap or even a shoe lace to connect their boots and binding. On the other hand, some skiers feel: "If I can just keep the ski far enough away from me, it won't hurt me!" and do not use any strap. The only thing wrong here is that a loose ski sailing downhill about 40 mph under its own power can be terribly damaging for an unwary bystander!

Another type of injury is in the 1.9 per cent "Miscellaneous" catchall. Several cases of carbon monoxide poisoning have occurred in and near ski areas. Skiers, or more particularly spectators, protect themselves from the chilled air by closing all car windows and keeping the heater and motor running. Modern automobiles still leak carbon monoxide. Eliminating this accident by education is not difficult.

CAUSES OF ACCIDENTS

Patrolmen hear many complicated alibis. The victim says he caught an edge, or another skier appeared out of the blue and scared him, or he hit a hole, or he hit a bump, or his tips crossed.

Unfortunately, there are such things as practically unavoidable accidents. For example, 3.6 per cent of these injuries result from skier-skier collisions. A capable skier may be coming down a slope, when a novice skier at high speed crashes into him! The remaining 4.4 per cent of this category were skier-object collisions involving stumps, rocks, or trees. If the object protruded above the snow, the skier can only blame himself for not avoiding it. However, if he hits a buried object under the snow, there may be some justification in blaming an area operator. Whether such an accident is unavoidable is questionable. Just as the motorist should drive cautiously on a strange highway, so should a skier proceed with caution in strange terrain.

Another accident in the "preventable" category has to do with ski lifts. An inexperienced skier should receive a little quick instruction before grabbing hold of a fast-moving rope. If the chair lift operator had kept his equipment up to top safety standards, that chair or its hanger cable would not have dropped several feet into the snow or rocks. Proper safety gates should be provided at the top of the rope or the T-bar to stop the skier.

Skiers might not break legs if the operator smoothed out the tow track ruts so they would not catch a skier's binding. And then, there is the happy lad that jumps off a T-bar, swinging the bar high in the air. He skis safely away unconscious of the unconscious body in the snow behind him— the skier riding the next T-bar that could not duck quickly enough.

Lastly are those skiers using long wool or silk scarves or loose sweaters when riding a rope tow, or even a T-bar. Capital punishment can be inflicted by clothing entwined in a fast-moving rope!

SKI SAFETY EDUCATION

The basic fundamentals of ski safety, and the results of a lack of safety are known. The student must correlate these two factors. However, one thing must continually be emphasized in any ski safety program. We must not destroy the student's confidence. On the other hand, we must not build up overconfidence. This factor of overconfidence is of particular importance in sports of speeds 60 to 70 mph, and where nature does her share to throw in hazards.

Ski safety education must concentrate on first aid instruction, physical conditioning, ski instruction, good equipment, survival training, and psychology. For many of you, meeting this problem for the first time, here are a few trail makers:

PHYSICAL CONDITIONING

The physical exertion in skiing is as demanding on the human body as football, track, or any other strenuous outdoor sport. The stresses and strains on the muscular system and the human bones in a high-speed spill, or even a slow fall, are almost unbelievable. The principle of the lever explains this; the skis are firmly held in the well-packed snow, whereas the body still moves forward with the same acceleration it had when the skis stopped. Good physical condition minimizes the results of such accidents, but it cannot eliminate them.

Proper physical conditioning must be directed toward three goals: strengthening muscles, tendons, and ligaments, quickening the reflexes and expanding lung power. As for any sport, body conditioning should begin before the skiing season starts. During ski season, they should be continued if the skier is just a week-end skier. Daily repetition of these exercises is absolutely necessary: ten minutes a day often is sufficient.

Following are a few exercises that also can be used as a guide for developing others: (1) Deep knee bends, (2) rising up and down on the ball of the foot, (3) placing the toes on a book laid on the floor and then rising up on the toes, (4) long hikes interspersed with occasional jogging or slow trotting, (5) attaching an inner tube to the wall and stretching it with the hands or feet, (6) frequent swimming materially aids the lung capacity although some ski coaches say it has a tendency to

weaken the ankle muscles. The important thing is to stress daily repetition of these and similar exercises prior to the ski season, and their continuation during the season.

First Aid Instruction. As experiences in industry prove that industrial accident rates are reduced if employees are trained in first aid, so in skiing. First aid training makes the student aware of the consequences of an injury and is less apt to take chances. This training is a part of the curriculum of many schools. Where it is not, classes outside school can be assembled through the local American Red Cross chapter.

SKIING INSTRUCTION

Skiing differs from some sports, in that a beginner needs a competent teacher before trying it. The greater percentage of skiers have not had competent instruction. As a result, they never learn to ski properly and are always potential candidates for Ski Patrol service.

At one time, skiers *had* to learn by the "by guess and by gosh" method. Today, however, most ski areas have schools supervised by certified instructors. This certification requires the candidate to pass rigid oral, written, and field examinations on his teaching and skiing ability. The cost of instruction is nominal. The Patrol often warns the novice that he can choose between ski lessons or an X-ray, as they both cost the same! The important thing is that the instructor be certified and that the lessons be continued.

It also is important to stress that the novice should not learn from his friend unless that friend happens to be a certified instructor. Lest "commercialism" rears its ugly head, it should be explained that certified instruction was instigated by your ski associations and ski patrols as a safety measure; it is endorsed by the United States Forest Service who administers most of our ski areas. For example, no ski school is permitted on Forest Service land unless it is run by certified instructors. Ski instruction will permit greater enjoyment of a wonderful sport, and reduce the chances of an accident.

Ability Analysis. We now come to what is probably the most important single contributing factor to accidents. How do we teach the skier the limitations of his ability? He has to realize his limitations from the first time he puts on skis, right up through many years of lessons, and even into competition. It is a factor that all too often is under-emphasized. Unfortunately, because of the ease in making turns many ski schools teach their students on packed slopes. The skier may learn the proper weight distribution and body movement for a turn on a packed slope, but, all too often when he attempts these in soft, deep, or crusty snow his turn comes to a disastrous conclusion. This analysis ability could be effective in a ski school. Forewarning can be given. The skier must try his skill in all types of snow conditions and on all slope gradients.

An important adjunct is to teach the skier the limitations and dangers inherent in certain terrain and climatic conditions. For example, in the early part of the season, the snow may be deep but without a firm base and the skis may break through and hit a hidden rock or stump.

The expert, for instance, avoids skiing close to a tree trunk where snow has been continuously in the shadow; he knows that this snow may be extremely soft. On the main slope during the day, the snow softens and offers little resistance to the skis. But by late afternoon, the surface begins to freeze *into hard ridges that snag ski* edges. These are factors learned by experience, and the beginner should be cautious when skiing through strange terrain or in bad weather.

In addition, 0.5 per cent of the accidents are caused by poor visibility. When it starts to snow hard or a fog settles over the slope, the overly enthusiastic skier refuses to give up, and trees, deep holes, or other skiers, completely invisible because of a blizzard, become hazards. "Flat light" is another dangerous visibility condition that often occurs above timberline. A complete overcast with a bright sun behind the clouds causes the snow surface to blend into the sky. *Thus, it often is impossible to determine* terrain contours. A skier may be thinking *he is going downhill, but unexpectedly rapidly rise* uphill because a snow bump appeared to be part of the sky. This light condition is extremely dangerous and the skier should leave the slope immediately.

SELECTING SAFE SKI EQUIPMENT

Now comes the third important educational problem—selecting proper ski equipment. The choice of equipment is controlled by cost, style, the skier's ability, the advice of his friends and the sporting goods salesman.

The most important purchases are skis, boots, and bindings. There is an old but accurate saying that "the foot should fit the boots, the boots the bindings, and the bindings the skis." If this is complied with, the skier will be unable to wiggle his ankle or his foot without also causing the same amount of movement in his ski. A loose boot or loose equipment means lack of control and a resulting accident.

Boots. These should have a snug but not a tight fit to avoid freezing the feet, a stiff sole that does not buckle when the binding is tightened, a stiff toe to prevent constriction of the toes, and at least one pair of heavy wool sox worn when fitting the boots.

Bindings. The bindings should be a release-type. Considerable emphasis must be given to the binding adjustment. Adjustment of a release-type binding should be done only by an expert. Most of the 35.7 per cent accidents on release-type bindings were caused because the victim thought his binding was too loose; he proceeded to tighten it so much that it could not release. A long and strong leather strap should connect the binding to the ski boot to prevent loss of the ski in a spill. The best strap is one that winds around the boot and the binding so that the ski will not flop around in the air when released.

Skis. These must be selected according to the weight and height of the individual —the heavier the person, the longer the ski. The amount of flexibility will depend upon the use and the skier's ability. The beginning skier needs a ski with medium stiffness. Too much flexibility causes control difficulties on a hard packed slope; too stiff a ski may be hard to handle in deep snow.

Ski Poles. As far as accident prevention is concerned, a long pole is preferred. Too short a pole may jab into skier during a spill. Too long a pole may be too difficult to handle. A pole of proper length will reach from the ground to somewhere between a hand's width above the belt line and the arm-pit. The points on ski poles should be blunted and bent slightly to reduce their ability to penetrate the body. The poles should be made of a material such as cane, fiberglass, hollow metal that will bend rather than break if the skier falls on them.

Misc. Equipment. The remainder of the skier's equipment—clothing, goggles, hats, mittens will depend on the weather conditions in the area and his predilection for local fashions. Clothing should be selected on three basic principals: (1) an inner layer of absorbent material, (2) a center layer for insulation, and (3) an outer layer that offers wind protection, some water repellency, and will not allow snow to adhere to it. To prevent perspiring and subsequent danger of freezing, it should be easily opened when the skier becomes too warm.

SURVIVAL TRAINING

Our final topic is to be taught only by an expert. It is vital to a skier who intends to do winter-mountaineering or touring, or in anyway get off the beaten path. As a matter of fact, it is important knowledge for anyone in snow country in the winter time.

First and most important is never travel alone in the mountains or woods; stick to the rule of four. Then, if someone gets injured, one can stay with the injured person and the other two can go back for help. Secondly, anyone traveling across country in the winter should have and be able to read a compass and a map. Third, whether skier or motorist, they should have a minimum of first aid supplies, edequate clothing, some basic food rations, and know how to build a fire and construct emergency shelters in the snow. In the high mountain areas, a basic knowledge of avalanche recognition is absolutely necessary. Much of the detailed knowledge on these subjects is given in the Ski Patrol Manual which can be a basis for brief courses on winter safety.

Teaching Aids. It probably is apparent by now that much of the material discussed is as technical as any course in algebra, geology, or English. This poses the question: "Where can the teacher acquire the necessary knowledge for proper safety instruction?" There are many aids at his disposal. For example, members of local ski

patrols and certified ski instructors volunteer their time as lecturers. American Red Cross chapters provide first aid instruction. Members of local ski clubs encourage beginners. Finally, there are such written materials as the Ski Patrol Manual, safety posters, USFS Avalanche Training Handbook, various mountaineering handbooks and many books on skiing. Ski movies available with little or no charge show the beginner the advantages of proper training. The services of a divisional ski association, the National Ski Association, and the National Ski Patrol System always are available for the promotion of ski safety.

As was previously emphasized, the ski safety campaign is practically a year-round job. Physical conditioning should start in the summer and the "book learning" in the fall immediately prior to the season and continued from time to time thereafter. This training often can be combined with the advanced course in Red Cross First Aid.

One point recently considered the most important contributing factor to ski accidents is "Overconfidence." Whereas the skier must develop confidence, he must not be taught to be so confident that he thinks he can do anything. The one that thinks he can do anything, often does, much to the benefit of local orthopedists, X-ray technicians, and hospitals.▲

MAKING STUDENT ACCIDENT RECORDS WORK

by NORMAN V. STEERE
assistant director, Dept. of Public Safety, Michigan State University, East Lansing, Mich.; chairman, Committee for Standard Accident Reporting in Colleges & Universities, N. S. C.

Most colleges and universities do not prepare reports of student accidents. The few who do report student accidents depend on their college hospital or health service for the reports on student accidents, a practice which is not universally satisfactory.

The question might be asked, should an effort be made to obtain reports of student accidents in colleges and universities? For three reasons I believe the answer should be yes.

First, records can furnish concrete proof that a real problem exists.

Second, accident records can determine the frequency and severity of student accidents to show progress of safety programs within an institution or to compare with accident rates at other institutions.

Third, records can provide necessary information for a planned safety program. Accident records are the foundation of a scientific approach to accident prevention.

Student accident reports to demonstrate the magnitude of the problem could be fairly simple and relatively brief. Brief student accident report forms can be obtained most readily through the cooperation of the medical and nursing staff of the hospital or health service at your college or university. If you can obtain the assistance of your institution's student health service in obtaining simple reports of student accidents, you have taken a large first step toward an intelligent prevention program and a safer campus for your students.

EVALUATE STUDENT EXPOSURE

Determination of student accident rates for comparison with other universities is a problem considered by the committee for standard accident reporting in colleges and universities. John Hill, Director of Workmen's Compensation Insurance, for the Texas A & M College system, outlined the problem as follows:

"To determine an accident frequency and severity rate for students in their pursuance of academic studies, it is recommended that we establish a uniform exposure procedure.

This exposure will necessarily require consideration of the total number of students enrolled in the institution.

"Provision should be made to evaluate student exposure on the following basis:

A. Students residing in dormitories on the campus
B. Students residing in approved off-campus housing
C. Day students who commute to the campus
D. Part-time students (those registered for less than a normal semester or term load)

"Exposure for students must consider the total number of full-time students enrolled. This will mean converting part-time students into full-time. It must also consider total credit hours or semester hours for the basis of arriving at a full-time student. Suggested formulas for computing frequency and severity rates for students are as follows:

- Student frequency rate is the number of accidents resulting in a student's being absent from class for 1,000 full-time students enrolled.
- In determining a full-time student, it is recommended that we consider 30 semester hours or 45 term hours for one full-time student year. For this we can determine the total full-time students registered for 12 months period in our institution.
- Student severity rate is the number of academic days lost by students who are unable to attend because of injury per 1,000 full-time students enrolled. In determining student days for severity, it shall mean a student's being disabled from attending class for one full day.

$$\text{Student frequency} = \frac{\text{Disabling injuries} \times 1{,}000}{\text{Total full-time students enrolled}}$$

$$\text{Student severity} = \frac{\text{Full days missed from class} \times 1{,}000}{\text{Total full-time students enrolled}}$$

Further details as to what constitutes a disabling injury and a full day missed from class must be considered."

John Morris, safety coordinator at the University of Illinois, suggested that days in the hospital per 1,000 students would be a significant figure readily determined, and that student accident rates not be based on classes missed. He said that days missed from class due to injury would be difficult to find, and further, that students will be going to class with disabilities which would not permit them to work at any job, such as the intrepid skiers who carry a fractured arm or leg to class for weeks.

DISCUSS ACCIDENT REPORTING

Within reasonable limitations on man power available for accident investigations, and the amount of responsibility which college students accept voluntarily, there may be possibilities of getting the injured student to fill out his own accident report.

Although we have not gotten off the ground at Michigan State University on a student accident reporting system, our public safety department has held a meeting with a dozen student leaders and received a number of suggestions on ways in which reporting student accidents by students could be implemented.

The suggestions were (1) to explain the reasons for student accident reporting at registration time as a part of the registration process and (2) to use various other means of soliciting cooperation of the students. It was suggested that a simple, card stock, check-type accident report form which could be key punched for sorting and analysis, be developed. This could be sent to the safety department through campus mail with no postage required.

It was suggested that copies of the student accident report forms could be available to students waiting for treatment in the college hospital, dormitories, fraternities and sororities, and to umpires at intramural soft ball games. The student leaders accepted fairly readily the idea of reporting all accidents to students regardless of whether they occurred on or off campus or during or after instruction periods.

Thelma Reed, chairman of the Standard Student Accident Committee, gave the reasons for colleges' and universities' gathering information on injuries occurring to students while they are not in school. In her article "Using Student Accident Re-

ports" in the January, 1957 issue of *Safety Education* magazine, Thelma Reed said "if the school administration is to have complete information on which to base its safety effort, information on student accident experience cannot be limited to those injuries resulting from participation in the school's program." Thelma Reed's observation applies equally well to colleges and universities.

I hope that within the next year Michigan State University will be able to try out some suggestions of the student leaders to determine the type of form, how the form stands up in handling, and what kind of cooperation to expect from the students. I would like to encourage other colleges and universities which might be interested in a similar program to go ahead so we can compare results and see if we can develop recommendations from our mutual experience.

EMPLOYEE ACCIDENT RECORDS

Most colleges and universities report work injuries only in the detail required for the State Workmen's Compensation Commission. Most colleges and universities do not analyze their employees' accidents for prevention programs. In addition, most colleges and universities don't know how their accident experience compares with other colleges or universities or with comparable industries.

Colleges and universities could compare employee accident rates both within departments and with other institutions by determining their frequency and severity rates. In most cases you can be guided in determining the frequency and severity rates for your institution through the use of American Standards bulletin Z16.1 entitled "Recording and Measuring Work Injury Experience."

The standard method, briefly, is to determine how many lost-time injuries occur for a given number of man hours worked and the total number of days lost for the number of man hours worked. These rates are expressed as a certain frequency or severity per 1,000 man hours.

DETERMINE FREQUENCY

If you decide to try to calculate the frequency and severity rates for your institution, you may encounter one problem that we did at Michigan State University. The number of man hours of exposure in industry is commonly determined by adding the total number of hours worked by the men employed by the plant.

Our University Business Office informed me that because of our payroll set-up, it would be difficult and time consuming for the Business Office to determine the number of man hours of exposure. At the present time, we are considering an approximation of the man hours of exposure by dividing the payroll expenditures in dollars calculated by the Business Office by the average hourly rates determined by the Personnel Office.

After you determine the frequency and severity rates for your institution and decide that you must do something about safety, the next question is, what should you do? A haphazard safety program is costly and liable to be ineffective. You need accident records.

If you set up a separate form for reporting accidents to your newly organized safety department and possibly even a different procedure than is used for reporting work injuries to your business office, you will have the business office and everyone of the operating departments hopping all over you. You can achieve reporting of the information you want with the least frazzled tempers by working with your business office and operating departments to amend the forms for the reporting of accidents which must be reported to the State Workmen's Compensation Commission to include additional appropriate questions and by extending the use of such forms to all employee accidents.▲

SAFETY IN DORMITORY LIVING

by MAVIS HOLMES

dean of students, Southeast Missouri State College, Cape Girardeau, Mo.

As important to a consideration of the values of safety and safety education in college dormitories as the problems of accidents and accident prevention is the nature of the dormitory itself—the setting in which this education and safe living take place. What kind of living is done in a college dormitory? What are its characteristics? What do we expect dormitory living to do for our students? What are the values inherent in dormitory living? How does the life of a college dormitory contrast with that of other types of living?

To view dormitory problems or conditions in the same manner and with the same perspective as other problems is to overlook entirely the distinctive features of dormitory life. In its atmosphere of relaxation, for example its informality, and its emphasis upon the personal needs of students, it is completely foreign to the atmosphere a student faces elsewhere on the campus.

When he attends classes, in student activities, even in the relatively informal atmosphere of the college snack bar, the student is living with the public. He is on guard, aware of his actions and their effect on others. But when he reaches his dormitory he has the feeling that he has come home. He expects to relax, be careless in his habits and less watchful of their effects.

As a matter of fact, he can even be less mature. Whereas on the campus he is an adult and acting as an adult, in the dormitory he is likely to become the young adolescent he was in his home. For example, in a men's dormitory there would be a good deal of wrestling, fighting, and general horseplay. Furniture may be knocked about, bed springs may give way and almost any sort of damage may be done to the room or to the person. Although less vigorous, girls may occasionally indulge in the same sort of thing and accidents may result.

TENSION IN DORMS

On the other side of the scale is the tension of dormitory living which does not exist in a home situation. It is more difficult for dormitory residents to find privacy; they are living in large groups and almost never are they without people near them. Although it is home, it is not quite home, and as a result students are living in an accident-producing tension.

Dormitory living has other characteristics which make it unique in the educational setting. As in a home in one single unit all features of living are combined. As a setting for accidents and their prevention, we can not think in terms of a single type of accident. The laboratory provides certain definite problems with which certain preventive measures will be effective. The class room provides others.

In a dormitory, however, all types of living are combined in one. In the same dormitory, residents will be using bathing facilities; they will be studying and congregating in the same room; they may even be cooking with appliances connected in many devious ways. They will be visiting neighbors in adjoining corridors and traversing long halls which are in themselves semi-public. They might even be carrying on athletic activities.

All of these activities will be carried on under one roof, and, therefore, prevention of accidents will have to take into account the fact that all types of accidents may occur. We must be prepared for anything. We must even be prepared for the invasion from the outside.

Thus, it is apparent that dormitory living is not simple type of living. It offers the student opportunity for relaxation, but also presents problems which he does not have in other college situations. It presents him a home situation, but at the same time multiplies the tensions of a home and the number of its activities.

HOUSING IS CROWDED

Another factor to be considered in student housing situations is the nature of dormitory structures. In the past, college and university campuses have been able to provide

living units of a relatively small size. It has been assumed that a unit of 75 or not over 100 was highly desirable, and if possible, even a smaller unit was provided. Now it is quite evident that such units are not feasible. The greatly expanding enrollments make it impossible to spread our housing over the wide area necessary for these small units. Instead we are building higher and higher dormitories holding greater and greater numbers of students.

As buildings become larger they intensify the problems of dormitory living. As size increases, monotony also increases; standardization of structure and procedure increase. Many times, of course, that adds to the structural safety of a building, but for the resident of the dormitory the homelike atmosphere of the small unit has gone and he is less of an individual as he lives there. Where safety education exists it must become more and more of an activity for the group rather than for the individual.

Part of the understanding of the dormitory setting also lies in the goals we seek for student housing. What do we expect dormitories to do for our students? Since we usually expend large sums of money to provide housing for students, we obviously consider it to have desirable values in their educational development. Students are learning to live in a community, one that is larger than their home, larger than their immediate home neighborhood.

DORM LIFE—MATURING

They are developing a sense of responsibility for their own actions and those of others. They are maturing, developing independence. This may come through a well organized student program in the dormitory or it may be merely a part of the living process. In any event, the room, the corridor and entire dormitory become the setting for the growth of the individual in responsibility and maturity. It is in the living situation that a student can see more closely the results of his actions, and can also practice his skill in cooperation with others.

Here too, however, we must recognize a difference among dormitories. In some dormitories student responsibility may be very great and in others almost negligible. The manner in which his education is being given must be considered before we can plan the type of educational program in safety or any other area successfully. In fact, this is implicit in all we have said about the setting of the dormitory. The type of education in any activity may vary from dormitory to dormitory as well as from campus to campus. What we do must fit the particular setting in which we operate.

Moreover, we may find ourselves concerned not only with safety and safety education in dormitories alone but extended throughout the campus into all types of housing. In these days of crowded housing very few public-controlled institutions can afford the luxury of dormitory housing for all of their students. Increasingly they are forced into using off-campus housing. Some institutions make these units an integral part of their housing program—arranging for frequent inspection and close supervision of the conditions under which students live.

OFF-CAMPUS HOUSING

Such a system is, in fact, so successfully operating at the University of Minnesota that off-campus living standards are nearly equal those in college housing units. Here, of course, safety education can be a very real part of all housing units. In some of our units, however, where we are obliged to use any type of respectable housing available, we can carry on only rudimentary safety education.

All of this is a preface to the assumption that what we know of dormitories and dormitory living determines the type of accidents that will occur in a dormitory, the type of safety education necessary, and even the type that will be most effective. Preface, indeed. It is the very basis of everything we can possibly say on the subject. Our next problem is to determine how to make the best use of this knowledge in the development of a safety program for college housing.

Some years ago a committee of personnel administrators, member colleges of the AACTE made a study of safety practices in college dormitories. The committee had as its aim, "the development of educational techniques in the safety area, some experimentation with those techniques, and an evaluation of them to the end that they might serve as a basis for general use in college programs of residence hall education and counseling."

The committee did not anticipate making a definitive contribution to the field of college safety education, but merely aimed "to develop additional possibilities for education in this area, to exchange ideas, and to observe procedures critically, giving them enough practical use so that they could be evaluated."

VARIETY OF PROGRAMS

Actual experiments in this area of education were carried on in six colleges and they varied from embryonic attempts to publicize the need for such education and the elimination of fire hazards to some well developed programs for the inculcation of desirable habits and attitudes in the area of safe living. The report on this initial experiment indicated that regardless of the extent of the experiment they all had common features: They were planned and carried out by student groups; they all included an emphasis upon the problem of safety in the college plant as well as with education itself, and they all used some sort of check list to arouse in the dormitory residents a consciousness of their own practices in the area of safe living.

A major factor evident in the final analysis of the study is the tentative nature of its results. In fact, no final results in any direction were obtained. Experiments were all student initiated, directed, and evaluated, but the best methods by which such student participation and leadership could be secured for a continuing attempt at self-study and evaluation were not made evident.

It was also apparent that in every one of the experiments the dormitory phase of it was a part of the larger campus whole, and that in nearly every case the interest and leadership for the program lay outside the dormitory in some student group representing the student body as a while.

PROGRAM MUST CONTINUE

The fact that most of these experiments were incomplete indicates, I believe, that any program which is to be successful must be contingent upon the use of a considerable length of time. It must be a developing program conceived with the idea of continuance. Just as education in any of the desirable habits and attitudes necessary to successful dormitory living is a continuing process and as general education for safety is a continuing process, so will it be in the college dormitory.

No single plan will be the only desirable one. Many will need to be tried and some discarded because of their unfitness for the surroundings. Each type of dormitory and campus and each student body will require a different approach.

Here, then, is the setting. It is with this type of living and this background of experience and experimentation we have to work. To develop adequate safety measures in college housing, therefore, the plan we adopt must be variable, flexible, and unique. It must utilize every principle we have learned about safety education elsewhere, and yet it must apply those principles to a unique situation characterized by problems not be found in any other situations.

CONSIDER PHYSICAL LAYOUT

Before an educational program can be developed, however, some real consideration must be given to the physical plant—the actual plans for safety in the dormitory building itself and the maintenance of the completed building. Fire safety has been given a great deal of attention in building planning and certainly it has priority there. Perhaps little can or needs to be done to prepare against accidents of another nature in building plans.

Experience has shown, however, that glass in interior doors, for example, provides an opportunity for residents to injure themselves, that shower stalls placed too near long halls have proved dangerous to those residents who ran quickly from them onto the smooth tile floors of corridors, that unmarked shower knobs may provide a hazard, that loose light fixtures can cause accidents and that sharp-cornered funiture carries its own hazard.

Many dormitory accidents could be prevented by the removal of hazards that have no place in the structural phases of the building—hazards placed there by the carelessness of individuals. Spilled food on the dining room floor, slippery corridor floors, poorly-wired appliances in dormitory rooms, loose rugs, loose light fixtures, stair treads that are worn, or stairs that are uncovered and worn and cooking or ironing facilities

in use in dormitory rooms—all these and many more are the result of the care or lack of it with which the dormitory maintenance staff and the residents treat the furnishings and fixtures of the dormitory. With proper forethought and attention these can be eliminated in building plans or they can be cared for by proper attention to maintenance.

EDUCATE RESIDENTS ON SAFETY

The crux of the problem of safety in this area, however, lies not primarily with structural considerations, but with the extent to which dormitory residents are made aware of their own responsibilities in maintaining safety—the extent to which attitudes, skills and knowledge are and can be developed which will lead to safe living within the dormitory. General principles of safety education are of value here, but only when they are adapted to the peculiar nature of the dormitory.

For example, developing attitudes that predispose the students to adjust properly to their environment is assuredly one of our goals. And in a college dormitory the primary attitude of respect for authority, both college and group authority, is our responsibility. But we must recognize first of all that in developing such an attitude we are dealing with an adolescent who is at the moment at the peak of rebellion against that authority.

The rebellion may and often does alternate with a recognition of his great need for a source of authority, and the resulting uncertainty gives an emotional quality to this whole problem that needs to be taken into consideration in developing a sense of responsibility for authority. Rebels there will be—rebels to flaunt authority, and because so many of them live together, the rebels will have followers. Petty rules may be disobeyed merely for the sake of rebellion. Reckless acts may be the next step. Panty raids, though in themselves no accident, can and do cause serious injury.

EMOTIONAL RELEASES HAZARD

Unrestrained emotion can cause accidents and dormitories are full of examples of that type of action—the endless scuffling that freshmen—and often sophomore—men engage in even though they are aware of the disapproval of house directors and their own contemporaries, and are only too experienced in the damage caused—the initiations both men and women carry on in their dormitories usually held under circumstances which include every sort of hazard—darkness, stacked rooms and blindfolds.

True, any formal programs of this sort have probably disappeared from nearly every campus in the country, but occasionally in a reckless mood students can and do carry out some of their features informally. Hence, to develop attitudes of responsibility, respect for the rights of others, adjustment to the needs of the group—attitudes which will be conducive to safe living—we must be constantly aware of adolescent attitudes toward authority and heightened sensitivity provided by the group in which he lives.

Developing skills in safe living is also a function of safety education. General habits that alert the student to hazards and protect him against them and against all manner of circumstances are a part of his educational equipment and must be our responsibility in the best dormitory living. Students who, at home, took for granted habits leading to safe living now need to be taught to develop those habits in the group.

Appliances used in common need to be checked, for example, before using—at home, one could be reasonably sure they were put away in good order. One's own appliances and light bulbs need to be used with care. One needs to use care in one's personal habits so that hazards are not placed in the way of others using the same facilities. One needs to learn to walk instead of run.

GOOD HOUSEKEEPING ESSENTIAL

But above all, I believe, habits of good housekeeping need to be developed. Cluttered and disorderly rooms are the centers for accidents. Carelessness in the use of bathrooms and halls can constitute hazards. Fewer accidents will occur in neat tidy rooms where the residents are aware of their responsibilities for maintaining order and where good housekeeping skills are established.

After these have been developed, however, after desirable attitudes and skills toward accident hazards and prevention are a part of the student's equipment, we must see that he goes beyond that and acquires the knowledge to deal adequately with an accident situation when it does occur.

In education for fire prevention we realize that in spite of all we have done a fire may still occur, and so we prepare for it with fire drills. Here we must do the same. Accidents will still happen but their effects may be reduced to a minimum by the proper behavior on the part of the students. To give them that knowledge is our responsibility.

These accidents may be predictable or they may be of the purely fortuitous sort that seem to have no direct relationship to dormitory living, that are not in any way connected with the type of activity being carried on there. Such an accident, for instance, is that caused by the sudden falling of plaster in a dining room during meal time, an accident causing some rather serious injury to several students.

Accidents of this sort may also occur because of the nature of dormitories—the centers of community attention and perhaps the subject of irresponsible vandalism. For example, our women's dormitory often becomes the center of attention for teen-agers driving around at night. Usually they confine themselves to whistling, screaming and singing, but one night last summer a bottle crashed through a bedroom window and seriously injured a girl sleeping near the window.

DORMS ENCOURAGE ACCIDENTS

All of these serve merely to point up the fact that accidents may occur simply because a dormitory is a dormitory— and especially a women's residence—and that although they are in a sense a community responsibility, they are primarily the responsibility of the college. Dormitory residents must be prepared against them. Panic can become a very effective stimulus to further accidents. Organization must be set up, education provided so that students are assured and confident of their ability to handle a situation of this kind effectively when it occurs.

How is all this to be done? How are these attitudes, skills, and knowledge to be developed? Full and free discussion of accident hazards, of individual habits that contribute to accidents or to the panic that may follow accidents, and of means of prevention is a first step in enlisting the interest and support of house residents. To arouse this discussion we may have to make use of an accident which actually occurs, or to play upon the obvious structural or housekeeping problems which catch attention immediately. But from that beginning—endless possibilities for discussion present themselves.

From discussion and the development of interest in the problem, the next step is some democratic action. At this point, of course, autocratic house government can provide some learning situations in safety, but the democratically controlled house unit will be most significant in developing group cooperation, group responsibility, setting group standards and providing group leadership.

Conformity is a distinctive feature of our campus life today, and conformity to definitely established group standards in the safety area can be secured if group action is sincere and genuine. Students who provide their own authority are the best reply to the demand for mature, responsible individuals who are aware of accident hazards and can produce the skills and knowledge to prevent them.▲

DEMONSTRATION OF TELEVISION TECHNIQUES FOR DRIVER EDUCATION

by FRANK BURROWS, CHARLES MICHALSKI, JOHN TUCKER
Citizens Traffic Safety Board, Chicago

Seven and a half solid hours in front of live cameras televising traffic safety educational programs were mighty illuminating—and the results encouraging. Summarizing the most important lessons gleaned from producing the 15-week series "The Man Behind the Wheel" the *Citizens Traffic Safety Board* found out that:

- Creating a series of television shows is different from producing spot announcements or interview programs. The interest of the audience must be captured and sustained for 30 minutes. Programs must be "theatre" in the best sense of the word.
- Illustration, not elocution, must be used to make the message come alive. Dramatize. Demonstrate. Even startle the audience now and then. Emphasize and re-emphasize important points.
- Each program should be developed around a single thought to avoid confusing the viewers on what they are to learn during the show. Further, each program should add to the cumulative reaction you hope to get from the audience.
- The programs should be directed at as many members of the home viewing audience as possible. Often include a feature for each age group.
- A great majority of the audience which tunes in your program is interested in learning how to improve their driving knowledge and ability. Don't abuse the opportunity to educate them. Keep this interest alive.

Throughout the series, the CTSB leaned heavily for guidance on the WTTW production manual, written by Colby Lewis, the station's production manager. The practical working knowledge and interest of the WTTW staff made possible frequent use of tricks of the television trade.

For example, to illustrate the difference between day and night visibility, the camera picture was darkened electronically to a shadowy outline. In another program, one camera (two were used) shot a close-up while the second focused on another action. The two images were combined on a "split-screen" to show correct wheel handling via the close-up while the far shot showed a learning driver turning a corner.

ORGANIZING THE PLAY

In writing a story, or a play, an author tries to establish an identity between his audience and the characters in his plot. This creates a valuable personal association. Featured cast members in "The Man . . ." were three non-drivers learning the hows and whys of scientific driver education. Through this trio's eyes and ears the audience shared in a personal experience.

After the plot and story line had been set, and "casting" arrangements made, props, materials, and guest experts who could teach with authority and showmanship were found.

Outline scripts and time cues then established a dramatic high point at places where audience interest usually sags.

There is good reason why a play-wright tries to build a climax on his second act curtain. About two-thirds of the way through any story there is an "interest lag" whether the audience is in the theater or at home in front of their TV set.

At about 20 minutes through each half-hour show an "interest booster" was planned. Sometimes this was just a loud noise, a brake detonator explosion, a police whistle —something jarring—or, perhaps, a transition was bridged at this point with a promise of exciting things to come in the last ten minutes of the show.

DRAMATIC TOUCH HOLDS VIEWERS

"This type of dramatic treatment kept audience interest high," said James Robertson, WTTW's general manager. "The program had been aired twice when we realized we had a 'sleeper' on our hands. I knew it was going to be one of the best series we'd ever put on when I heard our stage and camera crews—usually laconic—discussing vigorously the merits of the show."

Audience reaction was a pleasant surprise to both station personnel and the CTSB staff. Mail response, queries and requests for free educational material offered, continued throughout the entire series at a weekly average of 100 letters and post cards.

"This steady response is sure proof that "The Man . . ." gained new viewers for every program," said Chalmers Marquis, promotional manager for WTTW. "Based on authoritative estimates it is reasonable to say that the programs reached a total audience of 1,500,000 to 2,000,000 persons with a message . . . in depth . . . on safe driving."

Films were used liberally. Some were taken specifically for "The Man . . ." by Sergeant Joseph Casey, head photographer for the Chicago police department. These were filmed against neighborhood backgrounds familiar to the audience. Another film was a sequence in the county morgue. Clips from films such as "Don't Skid Yourself," on winter driving produced by the Aetna group of insurance companies and the National Safety Council were used.

PROPS FOR VIDEO

Among props which illustrated methods of scientific driving instruction were the Aetna Drivo-trainer, psycho-physical devices and blow-ups from pages of "Rules of the Road," produced by Illinois' Secretary of State Charles F. Carpentier, which contains hints. The "Rules . . ." book was state traffic laws and good driving offered free to correspondents along with the driver evaluator test sheets created by the Shell Oil Company originally as full page newspaper ads.

Other props; grim accident photographs were used with the morgue film to illustrate the tragic consequences of inexpert driving; stopping and sight distance charts and simple demonstration devices. (For example: corrugated cardboard was accordion pleated, compressed and expanded to illustrate the Doppler principle of sound waves in explaining how radar works.) A Tinker Toy made a fine demonstration of how power is transmitted through piston, crank shaft, clutch plates and transmission to the rear wheels.

The teaching job was done by guest experts whose authority was unquestionable. Behind the wheel instruction was given by Royal Brown, driver training instructor at Lane Technical High School; Maury Lindquist, chief examiner of the drivers' license division of the Illinois Secretary of State's office and Officer Archie Hignett, director of the police department's safety education unit.

EXPERTS AID PROGRAM

Cleve Wallace, top instructor from the General Motors training school in Hinsdale, Ill. and Carl Dalke, automobile expert of Chicago Better Business Bureau told how to buy a used car. Illinois' Secretary of State Charles F. Carpentier discussed the operation of the central driver's record file.

Judge Alfonse Wells, Chief Referee Francis X. Poynton of Chicago's Municipal Court and Deputy Chief Pierce Fleming of Chicago's Park District police talked about enforcement by police and courts. Charles S. Michalski, CTSB traffic engineer was a frequent guest expert to explain technical points. Other experts: Officer James Casey of the Safety Education Unit, who demonstrated school safety education and Park District Officer Julius Watson, drunkometer technician.

All of these experts, teachers for the day, were able with *films, demonstrations,* and simple devices to make their discussion dramatic and living. Actual driver training behind the wheel was demonstrated by the learning trio in convertible automobiles which permitted the television cameras to examine closely the correct techniques in steering, shifting, braking and clutching.

From time to time, the audience with the three learners saw a demonstration of expert driving. In one such demonstration, Robert Eck, a steel truck driver from the Willett company, dramatized the almost unbelievable ability of an expert driver—he was runner-up in the 1955 state truck competition—piloting his 45-foot long tractor-trailer combination through a maze of tennis balls, traffic cones and one egg, stopping the mammoth combination on a designated pin-point.

Cameras tight on the egg as the huge truck wheel approached while the audio picked up the roaring of the diesel motors was enough to make one viewer comment: "It nearly made my breath stop. I felt like that truck was going to roll right over my stomach."

In another expert driving exhibition, Arthur Henderson and Ed Closson of the Country Mutual Insurance company demonstrated stopping distances. A radar unit focused on their car, combined with the "split-screen" technique, illustrated the point so often preached—so rarely proved—"No One Can Stop On A Dime."

FILMS INCORPORATED IN SHOW

When bad weather made it advisable to stage the programs in the studio, films were used if the rains came without enough warning to arrange an inside show. The films, "Day In Court" produced by International Harvester Company, and "A Closed Book," produced by the Farm Bureau Mutual Insurance company, emphasized the message —SAFE DRIVING IS A WAY OF LIFE.

When possible, studio shows were guest expert panels answering correspondent's queries. On one panel program, the audience was asked to phone in questions while the show was on the air. The switchboard was swamped. About 75 calls were taken by operators while a probable 200 or 300 more callers got the "busy" signal.

Mail and phone questions covered such items as: "What is a safe passing distance on the highway?"—"Should a violator bring his own lawyer to court?"—"What should you do when a tire blows?"—and a great variety of others ranging from: ". . . How hard do you hit at 40 mph?" to "What do traffic police gestures and whistle signals mean?"

Answers to such questions were dramatized. Toy automobiles, large drawings done "live, on camera," a current series of newspaper advertisements, and a demonstration of "The musical virtuosity of the Chicago traffic policeman on his little whistle" all figure in fulfilling the operating maxim: "Use illustration, not elocution."

The experience of producing "The Man Behind The Wheel" can be summarized in this statement:

"Make no mistake about it—a great number of people are lamentably uninformed about the basics of safe, expert, law-abiding, *good* driving practices. Most of them want to learn to be better drivers. The opportunity should not be abused by improper presentation of driver improvement education. Particularly is this true on television which offers so much to the safety education.

Aim your presentation at the group which wants to learn. Make use of all dramatic techniques at your command and the wide possibilities of television production."

PROTECTING SCHOOL BUS PASSENGERS THROUGH EDUCATION

by A. P. SMITH, JR.

supervisor of transportation, State Dept. of Education, Jackson, Mich.

Two persons play an important part in protecting school bus passengers in Mississippi. They are the bus driver and the bus patrol. Education is essential to the safety of the passengers on the bus. I shall deal first with the training of the bus driver.

BUS DRIVER TRAINING

The program for the training of bus drivers had its beginning in Mississippi during the summer of 1945, under the direction of the State Department of Education. In June of 1945, representatives from the American Automobile Association, The National Safety Council, the Illinois Central Railroad, General Motors Corporation, Highway Patrol, State Department of Education met with County Superintendents and 25 or 30 school superintendents for a Bus Driver Trainer's School. During a four day meeting some 25 school superintendents were trained, and plans were made for training school bus drivers over the state.

The demand for trained bus drivers increased year by year. The Division of School Building and Transportation and the Division of Vocational Education have worked in close co-operation in planning, scheduling and supervising training schools with the Vocational Department, providing funds for conducting the schools until July 1, 1954. During the extraordinary session in 1953, provision was made for the State Board of Education to formulate training courses for school bus drivers and for financing such courses.

Every other year bus drivers are required to take the training course and secure a driver's certificate. The training course consists of two and one half days or 20 hours of training, approximately 12 hours in classroom instruction, and eight hours of open road and obstacle driving.

The driver certificate may be renewed the second year for one day or eight hours attendance. During the past two years more than 8,000 bus drivers have taken the training and received certificates. School Superintendents with special training instruct the bus drivers in the local counties and school districts during June, July, and August, under the direction of the State Department of Education.

The value of education and training for the school bus driver is reflected in the fact that during the past 10 years only two passengers have been killed while riding the bus, and four others were killed in an attempt to cross the highway before or after alighting from the bus.

SCHOOL BUS PATROL TRAINING

Under the Mississippi Code of 1942, it is required of the Superintendents of Schools with Transportation to select from members of the student body a safety council for each school bus. The Superintendent of Schools is also responsible for instructing the safety council. The State Board of Education assumed the responsibility this year for training bus patrols.

The bus patrol training course consists of four hours of training. Approximately two hours are spent in the class room reviewing safety regulations, rules of road and slides in correct loading and unloading procedure.

Approximately two hours are spent on the road going through the correct procedure that patrols follow in directing passengers across the highway to and from the bus.

There is no record of passengers killed while crossing the highway when the bus patrol was in action.

PROTECTING SCHOOL BUS PASSENGERS THROUGH EDUCATION

by BILL LEMON

director, School Bus Safety, New Mexico Western College, Silver City, N. M.

In New Mexico we have the school bus "Stop Law" which requires motorists to stop when approaching a school bus from either direction that is loading or unloading children on the highways. We know, however, that any school bus driver who depends on all motorists to adhere to the law is headed for real trouble. Therefore, we feel that training school bus drivers in the procedures and precautions dealing with this operation is our best solution.

At our annual School Bus Drivers Institute, held the first week of August on the campus of New Mexico Western College, Silver City, the loading and unloading of school bus operation is a part of each class whether it be First Aid, Child Behavior, or any scheduled classes in "Uniform Bus Regulations" and "Traffic Law Enforcement." Prior to the Institute a meeting of all instructors is held so that a uniform understanding and presentation can be worked out.

All new drivers must attend the Institute and others at least once each three years. Many drivers attend every year. Enrollment annually is about two-thirds of our 1,200 drivers. We follow this up with schools and

meetings with drivers in counties, cities and towns over the entire state during the year.

This past year our open highway speed limit was raised to 70 mph. This, coupled with increased volume of traffic, new construction, and our accident experience, led us to revise "stop" procedures.

On divided highways, we have no control over traffic in the opposite roadway. We never unload children if they must cross these multi-lane highways to reach their homes; unload only those children living on the side of the road on which the bus has stopped. This, of course, necessitates some doubling back on the part of the driver, but we feel the additional cost and time is worthwhile.

We do not load or unload in a traffic lane but on the parking apron adjacent and do not use flashing lights or stop arms thus permitting traffic to continue. We also follow this procedure on two-lane highways where speed, volume of traffic, and available shoulder space are conducive to this type of operation.

This is uniform over the state and requires the motorist to remember only that he is expected to stop when a school bus is stopped on the travelled portion of the highway and lights and stop arm are in operation, otherwise he is free to continue on his way. We believe motorists will be more willing to comply when they feel we stop them only when essential to the pupil's safety, and, too, when we are getting out of their line of fire when possible.

PROTECTING SCHOOL BUS PASSENGERS THROUGH INSTRUCTION

by EARL HEATH

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In presenting the case for educating the pupil passenger, it may be well to begin with an examination of the limitations of legislation and enforcement in providing protection for the pupil.

Legislative and enforcement measures were designed to protect the pupil passenger and it is only indirectly that they serve to educate him. Such protection may be said to reach a climax when the motorist who approaches the school bus stops his vehicle at or beyond the distance prescribed by law.

At this point, we may ask: "What happens if he does not stop?" The answer is that he has committed a moving traffic violation and is subject to a warning or an arrest. We then may ask: "What is the effect on the pupil crossing the roadway?" It may be a near-miss, or it may be injury or death.

An individual who attempts to cross the roadway prior to entering or after alighting from a bus is concerned with a myriad of complex external variables, most of which are under neither his control nor that of school or community officials.

CROSSING POLICIES

The several pupil crossing policies may be summarized as falling into one of two categories:

1. Crossing in front of the bus (after approaching traffic supposedly has stopped) as an individual or as a part of a group with or without an assist from a bus patrol member, the driver, police officer or auxiliary crossing guard, and

2. Waiting at the side of the road until the bus has pulled away and accumulated traffic cleared before proceeding across the road under the pupil's own direction.

Experience in the field of pupil transportation and traffic safety education has led me to favor the practice of having each student decide for himself as to the most appropriate time to cross the traveled thoroughfare.

Having pupils cross in front of the bus involves assumptions which are too numerous and too presumptive for a situation involving human lives—assumptions involving the condition of oncoming motor vehicles and their drivers, knowledge on the part of the motorist of the local school bus law, the condition of the school bus, the driver's use of warning lights, and his ability to see that traffic in both directions has stopped, to determine when all pupils have crossed, and to stop pupils about to cross in case of an emergency situation.

STUDENT MUST LEARN FOR SELF

Perhaps the best way we can look at what can be done to educate the individual student as to safe and efficient roadway crossing practices is to dis-associate ourselves from the school bus medium. Since the child throughout his lifetime exercises pedestrian and passenger practices outside the context of the school bus routine, it is believed essential that he be grounded, as early as possible, in practices basic to his welfare where traffic situations are involved. A thorough and effective traffic safety education program for the pupil should include, among other items, the following:

1. Instruction in walking to and from the bus stop site on the left side of the street facing traffic and in making maximum use of sidewalks and shoulders of the roadway.
2. Instruction in crossing streets at right angles and at an alert walk.
3. Looking carefully left and right to determine whether a vehicle is approaching. The determining factor should not be the green light, nor the motion of a safety patrol member, police officer, or auxiliary crossing guard. The determining factor is—are there vehicles to the right and/or left and have they stopped. Then, and only then, should a pupil cross the roadway.

   In most, perhaps all, instances, the patrol member, police officer, or auxiliary guard will direct the students to cross once the path is clear. However, the student should be trained to rely on his estimate of the situation as well. This is good practice because the youth will be crossing many other roadways not associated with pupil transportation.
4. Instruction in evacuating the vehicle in drills similar to fire protection exit drills conducted at the school.
5. Instruction in desirable passenger practices including waiting on the curb and in line for the bus, having fare or identification ready to show to the driver, moving quickly to his assigned seat and remaining there until the bus has stopped either at the school or at his home stop.

Pedestrian and passenger instruction, properly conducted, can be beneficial to the pupil throughout his entire life and will also supplement legislative and enforcement measures designed for his protection.

SCHOOL BUS ACCIDENTS: How Much Do We Know About Them? How Can We Find Out More About Them?

by HALLIE L. MYERS

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As members of the National Safety Council we seek its opinions. Since the source of much of National Safety Council's information is in its membership, we often have our own opinions fed back to us with the weight of "National Safety Council says" attached to them. One of the purposes of this paper, therefore, is to promote

a healthy skepticism on your part of many opinions that are advanced, and a strong dissent with some things you may have been accepting as truth.

It is fairly easy to dispose of the first part of the assigned subject "How much do we know about school bus accidents?" It could be answered in two words—"Very little." We know so little about any kind of accidents that it is tragic.

The National Safety Council has little information on school bus accidents and only the composite picture of 38 reporting states. Apparently the 10 non-reporting states have even less information.

Someone in each state must know how many school buses are operated. Some others know how many miles they travel per day; how many pupils are carried. Someone else knows how many buses are involved in accidents each year and how many persons are killed or injured in these accidents, but seldom are all of these things assembled in one summary—and beyond this there is little information.

DOESN'T BELIEVE FACTS

It is possible to get a bleak picture of school bus accident problems in Indiana from the published figures. I don't believe these figures, for I am sure we don't have all the facts. I am sure that no one in our state knows how many school bus miles are traveled each year, and I am convinced that, beyond mere totals, no one knows much about accidents involving these buses.

This is not surprising, because even with the best of reporting, our information is always colored by individual prejudices, and biased opinions. The information is always presented to put the blame on the other driver or on the child. It makes little difference to me whether the person or persons killed or injured are in the school bus or in the other vehicle. We cannot assume that the other fellow is always wrong—and even when he is, there are often extenuating circumstances.

In my experience with bus operation I have seen many buses hit in the rear by automobiles with the fault being that of the bus driver. I find it difficult, also, to consider accidents to children crossing highways to board or after alighting from a bus as being anything but school bus accidents, but they may go into the books, in some states, as pedestrian accidents instead.

ONE ACCIDENT RECORD PICTURE

As an example of two ways of presenting the little information we have, consider this statement issued by an official department: "During 1956 the public schools of Indiana operated 6,233 school buses, 200,000 miles per day, transporting some 300,000 pupils. Not a single bus passenger was lost and only one person—a 17-year old driver of a passenger car in collision with a bus—was killed. Only 77 persons were injured in 247 accidents; only 36 were school bus occupants, including 17 drivers, 12 pupil passengers and 7 adult passengers. The remaining 41 were drivers or occupants of other vehicles."

This statement sounds reassuring. It is a tribute to school bus drivers, school administrators and state school authorities—every one has done a good job—a good job, that is, if we don't consider the occupants of other vehicles. But we can't pass lightly over deaths and injuries merely because they did not occur on the bus.

DIFFERENT PICTURE PRESENTED

Now, see how the picture is changed when we add to the above statement the following paragraph based on these same facts. "This performance record shows that accidents involving school buses are occurring in Indiana at the rate of 1.4 each school day; that their accident rate per 100 million miles of travel is 690 compared to 554 for all traffic; their injury rate is 215 compared to 193 for all traffic; their fatality rate in 1956 was 2.8 compared to 6.1 for all traffic and in 1957 will equal or exceed the state fatality rate. 1956 was the third straight year showing an increase in number of school bus accidents."

This sheds a new light on the same picture, and, I fear, not a very rosy light either. I do not vouch for the correctness of either of these statements—in fact, I think both are wrong—but if the first is correct, as we are told it is, then, the second is also correct.

The reason I am inclined to discount them is that school authorities report mileage as the total number of daily route miles, whereas buses make many special events and many drivers make two round trips to accomplish one round trip movement. Accidents on these off-route trips and on deadhead miles are included, of course, as accidents involving a school bus. Perhaps a true report of mileage would bring the rates down.

In any case, these two statements point up two conditions that should be corrected —incomplete information and some apparent tendency to "play down" the record. Our school bus safety program needs some attention. Perhaps yours does, too.

ADMINISTRATORS' NEGLECT

It may be that those in charge have been too close to the trees to see the forest. It may be, also, that they have received too little help from public support groups in getting needed reforms and funds.

It seems that each school corporation has such a small part of the problem that the administrator finds it easy to believe that accidents can't happen to his schools because they never have. In this he becomes much like the man who drowned in a stream that averaged only 3 inches in depth or the average Indiana motorist who, hearing that we have six fatalities per 100 million miles of travel, still knows he will not be one of them because in his lifetime he will not drive even one million miles.

With 247 school bus accidents last year in Indiana, scattered over a fleet of more than 6,000 buses, no local school authority could be much impressed with his share of the total and none could even attempt an analysis of causes. This points to the need for a very careful investigation of every school bus accident and for prompt and complete reporting of all facts to a central agency for analysis on a state-wide basis.

QUESTIONS NEEDING ANSWERS

If I were trying to track down the causes of school bus accidents and devise ways of preventing them—in other words, if I were Fleet Safety Director of School Buses for any state—I would want much more information on each accident than is now available. I would, for instance, want to know: Did the accident involve an empty bus? Was it on a multiple lane highway? Was the bus stopped and standing at the time of the accident, and for how long had it been stopped? Did the accident occur during hours of darkness? Or on a special trip? What were weather and road conditions? Was the stop location a factor? Age and sex of the bus driver? Other driver injured? Experience and training of bus driver. Was a substitute driving the bus? Did the accident involve no other driver? What injuries were suffered, and by whom? Did the bus meet published safety equipment requirements? Was safety equipment used? What was the passenger load at the time?

All of these questions, and more, I would want answered to provide a factual basis for attacking bus accidents. Our best existing source of information on school bus accidents may come from the records and practices of commercial bus fleets. I have found in my experience that commercial vehicle operators have made more progress in reducing traffic accidents than any other group. This probably results from the fact that for many of these operators the costs of accidents are greater than the total net profit of the company.

ACCIDENT REDUCTION PROGRAM

Increasing or decreasing this total represents the difference between profit and loss. They have good records of accidents and drivers. Analyzing their activities further we find that the succesful ones nearly always follow a definite nine-point program of traffic accident reduction which includes:

1. A well defined set of rules and safety practices
2. Careful selection of drivers
3. Thorough training of drivers
4. Accurate records of accidents and drivers
5. Close supervision
6. Regular and thorough vehicle checks and maintenance
7. Removal of hazards
8. Incentives and awards for drivers
9. Penalties

In this batting order "penalties" are in 9th place, which is their proper position. The need for penalties comes only after all the other eight have been used. This list contains exactly what is needed in a public safety program; however, the public inclination is to pass laws as outlined in number one, then skip over the other seven, lightly, to get to number nine—the enforcement of penalties. Experience has shown that we cannot achieve traffic safety that easily. We

must bring the other seven points up to par. Let's take it point by point.

1. In many states there is a more or less concise set of rules for school bus drivers. It is doubtful, however, if many of them tell the driver what his duties are.
2. We have not even begun to do a job of driver selection. There must be some better way devised than the process of letting bus routes to the lowest bidder, as is now required by law in our state. In my opinion, there is no more reason for this than to hire teachers or janitors or superintendents on bids.

DRIVER TRAINING

3. School bus driver training has followed closely the pattern of selection—little done. True, we have, in our state, as in some others, a requirement that each bus driver attend a safety-training meeting each year. These last about 1½ hours. Sometimes these are held before school starts—usually after. This puts drivers in service before the safety-training session is held. In our state, these are conducted by state police officers. Without disparaging the splendid efforts of the police, may I suggest the following:
   a. We used three weeks, at an estimated $300 per man to train commercial bus drivers. It seems likely that one week and $100 per man could be spent profitably for a one time course for a school bus driver. If we can invest several thousands of dollars in a bus, surely we can spend $100 to train its driver.
   b. There is little in the training of a police officer that qualifies him for the specific job of operating or training some one to operate a bus. Such training is done much better by a school which specializes in training commercial bus drivers.
4. School bus accident records are not given sufficient attention. Rarely is enough information secured to permit proper analysis. A high standard of accident reporting *is the principal prerequisite for the* use of accident records. If the original accident reports themselves are poor, the analysis and results from them will also be poor. Since the number of such accidents is small we should be able to get each one investigated by competent persons and collect accurate and complete *information on most of the points* mentioned earlier.

   Such information must then be carefully analyzed and presented to each school administrator in such a way as to be of use in the hiring and supervision of drivers, the maintenance of equipment, the laying out of routes, the location of stops and in developing sound operating practices. Such information as we have now is probably the best kept of all accident statistics—kept, but not used. Its value for historical purposes is small. Let's use it.

SUPERVISE, CHECK FLEETS

5. Close supervision is not practiced in many school bus fleets. It is doubtful if one school corporation in 50 has made any one person responsible for supervision of school bus operation; yet, commercial fleets find it economically sound to use riding supervisors.
6. *In our state and in many others there* is no requirement for periodic vehicle checks or any required maintenance schedule. School buses must be inspected once a year. Commercial fleets give a better inspection every week or 10 days.
7. Removal of hazards. Most school bus route hazards are fixed. It is often impossible to remove the hazard from the bus line, but it is seldom impossible to move the bus line from the hazard. Careful *selection of stops, turn arounds,* routes and schedules with hazard elimination in mind can work wonders. Here it would be well to utilize the services of a skilled bus operations man, rather than a school official. It would be better to use the two together.
8. Incentives and awards are used in few states. Indiana and Virginia, use the National Safety Council Safe Driver Award. This plan provides regular monthly mailings to bus drivers, keeping driver accident records and presentation each year of Safe Driver Awards to those qualifying. The cost of this program in Indiana is paid by an insurance company. This is the highest driver award in the land. Bonuses for accident free operation could be given also as incentives to more careful operation.
9. Whatever penalties are given—and their value is a debatable question—must follow consistent pressure on the other eight points. In fact, unless we believe that a driver deliberately has an accident it is difficult to conceive many situations where a penalty would do more than save face for the administrator. One penalty must be used occasionally. You must remove from service any *driver who cannot* be helped by the other eight points forcefully and faithfully applied.

SEAT BELTS HELPFUL

I want to touch on the use of seat belts in school buses. The present policy of the National Safety Council recommends the use of seat belts on all motor vehicles. This means all school buses, too. I am personally sold on the value of seat belts in motor vehicles. I use them in my own car. In the interest of getting first things first, however, I would recommend that, in our separate areas, we concentrate first on providing a seat for every passenger. We have too many thousands of overloaded buses to even consider seat belts at this time.

The following are specific recommendations for your careful consideration:

1. Provide a course of training for all school bus drivers, given by persons skilled in bus operations, preferably by a commercial bus fleet school.
2. Provide a better selection method than letting bus routes to the lowest bidder.
3. Make each contract contingent on the driver's successful completion of a pre-determined course of training.
4. Adopt and print a clear-cut set of rules and safe operating procedures that define clearly the driver's duties and responsibilities. Be sure he knows what his job is.
5. Adopt and print a clear-cut set of rules for bus passengers and distribute to parents of children using the bus. Let the parents know in advance what the rules are.

SELECT SAFE ROUTES

6. Make a careful selection of bus routes to get as little mileage as possible on high speed roads and as much of the loaded mileage as possible during daylight hours.
7. Select bus stops carefully to get as many as possible off the traveled way and to avoid stops just over the brow of a hill. Turn arounds should also be carefully studied to avoid hazards.
8. Have each school bus accident investigated by the county superintendent of schools and the area State Police Officer. See that a complete report is sent to a central state school official for record and careful analysis.
9. Require periodic vehicle checks of all buses, preferably by a commercial bus fleet garage.
10. Appoint some one person, either full or part time, as School Supervisor of School Bus Transportation and have this person make frequent observations to see if rules are obeyed. Appoint also a State School Bus Supervisor.
11. Provide National Safety Council Safe Driver Award.
12. Send, from a central state agency, an annual summary and analysis of school bus accidents to every school administrator and use the results of such analysis in bus driver training schools.
13. It goes without saying that authority must be given to drivers and must be exercised by them to maintain order on board and in entering and leaving buses.

REQUIRE PHYSICAL SPECIFICATIONS

14. Finally, both school and licensing authorities must put into effect at once procedures and practices that insure physically qualified drivers. An Indiana accident last year which injured six or seven school child passengers involved a bus driver with only one arm. He used a hook for the other hand. This bus collided with a bread truck. It does little for public peace of mind to know that he is driving the same route again this year. In another recent case, the parents of school bus passengers worked through an insurance company to influence a township trustee to remove a 74-year old driver who used a hearing aid. The trustee is paying his

wages for the remainder of the school term.

These 14 points may or may not make sense to you. I know I have wandered far afield from the assigned subject. If they seem visionary to you, just remember they do not seem visionary to hard headed business men whose profit or loss depends on freedom from accidents. They merely outline a standard of performance you have grown to expect from the public transportation that you use.

Are you willing to settle for second class transportation for your children?

SCHOOL BUS ACCIDENT IN THE COURTS

by HARRY N. ROSENFIELD
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The law courts are neither the customary nor the best place for school people to find out ways of improving their school programs. Nevertheless, liability suits arising out of school accidents are to safety and accident prevention programs what an autopsy is to a preventive health program.

The law suit is both a possible sign of failure and an opportunity for possible improvement. Out of the facts disclosed in the trial we can often learn a great deal of what has gone wrong in school safety programs and what needs to be corrected to prevent future accidents.

It has been estimated that the automobile generates over half of all the general personal injury cases in our courts. And to our already overcrowded courts, there are unhappily being added an increasing number of cases arising out of public school pupil transportation.

PRINCIPLES OF LIABILITY

First, let us consider the ground rules of the game. Perhaps it will be helpful if at the outset we compile a glossary, defining some words that will recur in this paper. *Liability*—this must be discussed under two headings:

SCHOOL BOARD LIABILITY—The predominant rule of law in the United States is that a public school board is not liable for accidents except where so required by statute. This is the remnant of an ancient rule that the sovereign cannot be sued unless he consents. Some states have found this rule of governmental immunity from liability for accidents so harsh, unfair and anti-social that they have enacted statutes repealing the rule in whole or part.

Some states, such as California, have an all-embracing waiver of immunity so that California school boards are substantially on a par with private corporations and individuals and are liable when they, or their employees, are negligent. Other states, such as New York, New Jersey and Connecticut, do not in terms waive school board liability, but provide that the school board will pick up the tab wherever one of its teachers has been held liable for negligent performance of duty.

Still other states have a more limited waiver of governmental immunity. In some such states, as Connecticut, Idaho and North Carolina, there is a waiver of immunity for school bus transportation. Many others have repealed immunity, in effect, by authorizing school districts to use public funds to purchase liability insurance for bus transportation. Still others, as Kentucky and Tennessee, have sought to deal with the situation by requiring the bus driver to carry insurance or furnish indemnity bonds.

But it is basic that unless the State Legislature has decreed otherwise, a school board is not liable for negligence. A corrolary of this rule of law is that, unless authorized by statute, such a school board may not purchase liability insurance—the reason is obvious—if there is no liability, there can be no public money spent to insure against such non-existent obligation.

TEACHER LIABILITY—A teacher gets no protection from his employer's immunity. When a teacher is negligent, like any other negligent person he may be liable. And when the teacher is not negligent, there is no liability even if there be a major injury. One point further, a teacher who works for a school board protected by government liability, cannot be reimbursed by the board for the liability judgment and cannot be covered by insurance, for reasons already indicated.

Negligence—the failure to act as a reasonably prudent person would act under the circumstances. What is "reasonable prudence"? If one could, or should, anticipate trouble or some untoward development under the particular circumstances, failure in attempting to avoid such trouble or prevent such untoward development, is not reasonable prudence. The key issue is one of fact, and the question of fact which must be answered is whether in the ordinary exercise of reasonable prudence, the teacher—or his driver—should have anticipated danger in the specific instance. If "yes" and nothing was done about it, the teacher was negligent.

Remember, not every accident means someone has been negligent. Furthermore, even if a teacher is negligent, she may be freed of liability because of certain applicable defenses to liability.

SCHOOL BUS ACCIDENTS

How do these principles of law work out in school bus cases? By and large, the cases seem to revolve about three factual situations:

1. the condition of the bus,
2. the driver's negligence,
3. improper supervision of pupil transportation.

CONDITION OF BUS—Safe design, good condition and proper maintenance of the school bus are important in avoiding law suits. Only a relatively small proportion of the school bus accidents in courts today are due to the defective condition of the bus itself. In some of the earlier cases, pupils had to sit with their feet over the running board, were exposed to the elements without protection, or fell out of a bus because of the disrepair of the door latches. And— an otherwise safe bus may become unsafe due to overcrowding.

DRIVER'S NEGLIGENCE—Most school bus accidents occur because of someone's negligence, often the driver's. Take, for example, the Georgia driver who drove his bus up a narrow but unobstructed road at 30 mph passing so close to a tree that its protruding limb hit a child in the bus and put out his eye. Then there was the New York driver whose failure to maintain proper order in the bus resulted in a pupil's putting out another pupil's eye by shooting paper clips with a rubber band.

A North Carolina driver failed to pay attention to the location of a pupil who had just alighted and the child was sideswiped by the bus when the driver abruptly pulled it onto the road. When an Illinois driver suddenly started his bus, the resultant lurch threw a rider standing in the aisle against another pupil.

In Louisiana, a bus driver was on the left side of the white line on a curve, and failed to pull over to his own side of the road because he thought the other driver—who was also on the wrong side of the road—would get out of his way.

Excessive speed, recklessness, driving on the shoulder of the highway instead of on the road itself, parking in the path of a known path of children sledding down a hill—these are other examples of driver negligence that lead to accidents and injuries—and to liability. What can a liability judgment amount to? In the Louisiana case, three pupils were killed and there was a verdict against the bus driver and the other driver totalling more than $75,000.

LOADING AND UNLOADING BUSSES

Perhaps the most frequent kind of school bus accident to reach the higher court occurs while pupils are getting on or off the bus.

GETTING ON BUS—In a New York case the school bus backed onto the school property to the place where the pupils were waiting, and killed a child. Here, the school board was held negligent (but not the driver) for failing to provide supervision of pupils waiting for a school bus on school grounds, and for failing to promulgate and enforce rules and regulations for their safety while so waiting.

In a Virginia case, it was common knowledge that the students shoved, pushed and rushed to get into the bus. The driver was negligent for failing to stop his vehicle; here a 13 year old boy was pushed and shoved under the wheels of the slowly moving bus. However, in a Utah case where there was no disorder among the waiting pupils, it was not negligent for the bus to be drawn within two or three feet of the end of the line of waiting pupils, even although in this instance a child was also shoved and fell under the wheels.

ALIGHTING FROM BUS—The most common school bus accident case is the one where a child is injured or killed while crossing the highway after alighting from the bus. Of the 30 school bus passenger deaths reported in 1956, 25 involved pupils crossing highways.

The courts in these cases have often held the school bus driver liable. Although the normal rule of law is that one is not guilty of negligence if he uses ordinary care, in school bus cases the courts have often expressed and applied a more rigid standard of care.

Because of the inmaturity of the riders and the surrounding circumstances, a special kind of obligation is attached by courts to school bus drivers, to exercise "the highest degree of care." The courts of many states have repeatedly ruled that school bus drivers must exercise "extreme" or "extraordinary" care.

Would there be much question about the negligence of a school bus driver who left his pupils off at an unsafe place in the dark or stopped his bus on the wrong side of the road? With other than school bus transportation, the driver's duty ends when he deposits his riders at a safe place, even if the riders are school children.

DRIVER'S RESPONSIBILITY EXTENDS

But a different and more stringent rule is often applied to drivers of school busses. Many courts have ruled that the school bus driver's responsibility extends to and includes the safety of the path which the driver knows such child will have to take homeward immediately after alighting from the bus. Such courts impose on the driver the obligation of ascertaining whether it would be safe for the child to cross after leaving the bus.

For example, in Louisiana and California school bus drivers were held negligent for permitting seven and eight year old children to alight without the drivers first assuring themselves that the road was clear for the children to cross.

Other courts have required school bus drivers to warn their riders of specific known danger on alighting and even, under some circumstances, to protect their charges by refusing to permit them to get off. So, when a bus driver in the state of Washington did look and saw that the child would be endangered by approaching cars, the court said that the circumstances required the driver to warn the child of the danger.

DRIVER MUST AID CHILD

For a Tennessee court such circumstances required the driver to keep the six year old child from alighting altogether. And a Georgia court, faced with such facts, found the driver negligent for failing to aid the nine year old pupil to get to a safe place. "Whether or not," said the court, "a place of deposit is a place of safety cannot be determined solely by whether or not one would be safe if he remained on the spot."

In addition to the general rules of negligence law, a school bus driver must comply with his employer's instructions. For example, the North Carolina State Board of Education promulgated rules requiring school bus drivers to supervise pupils alighting from the bus "until they have crossed the highway in safety or are otherwise out of danger" and to refrain from starting the bus "until pupils are seen to be out of danger." Noncompliance with such safety rules is a long step toward legal negligence.

These are some of the lessons that come out of the school bus accident cases that have gone to court. Court records are by no means the best way of learning how to improve a safety program, but the litigated cases can and should alert us to matters which need attention.

NEW SAFETY PROBLEMS FROM THE EXPANDING USE OF SCHOOL BUSES IN URBAN AREAS

by ROBERT G. HAYES

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Role of the Cook County Superintendent of Schools in Providing A Safe School Transportation Program.

The Boards of Education in the State of Illinois operate the pupil transportation program. In Illinois we have a non-centralized school system of education. This means that each local school district operates its own program of pupil transportation.

Responsibilities of the School Board:

1. Provides, by purchase or contract, safe, comfortable, and convenient transportation facilities.
2. Designates school transportation routes.
3. Makes all contracts and bonds, keeps in force adequate insurance, and provides licenses for district owned buses.
4. Purchases only transportation equipment which is approved and meets the standards required by the superintendent of Public Instruction.
5. Selects fully qualified drivers in whom the parents have confidence and employs only school bus drivers who have been duly approved by the county superintendent of schools.
6. Makes the school executive responsible for the management of the transportation system.

The County Superintendent of Schools is the *supervisor* of school transportation in all of Cook County. The Cook County Superintendent of Schools plays an important role in providing safe school transportation for the children in this county. He supervises school transportation and assists in enforcing all regulations adopted by the State Superintendent of Schools.

Responsibilities of the Cook County Superintendent of Schools:

1. Checks vehicles used for pupil transportation to see that they have passed a semi-annual safety inspection before being put into service.
2. Approves all new applicants for school bus driver positions and arranges for a school bus driver examination with the official State Examiners of the Office of the Secretary of State. This exam consists of a written and road test.
3. Checks all persons operating a vehicle used for pupil transportation to see that they hold an Illinois School Bus Driver's Permit.
4. Plans a special training safety program for the school bus drivers. An active training program is now in operation to assure the safety of the many children who ride the school buses in Cook County.
5. The Safety Training Program includes the following:
   a. Annual standard first aid courses are offered in four sections of the County. These courses are planned in cooperation with the American Red Cross and are usually held during September.
   b. Fifteen hour safety course. This course has been planned and conducted by the County office and includes the following:

UNIT I. Understanding and Appreciating the Job of the School Bus Driver.
UNIT II. Regulations of the Office of Public Instruction Governing School Transportation.
UNIT III. Preventive Maintenance.
UNIT IV. Illinois State Motor Vehicle and Traffic Laws.
UNIT V. Psycho-Physical Testing, Scoring and Interpretation.

   c. Five hours practical First Aid Training.

This safety course is not compulsory but is an added service of the County office to enable the bus drivers to do a better and safer job of transporting children to and from school.

GROWTH OF SCHOOL TRANSPORATION

It is the purpose of this paper to show the tremendous growth in school transportation in Cook County and to pinpoint more or less some of the safety problems faced by the Boards of Education, Office of the Cook County Superintendent of Schools as well as parents of the children who are transported.

Boards of Education in Cook County are constantly being petitioned to provide more and more transportation.

Twice a day, in the morning and in the afternoon one traveling on the highways in Cook County will find a vast fleet of yellow buses transporting one out of five children now attending schools in suburban Cook County.

Not only is it a vast fleet, but it is a growing one. The school bus fleet must keep pace with the school population, which is enjoying the highest rise in the history of suburban Cook County.

Right now according to our statistics, more than 40,000 pupils in the elementary schools are transported. This is a record. Still, this is only the beginning.

More than 500 vehicles are used to transport these children.

Here are some of the reasons for this tremendous increase in school transportation in Cook County:

—The enrollment in the elementary and secondary schools has increased 75,000 pupils during the past five year period, from 1950-51 school year to 1955-56 school year.

—Illinois law requires consolidated and community consolidated school districts to transport all children living over one and one-half miles from school.

—The increased traffic on the highways in the suburban areas as well as the truck traffic has increased the hazards of walking on highways.

—In many parts of Cook County, the rural areas have developed at an unprecedented rate, but the pace of local improvements such as sidewalks and good roads has not kept up with this growth.

—Parents in the suburban areas no longer make their children walk great distances to school through rain, mud and snow. School bus transportation does give added protection against inclement weather, danger of highway traffic to pedestrians and the hazard of careless driving. It is understandable why the parents make demands for school transportation.

—Undoubtedly, the emphasis given to safety in all aspects of pupil transportation has had tremendous influence in its growth.

If we thought we had safety problems 10 years ago, today it is much worse. Thousands of cars, traffic congestion and crowded road conditions have made Chicago and suburban areas of Cook County one of the most hazardous areas in the middle west for a school bus or any vehicle for that matter.

This tremendous development of school transportation has involved the local boards and our office in some rather serious safety problems. Some old long recognized problems have taken on a new significance and then some new safety problems have presented themselves for attention.

NEW AND OLD SAFETY PROBLEMS

The present extent of school transportation and its continuous expansioning indicates the need for a general review of some of the major problems now confronting those responsible for safety in this operation.

Careful selection of school bus drivers

We must continue to select only the best people to operate our school buses. Drivers must hold a current chauffeur's license, have a first aid training, must pass a rigid health exam annually and must participate in safety training programs.

Shortage of School Bus Drivers

Carrying daily 40,000 jumping, red-blooded kids from kindergarten through high school has become a nerve-shattering encounter for many bus drivers without proper training, exposure and disposition, so that many new drivers quit their jobs within a short time.

The school bus driver is the most important factor in safe school transportation. Yet, we employ people who are too old or part time workers. About one-third of the bus drivers in Cook County are women. Women seem better bus drivers.

To insure a supply of good bus drivers we should have a good driver education program in our high schools. If we are to produce good bus drivers, we must teach our high school students to operate buses. If we have such a program, we can assure ourselves a potential group of safe bus drivers. They must know the meaning of safety and understand driving regulations.

Safe vehicles

All school buses in service must meet and exceed, current standards as set up by the Office of the Superintendent of Public Instruction.

Continuous maintenance program should be set up by all boards of education and private and public operators. This involves complete inspection, daily checks by operators of such items as brakes, windshield wipers and tires. Any vehicle in an unsafe condition should be promptly removed from service.

When should a school bus be retired from service? It is the general opinion of many specialists in this field that a school bus should be retired at the end of eight years, 10 years, or perhaps longer. It is not possible to say definitely when this should be done. There are many factors which enter into the picture, such as, maintenance, road conditions. Some districts in our County operate buses 10-12 years old.

Who should be transported? In determining who shall be transported to and from school the following factors should be considered:

Distances between home and school.

Dangers to child incident to foot traffic.

Ages of children.

Their physical fitness for walking the distance encountered.

Traffic hazards and climatic conditions have some bearing on the determining of reasonableness of walking distance.

"DISTANCE LIMITATIONS"

For many years, the State of Illinois authorized local school districts to provide free transportation. It was not mandatory for any school district to provide this service.

The "one-and-one-half" mile distance was a qualifying factor for State Aid. Many school districts which provided school transportation used this distance to exclude those who lived less than a mile and one-half.

It was not until June 16, 1953 that the Illinois State legislature enacted a law which required school boards of community consolidated districts, community unit districts, consolidated districts to provide free transportation for pupils residing at a distance of one and one-half miles from school unless such school board could certify to the Superintendent of Public Instruction that adequate transportation for the public is available.

1½ MILE DISTANCE

Since common school districts were exempt from this law, the Boards of Education of these districts, continued to use the one and one-half mile distance to determine who would be transported to and from school.

As many small children were required to walk to school often along State and National highways carrying heavy volume of high speed traffic, many parents began to question the wisdom of such regulations and demanded that their children be transported to school.

Often these parents offered to pay part of the cost of transporting these children, however, Boards of Education were prohibited by law to charge any fees as the law specifically stated that boards may provide "free" transportation only.

Finally, on June 21, 1957, the State legislature approved a law authorizing school boards to provide transportation for those living less than one and one-half miles from school and boards of education now may make a charge for such transportation in an amount not to exceed the cost per pupil. The new law also provides for a transportation tax not to exceed .02 per cent without referendum.

The fact that highway traffic is becoming increasingly heavy and that highway accident rates continue to climb has resulted in many school systems in our county trans-

porting pupils who live relatively close to the school.

In fact, the minimum distance requirement for providing transportation service is no longer a fair standard in many areas. Needs for the service in congested areas and along busy highways cannot be determined equitably on the basis of distance. For children having to walk a mile to and from school along a busy highway the basic problem is not distance, but safety. Recognition of this has resulted in greatly expanded transportation services by many school systems of Cook County.

CUSTOMARY ROUTE OF TRAVEL

In determining the one and one-half mile distance as a qualifying factor for state aid, the law states that it shall be measured by the customary route of travel. The law does not, however, define how this shall be done nor who shall have the authority to define the customary route of travel.

Many school districts in Cook County are small in area in terms of square miles. There are many children transported to school who live less than one and one-half miles as the "crow flies." Therefore, the Boards of Education and the Office of the Cook County Superintendent of Schools have often a real problem to determine the "customary route of travel." This may not be a problem in rural counties, but it certainly is in an urban county such as Cook County.

In defining the customary route of travel, the Office of the Cook County Superintendent of Schools does so in terms of safety and the general welfare of the pupils.

PARENTS DEMAND PICK UP, UNLOADED AT HOME

The school board has the legal right to make reasonable rules and regulations concerning the transportation in the school district. It is not legally required that the vehicle used in transporting pupils shall go to the home of each child in the district.

We cannot afford to spend public money to pick up children at each home and to unload them at each child's home. It is recommended that the vehicle go to the *nearest entrance* along the route of travel. It is suggested that in such cases the pupils may be required to meet the vehicle. If the distance is too great, the board may employ the parent or some other person (under contract) to transport the children to the transportation line. However, such supplementary transportation service is not compulsory.

OVERLOADING SCHOOL BUSES

From time to time we receive reports of overloading. Upon immediate investigation, we find that these complaints are true.

A state regulation requires no more than 54 seated pupils shall be carried except with the approval of the Superintendent of Public Instruction. School bus bodies shall have their maximum seating capacity painted upon the outside left and inside front and in no event shall be loaded beyond that limit.

In the interest of safety we must all insist that no vehicle used in Pupil Transportation shall at any time transport more than the rated capacity of the vehicle. All pupils must be seated while the vehicle is in motion.

Same specialists in the field tell us that 10 per cent more than the seated capacity of the vehicle is generally considered OK in overloading. Others point out that it is not considered overloading a school bus if a child stands at each row of seats.

LOADING AND PICK-UP STATIONS

The general increase in the volume of vehicular traffic throughout Cook County, points to the need for a continuing revision of all school bus routes and careful selection of "loading zones," at which pupils enter or leave school buses.

All loading and unloading locations must be clearly visible to on-coming traffic and all school bus drivers must give adequate notice of their intention.

A new Illinois law requires every school bus to be equipped with visual signals which shall be actuated by the driver whenever the brakes are applied. This new law requires signal lamps to be connected to the brake pedal by means of a toggle switch and to be disconnected when pupils are not being transported to or from their homes or school.

A bus driver is also required to actuate the bus signals whenever the vehicle is stopped to receive or discharge children, when children are unloading to cross a street, highway, or road, or whenever the bus is stopped to load children who must cross a highway, street or road to board the bus.

FREQUENCY OF BUS STOPS

On June 2, 1955 the Illinois State Legislature enacted a law which requires the motorists traveling upon a highway outside of a business or residence district to stop from either direction upon approaching a school bus stopped to load or unload children upon a highway. Therefore, a motorist traveling in Evanston, Oak Park or Chicago Heights is not required to comply with this law.

The frequency with which buses are permitted to stop on the highways needs careful consideration. Some people feel that loading and unloading stations should be spaced at greater distances. However, parents of some children affected feel that the heavier the traffic, the more frequently should the school bus stop in order to keep to a minimum the distance pupils are required to walk along the heavily traveled highways.

TRANSPORTING PUPILS TO CITY

More and more school buses bring children to special schools in the cities, hence giving rise to new problems.

In general the "stop law" applies only upon highways "outside of business or residential areas." However, on June 7, 1957 the city council of Chicago enacted an ordinance which requires motorists traveling within the limits of the city of Chicago to stop from either direction when a school bus has stopped to load or unload children and said motorist shall not proceed until the school bus resumes motion, or the visual signals are no longer actuated. This creates situations confusing to motorists traveling in Cook County.

SUPERVISION OF VEHICLES

There are a large number of vehicles used in pupil transportation by public school districts, private schools and private operators on non-reimbursable routes.

Since the jurisdiction of the County Superintendent of Schools in supervising school transportation is limited to those programs reimbursed by the state, we find there is no other state agency that can exercise supervision and control over these vehicles.

It is true that these vehicles are required to pass a "truck inspection" but there is no state agency to check to see that this is done.

In many cities including Chicago, we find charter bus service provided by a private or common carrier for a fee on an individual basis. This is not school transportation but it is so viewed by many parents. They fail to see why the County Superintendent of Schools does not supervise them. It is essential that these operators be required to meet the standards established for regular school transportation.

CITY PASSED RULING

Since the state of Illinois has failed to control these carriers, the City of Chicago decided to do something about it. On June 7, 1957, the City Council passed an ordinance which requires registration of all vehicles used in transporting children to or from any school, day nursery, day care center, day camp, play group or any regularly conducted public or private educational, religious, recreational or care program within the limits of the city of Chicago. Any vehicle used in the above programs must be properly registered with the Public Vehicle License Commissioner.

Among other things, this new city ordinance:

Defines "School Vehicle." This is not the same as the legal definition of a school bus. The Illinois School Code defines a school bus as every motor vehicle of the second division operated by or for a public or governmental agency or by a private or religious organization solely for the transportation of pupils in connection with any school activity.

Requires registration of all such vehicles. This will prohibit the operation of a school bus at all unless it is registered with the Public Vehicle License Commission and a certificate of registration issued therefore by the Commission. We objected to this section of the Ordinance because we felt that school buses operated by a board of education and supervised by the County Superintendent of Schools should be exempted from this requirement.

Provides a registration fee. Can the City of Chicago thus tax a school district? If so, is payment of registration fee good public policy?

Provides for inspection of school vehicles in order to determine the capacity. Public school buses are checked by other procedure and under regulations by the State Superintendent of Public Instruction. Regulations of the governing bodies will be in conflict.

Safety requirements. Every school vehicle shall have four doors and be equipped with a device or devices by which each door may be locked from the inside. This is in conflict with the rules and regulations of the Superintendent of Public Instruction. It would outlaw the standard, conventional type of school bus which has only two doors, and would violate the safety standards by having doors locked while transporting pupils.

Requires inspections by the Public Vehicle License Commissioner prior to the issuance of certificate or registration and at such other times as he selects. This would have the effect of duplicating inspections and expense in connection therewith.

We believe that the action taken by the City Council in controlling these vehicles was necessary and we hope the State will do likewise. However, it seems the ordinance should have omitted references to buses or vehicles operated by the public schools or by a driver employed by the public schools.

Transportation of school children is all regulated by State Law and rules and regulations issued by the Superintendent of Public Instruction. Many of these features included in this ordinance will lead to duplication, confusion and additional expense to the Chicago Board of Education and other suburban school districts.

RECOMMENDATIONS

A continuous program of traffic safety education is needed including proper conduct in entering, leaving, and riding the bus.

1. We recommend that parents be advised of the school's bus safety program and they should understand what is expected of their children.
2. We recommend that bus transportation safety be frequently mentioned at P.T.A. meetings.
3. We recommend to the school authorities that they should explore the possibility of providing a proper bus loading point at the school, preferably a platform, or raised surface bounded by a curb. It should be located so that the bus does not stand with any part of the main traveled portion of the roadway and, if possible, away from the path or area usually traversed by children on foot.
4. The Superintendent and Principal should ride buses occasionally to check personally on the efficiency of bus and patrol operation.

SAFETY PROGRAM IDEAS

5. In teaching safety in schools we suggest that the following be included in the safety program:
   a. Class discussions of school bus safety rules is one of the best ways to impress pupils with their part in the safety program.
   b. Clear explanations of traffic regulations and how they affect school bus safety should be given in classroom courses.
   c. Outline the rules which the individual should observe while going to and from the bus, and while traveling on it.
   d. Review these rules over and over until the pupil is thoroughly familiar with his part in the safety program.
   e. Every step in the training should be planned as carefully as is a regular course, with study assignments and classroom discussions.

PRACTICE ON BUSES

   f. Practice in getting on the bus and leaving the bus. Carelessness in leaving the bus can counterbalance the most stringent vigilance by the driver.
   g. Failure to observe proper safety procedures in the bus can cause serious accidents. Pupils must be constantly alert for their own protection; they must be reminded again and again that safety does pay.
   h. Bus safety will be considered important by the children only if teachers continuously show interest in and give proper emphasis to the subject.

Transportating safely 40,000 children to and from school daily is a tremendous responsibility. It is too big a job to be assumed by any single group of authorities.

Roads and vehicles improve continually, but there is no way yet devised to engineer the danger out of human carelessness and thoughtlessness on the highways. These are human factors which every law enforcement agent, school official, teacher, parent, pupil and motorist must constantly strive to eliminate.

Providing safe school transportation requires "teamwork." We need the earnest cooperation of the local Boards of Education, Highway Departments, parents, the general public, State and Local Police Officials.

Most of all, when you have cooperation of students with the bus driver, you are on your way to achieving your primary objective—safe school transportation.

THE NATIONAL SCHOOL BUS PROGRAM

WHAT IT IS

by RAY PRINCE
secretary, School Bus Advisory Committee, National Safety Council

This paper deals with the newest activity of the Motor Transportation Division, the national school bus program.

We feel that the school bus driver is an important person in any school administration. He spends only a few hours a day at his job and most of that time he is away from the school grounds. But he plays a vital role and deserves more help and recognition for the job he does play.

The ability to drive a motor vehicle safely is regarded as a pretty ordinary skill. Practically every adult is familiar with the motor vehicle and can operate it satisfactorily. Most of us have learned to drive from our fathers or from a friend and in most cases that training consisted only in learning how to make the car go and stop and how to steer the thing.

DRIVING SAFELY TAKES SKILL

We picked up a knowledge of traffic rules and regulations more or less by chance. As a result we think driving is easy and driving skill is taken more or less for granted.

But the ability to make a car go, turn and stop is one thing. The ability to drive safely is quite another. Last year while practicing the common ordinary skill of driving, we killed 40,000 people in this country. Driving is easy, yes. Driving safely apparently requires something extra.

It is that something extra that our motor transportation service for school bus operators is designed to give.

The most important thing about our program is a point of view. For an example, "What do you mean by safe driving?" Some of you might say that it means knowing and obeying all the traffic rules and regulations. After all, these regulations were made in the first place with safety in mind. So all we have to do is obey them and we'll get along fine.

But is it any guarantee that we will get along fine? You and I both know that it is no guarantee at all. We get the green light and proceed through the intersection. We are obeying a traffic regulation. But the other driver, who thought he could go through before the yellow changed to red, smacks into us. We have an accident, or our school bus has an accident.

Our driver is legally in the right, but that is small consolation if children are injured or killed as a result. We can be

legally right and still have fatalities and injuries and big repair bills. The other fellow may not have any insurance or any money to pay the damages.

If that is our concept of safe driving, to be legally right, we are covering only part of the problem. We are leaving our school buses and our school passengers exposed to the whims of the other fellow. He may not know or care about traffic regulations.

Our point of view toward safe driving has got to be bigger and broader. It must take in not only the operation of our vehicle but the operation of the other vehicle as well.

You may ask—"How can we drive the other fellow's vehicle for him?" The answer is that of course we can't drive the other fellow's vehicle. But we can drive our vehicle always in relation to his so that he can't run into us. That is the concept of defensive driving.

DEFENSIVE DRIVING

A defensive driver obeys the green light, yes. But he also looks both ways to make sure that intersecting traffic has stopped and obeyed its light before moving.

A defensive driver comes to a stop at a stop light as the law requires, yes. But he also takes care to slow down gradually before coming to a stop so that the vehicle behind him will not run into his rear end.

A defensive driver uses the correct procedure in making a left turn. He positions his vehicle in the left lane and puts his arm straight out or uses his left turn blinkers. But he also looks to the rear to make sure that traffic behind has seen and is obeying his signals.

A defensive driver keeps to the right as the law requires, but he also is alert for persons getting out of parked cars on the street side or children running out from between parked cars.

CUTS OWN SPEED LIMIT

A defensive driver obeys the speed limits. But if the streets are slippery from rain, snow, or ice, he keeps his speed down even further so as to be able to stop in time if an emergency arises.

This is the concept that we teach through our booklet "For Experts Only," through the monthly Safe Driver magazine, our monthly driving letters, and other training materials.

Our program also provides a means for keeping score, the safe driving score for each individual driver. It works like this. We require that a driver make out a complete report of every accident he has, and by an accident we mean "any contact between our bus and another vehicle, person, or fixed object which results in death, personal injury, or property damage. Such contact must be reported as an accident regardless of who was hurt, what property was damaged or to what extent, where it occurred, or who was responsible."

We require a report of every accident that fits this definition. Now you might say that this is carrying the thing to extremes to require reports of every little dent, nick, and scratch. You may say, I am not too concerned about those, but I am afraid of those major collisions. Those are the accidents I want to prevent. The others we can take in our stride.

REPORT MINOR ACCIDENTS

The reason we require reports of every accident, even the little ones is this. It is not the size of the accident that concerns us. It is the unsafe act that caused it. The same unsafe act can cause a minor accident or it can cause a fatality.

The unsafe act of barrelling up to a stop light and coming to a sudden stop may not cause an accident the first time or the second time, but eventually there may be a heavily loaded truck following you with bad brakes and he may plow right into the back of our bus.

You can't pick out the size of accidents you are going to prevent. The severity of the accident is up to chance factors alone. You can, however, control unsafe acts. And requiring a report of every accident, even the minor ones is your most important means of controlling these unsafe acts.

Let us say that your driver comes in to you with a report of this kind of an accident. He was driving along the highway in a downpour following another vehicle which suddenly stopped. Our driver slammed on his brakes but ran into the vehicle ahead doing very slight damage.

DEALING WITH ACCIDENT VICTIM

He has had the accident; he has made up his report and comes to you with it. Now what do you do? Do you bawl him out and tell him to drive more carefully, or do you look at the slight damage involved and say, "Well Joe, luckily it wasn't a bad accident. Try to be more careful next time."

Neither bawling the driver out nor dismissing it as a minor matter does any good in improving the safe driving ability of this driver. The only reason you want this driver to come in and talk with you is so that you can help him prevent this kind of accident from occurring in the future.

This interview between you and the driver is a mighty important one for him and for the safety record of your school bus fleet. And for this occasion, our program also provides you with a point of view.

TWO TYPES OF ACCIDENTS

I said that our program provided a means of keeping score. We do it by grading accidents either preventable or non-preventable. A preventable accident is simply one in which our driver failed to do everything possible to prevent the accident. A non-preventable accident is one in which the driver did everything he could reasonably be expected to do to prevent the accident, but the accident occurred in spite of all these precautions.

Our Safe Driver Award is based on the ability to drive without having preventable accidents. We don't charge against the driver those accidents he did everything he could to prevent. That would simplify the administration of the Safe Driver Award plan, but we think it would be unfair and poor psychology.

If drivers were charged for every accident regardless of whether they were practicing the principles of defensive driving or not, we feel they would soon lose interest in your safety program. However, if they realize that their driving is going to be graded on a fair basis, they are going to strive to stay out of accidents.

In the interview, you will discuss the accident from the point of view of whether he could have done anything to have prevented the accident.

In this case, he ran into the rear end of another vehicle. He may claim that the weather was bad and that his windshield wipers were not working too well. You must point out to him that bad weather is no excuse. A lot of driving must be done in bad weather. A defensive driver adjusts his speed to these weather conditions so that he can stop in time.

As for the windshield wiper, he is required to check these items at all times and see that they are in good operating condition. If it was not in good operating condition at the time he took the bus out in the morning, he should have had it repaired immediately or, if this was impossible, adjusted his driving accordingly.

During this interview, you should have before you the record of this driver's past accidents. These may reveal that the driver has had the same bad habits in the past, carelessness about inspecting his vehicle before taking it out—not allowing enough distance between his vehicle and the vehicle ahead.

If you are like most administrators, you would call this accident a preventable accident and charge it against this driver's record. That means that he will not get his Safe Driver Award for this year. For not practicing the principles of defensive driving, you are not penalizing the driver, you are merely withholding a reward.

NSC DRIVER AWARD RULES

The special features of the National Safety Council award are that a driver must drive one school year without a preventable accident for a one-year award. He must drive two consecutive years without a preventable accident for a two-year award, and three consecutive years without a preventable accident for a three-year award.

Up to the time the driver earns his three year award he is in what is known as the proving period phase of the award program. Any time he does have a preventable accident, he must start from scratch and try again at building up a record of three consecutive years without a preventable accident.

Once he has earned his three year award, however, he is on a plateau known as the penalty period. Now if he has a preventable accident he is charged one school year for it. In other words if he normally would

be eligible for a four year award on June 1, 1958, and he has an accident in December, he must drive without a preventable accident until June of 1959 in order to win the four year award. If he has another preventable accident before he reaches this point, the date of his award is moved up still another year to 1960.

AWARDS IMPROVE DRIVING

Do driver's drive differently when they are under an award plan like this than they would if your school had no award program? Experience in motor transportation fleets indicate conclusively that they do. And those school administrators who have used this program will agree.

The program involves more than the provision of a small piece of jewelry. Just remember that it based on a standard of safe driving performance that your drivers come to understand. They know that you understand this standard also. You are both speaking the same language. You both understand what is meant by the principle of defensive driving.

The driver also knows that you are keeping score. He likes this, because he knows that while you keep a record of his accidents, you also are keeping a record of his safe driving time and if he meets the requirements of the award he will be recognized for it.

He knows also that the award he receives is universally recognized as the badge of an expert driver—it is the emblem of the professional driver in all branches of motor transportation — and that includes truck drivers, city bus drivers, inter-city bus drivers, taxicab drivers, police in state and municipal police car fleets, drivers for public utilities, and in many other branches of driving. More than 100,000 of these awards are earned annually by such drivers. For that reason it is universally recognized.

You in the educational field know the value of accreditation. You would not go to a non-accredited school, because your credentials might not be universally honored after you had completed your study. We feel that this award plan, because it is sponsored by an agency that is chartered by Congress and because it is so universally used, has that kind of accreditation.

Yes, drivers will strive to earn this award and to do so, they know they must practice the principles of defensive driving — that something extra which means the difference between operating a vehicle and operating a vehicle safely—the difference between getting your pupils back and forth to school safely day after day.

WHAT IT MEANS TO A STATE DEPARTMENT OF EDUCATION

by C. WESLEY DANE

director, Division of School Traffic Safety Education, Indiana State Department of Public Instruction, Indianapolis, Ind.

Perhaps the greatest value of participation in the National School Bus Program is the rather obvious one—by being a part of this program one achieves "status." It is conceivable that a local unit or a state organization could develop a creditable program of recognition and plan of award distribution. But when one becomes part of a plan which is national in scope, the benefits to be derived are immediately enhanced.

School bus drivers in Indiana know that they are a part of a program which recognizes fleet systems and individuals all over the United States and that their awards are of the highest caliber. Our school bus drivers know that their record has been established in a central repository and that it will remain cumulative for all time.

Experience as a college professor and service in a branch of the state government has convinced me that the demand for work never catches up with the supply of available time. Therefore, it seems to me that another advantage of national affiliation is the outside stimulus toward achievement.

NATIONAL AWARDS GET NOTICE

You have heard it said that "The wheel that squeaks the loudest, gets the grease"; and I fully believe this to be a truism. It is conceivable therefore, that in the press of events certain things, many worthwhile things, may be delayed or denied because of the pressure of some other demand. When national leadership is involved, as it is in the giving of a Safe Driver Award, there is constant supervision, encouragement and assistance which preclude procrastination or failure.

While the Safe Driver Award is in itself prized by the recipient, it is a means to an end as far as a Department of Education is concerned. It makes necessary the keeping of records and submitting reports. Its administration gives the department a contact with national leaders who serve as frequent reminders of organization needs. The introspection occasioned by these frequent contacts stimulate self-appraisal and encourage new avenues of approach.

Since we are in our second year of participation, we cannot provide data and would not presume to offer statistics. Whether this program has influenced drivers to make and maintain accident-free records is not known. It would be entirely presumptive to maintain that any change in record is due to any one cause.

CONTACT WITH DRIVERS

We firmly believe that accident records are the result of many causes and that to achieve an accident-free record requires effort and emphasis along many lines. However, participation in a National School Bus Program establishes a regular contact with bus drivers which might not otherwise exist and this contact bears positive results.

One would not ordinarily think of a school bus driver as a correspondent, yet ours write us often and it is gratifying to receive their voluntary contributions. It is an evidence of their interest and their acceptance of our leadership.

From the evidence of interest on the part of school bus drivers, from our conviction that the program is sound, from the impetus that it gives toward improvement, we are grateful. We are most appreciative of the support of the Farm Bureau Mutual Insurance Company of Indiana, without whose financial backing the program would not be at all possible; but more than this, we appreciate the unselfish cooperation of the Farm Bureau Safety Engineering Department and the program it helps us conduct.

While the National School Bus Program may not be the total answer to safety problems involved in transporting school children, such a program is an excellent cornerstone on which to build.

WHAT IT MEANS TO A STATE MOTOR VEHICLE DEPARTMENT

by WALLACE N. HYDE

chief, Records & Driver Improvement Section, Dept. of Motor Vehicles, Raleigh, N. C.

In discussing this topic, I think that it is appropriate that I should first explain the Department of Motor Vehicles' responsibility to pupil transportation in North Carolina. In addition to the usual responsibility of certifying school bus drivers, we also have the major portion of the responsibility of training drivers. Inasmuch as approximately 90 per cent of the 8,000 school bus drivers in North Carolina are student drivers, the training of drivers represents a tremendous job.

To carry out this responsibility on the level that the importance of the job demands, the Department has employed 35 teachers on a full-time basis who spend approximately 80 per cent of their total time training school bus drivers.

To answer the question "What the National School Bus Program Means to the

Department of Motor Vehicles?" I would like to discuss it in three separate phases. There are three major areas in a sound accident prevention program; namely, selection, training, and supervision of drivers.

ARE MORE SELECTIVE

In respect to selection of drivers, I would say that the Accident Prevention Service of the National Safety Council offered a splendid opportunity for us to be more selective in picking drivers for our school buses. It has become increasingly more difficult for us to encourage the better qualified students in our public schools to become applicants for a school bus driver's position. This has resulted, primarily, from the inadequate pay scale in our state.

The state salary scale for school bus drivers is now $25.50 per month, and in the heavily populated areas of North Carolina, it is not difficult for an energetic high school student to find after-school employment that will earn him a salary superior to the monthly school bus driver's salary on a weekly basis.

Inasmuch as the award presented by the National Safety Council represents achievement and is internationally recognized, we believe that it will stimulate interest in some of our better qualified students to become school bus drivers. Moreover, we believe that it will add sufficient dignity and prestige to the position to attract many girl applicants who are not otherwise interested in becoming a school bus driver.

HELP FROM IN-SERVICE TRAINING

In terms of driver training, we have found that materials provided by this program will contribute a great deal to our training program. This is particularly true of in-service training. The news letters and pamphlets distributed monthly to each driver can be used to a great advantage for monthly driver meetings.

However, this program can make its greatest contribution in the area of supervision. We all know that many accidents would not have happened if the supervisor or the person who trained the driver had been present on the bus at the time the accident occurred. Since it is neither practical nor possible to provide this type of supervision, some stimulus is needed to encourage the driver to remain alert at all times while operating his vehicle. The fact that the driver recognizes that he must maintain an accident-free record to be eligible for an award will help keep the driver's attention focused on his driving.

During the 1956-57 school term, 35 counties in North Carolina purchased a membership to the National Safety Council Accident Prevention Service. Primarily, because of my interest in this program, I have observed closely conditions pertaining to school bus operation in these counties during the past year.

NEEDS PROPER ADMINISTRATION

The results have been what you could have expected—in the counties where the program was properly administered and emphasized—there has been a definite improvement in the overall efficiency and safety of the operation. In counties where the program was given little attention and no special emphasis, there was little or no appreciable change in the operation of the pupil transportation system. This program, like all other accident prevention program, will not produce results unless it is given the proper administrative attention.

We believe that this program, from the standpoint of cost, represents the best buy that we know of in this field. In fact, many of the counties in North Carolina are paying more for pins that do not compare in quality to the pins provided by this service, than the entire Accident Prevention Service costs.

Most significent of all—these awards do not offer the prestige and international recognition that is associated with the award provided by the Accident Prevention Service of the National Safety Council.▲

NEW HIGHER EDUCATION SECTION

By official action of the School and College Conference on October 20, 1957, and by the Board of Directors of the National Safety Council on October 21, 1957 a Higher Education section was created within the framework of the conference as a means of expanding the Council's activities in safety education and accident prevention in all colleges and universities of the country.

Activities at the level of higher education are not new to the School and College division in view of the Campus Safety committee which has been devoting its attention to practical problems of safety in and about the college community for a number of years. This committee was activated as a formal part of the Council structure in 1956, the forerunner of a section.

The new Higher Education section in addition to the Campus Safety committee will also include committees on research, and higher education. The Research Group will devote its attention to the promotion of educational research in the field of safety in colleges, and to the preparation and release of materials to indicate research which has been done in the past, is needed, and suggested techniques of conducting research studies.

The Higher Education committee will be concerned with curricula and course construction in safety, as well as the integration of safety in other courses of instruction at all levels of education and suggestions for teaching methods.

The new structure of higher education reactivates the Higher Education committee which was placed on inactive status in 1952, due to curtailment of programs, but also expands activities in view of the heightened interest and participation at the university level. John W. Hill, director of personnel insurance and safety for the Texas A. & M. College system, College Station, Tex. has been one of the active proponents of expanded activity at the higher level of education, and was instrumental in the creation of the new Section in which he serves as interim chairman.

Clayton W. DeMent, safety engineer for Purdue University is chairman of the Campus Safety committee, while Dr. Herbert J. Stack, program associate of the Center for Safety Education, New York University, New York, heads the Research Committee.

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TRAFFIC SAFETY

Transactions of the

45th National Safety Congress

(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE TRAFFIC SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Traffic Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Traffic Section carries on in behalf of its members, and for the benefit of accident prevention work in public safety generally. The Section gives guidance in the preparation of a great variety of technical and educational material useful in day-to-day safety.

The activities of the section are under the direction of its executive committee, the members of which are listed in the close of this volume.

A CONGRESSMAN LOOKS AT TRAFFIC SAFETY

by HON. KENNETH A. ROBERTS

member, U. S. House of Representatives, Washington, D. C.;
member, Committee on Interstate & Foreign Commerce;
chairman, Special Subcommittee on Traffic Safety

The United States Congress is concerned with all problems confronting the nation and its citizens. Certainly the horrendous number of traffic accidents, injuries, fatalities, and property losses clearly places highway safety in the national picture. Automobiles have long since ceased being an article employed solely for Sunday afternoon amusement. They have become essential to the operation of daily life Americana.

Today, many automobiles traverse several state boundaries each day. Thus, the driving habits of the citizens of one state are important to the drivers of other states. In today's living, such widely traveling vehicles are a matter of *inter*state concern and not just *intra*state.

I have a very good example of this type of interstate travel. In correspondence the Subcommittee on Traffic Safety had with the New Mexico State Police, there was enclosed a description of a three-car accident which left in its wake five dead and two critically injured. The accident occurred at 3:13 p.m. on U. S. Highway 66 just 19½ miles west of Gallup, N. M.

The three drivers of the cars were all legal residents of California as were all the remaining eight passengers involved in the accident. This graphically illustrates that the accidents throughout the 48 states and the drivers of each state are of concern to the entire nation and not just to their own states.

NATION'S LOSS ALSO

Epidemiologists term the annual slaughter upon the bloody altar of the U. S. highways as epidemic and a national health problem. I am also sure that I need not point out that in addition to the great personal loss suffered by the families of the 40,000 killed on the highway each year, there is a loss suffered by the nation—a loss of talent and potential future earned income.

This will give you just a thumbnail sketch of why your Congress is interested and is concerned about the nation's highway safety so much so that this problem is now being investigated by a special subcommittee, of which I am chairman.

The Special Subcommittee on Traffic Safety was first appointed in June 1956 after the House of Representatives adopted a resolution to provide that a Congressional committee investigate the causes of automobile accidents to determine what action could be taken to reduce such waste of human lives and property.

The subcommittee held its first hearings in July 1956 and when Congress adjourned, the subcommittee took to the road to learn what was being done in different local areas to halt one of the nation's leading killers—the automobile on the highway. The subcommittee also made an inspection of the facilities of American Motors, General Motors, the Chrysler Corp. and the Ford Motor Co.

SUBCOMMITTEE CAN AID

Because of the tremendous scope of the study, the subcommittee was appointed again in the present 85th Congress and is continuing its investigation. In terms of age, the subcommittee is a fledgling compared to the organizations which have been doing excellent work in the field of traffic safety for many, many years. While at this time it is not anticipated that the subcommittee will undertake any original research, I do believe that the subcommittee can serve a valuable function in the field of safety.

The subcommittee is a body vested solely with the public interest. The function which the subcommittee can perform, and which I think is highly valuable, is that of bringing together in one place, before an impartial forum, all the work and research done in the many areas of traffic safety.

This past session of Congress, we had a good example of this function of the subcommittee in the hearings which the subcommittee held to determine the crashworthiness of [redacted] were held [redacted] of the [redacted]

[redacted] subcommittee [redacted] sideration [redacted] ented at the hearing, also filed a report which contained its own opinion on this safety device. In its report, the subcommittee stated its conclusion "favoring the installation and use of this safety device." This is an example where the subcommittee, I believe, has performed a valuable service though immediate legislation was not its purpose.

I would like to state, however, that I have personally sponsored a bill in the House which would provide that any automobile seat belts shipped in interstate commerce meet certain specifications established by the Bureau of Standards, so that when the public does buy a seat belt it is assured of purchasing one which will truly provide safety. It is my hope that the subcommittee will have an opportunity to give careful study to this legislative proposal in the next session of Congress.

Another legislative proposal I hope will become law in the next session of Congress is the bill to provide Federal funds to assist the individual states in establishing driver education courses. The subcommittee held hearings on this bill in the last session, but a shortage of time prevented the subcommittee from taking any further action.

In my opinion, the inclusion of driver education in the school curriculum can be of considerable value in teaching future drivers good habits and good manners as well as developing their mechanical skill in handling today's powerful machines. This training would naturally contribute to greater highway safety. As one witness testified, we do not challenge the value of driver education without also challenging the value of education itself.

I would also like to point out that several studies made of young people who had had driver training indicated a substantial reduction in accidents and traffic violations. Realizing this fact, some insurance companies now do not raise the rates in families having young persons driving the family car, during the young persons have had driver training. Several states by law also now require that young persons seeking driver licenses must take a driver education course first.

Due to the fact that some states can not afford to establish such education courses, and because I believe that such education will be of great value in increasing safety on the Nation's highways, I expect to work hard in the next session of Congress to have this legislation adopted.

PROMOTES STATE COMPACTS

Another bill which is pending before the Special Subcommittee on Traffic Safety and which I think would be valuable to safety if enacted, is House Joint Resolution 221, sponsored by my able colleague and member of the subcommittee, Congressman John V. Beamer of Indiana. The purpose of the bill, sponsored by Congressman Beamer, is to grant the consent of Congress to the several states to negotiate and enter into compacts for the purpose of promoting highway traffic safety.

In supporting his bill, Congressman Beamer told the subcommittee: ". . . It is essential that the laws regulating traffic safety be brought up to date. It is of equal importance that there be some method of making these laws more standard among the many states in order that people traveling distances will have a better understanding of the laws and rules governing the flow of traffic."

The enactment of Mr. Beamer's resolution would grant the consent of Congress to the several states to join in the formulation of a body that would have authority to legally prepare and promulgate legislation and regulations, if needed, to meet the serious problem of such losses in human life and property now occurring on the nation's highways.

Through such an interstate [redacted] states could act jointly and [redacted] solve a considerable portion [redacted] problem and would not [redacted] state sovereignty or [redacted] or jeopardized. The [redacted] interstate compact is [redacted] was established by the [redacted] pact and the Interstate [redacted] Prevention, both of [redacted] successfully.

Considerable interest [redacted] Beamer's proposal has [redacted] number of the states' [redacted] hope that the subcommittee [redacted] study and consideration to [redacted] and act on this bill in the [redacted] Congress.

LABEL AUTO FITNESS

Congressman Abraham Multer of [redacted] York has introduced legislation known as the "General Motor Vehicle Act of 1957," which is now pending before the Traffic Safety Subcommittee. One section of this bill provides that automobiles shall bear a Certificate of Fitness label. The label would insure that the vehicle had been inspected and found in good working order and in complete accord with all specifications as set forth in descriptive and advertising matter, as well as that the vehicle had been road-tested and found in good operating condition after such a test. It is my hope that this bill, also, will have the further study of the subcommittee in the next session of Congress.

In addition to these bills, in the next [redacted] the subcommittee [redacted] investigation and work, [redacted] problems of traffic [redacted] the human [redacted] enforce- [redacted] ing to [redacted] of [redacted] ver [redacted] o. [redacted] c- [redacted] ile. [redacted] inue [redacted] coming [redacted] Subcom- [redacted] sonal hope [redacted] included vol- [redacted] manufacturers in [redacted] that they are essential to the [redacted] health, but that if such action were not taken voluntarily, I would urge Congress to enact the necessary legislation.

The sole purpose of the Subcommittee on Traffic Safety is to work for greater traffic safety. It is our sincere desire to join efforts with established safety groups in making greater traffic safety a reality for all persons wherever they may live or travel.

This past session of Congress, we had a good example of this function of the subcommittee in the hearings which the subcommittee held to determine the crashworthiness of seat belts. These hearings were held as it came to the attention of the subcommittee that many conflicting reports had been carried in the press and much confusion existed in the public's mind regarding the true value of seat belts.

The subcommittee sat as an impartial forum and invited testimony from persons, both proponents and opponents, who had done work relating to this safety device. Also, any persons who requested the privilege of testifying on this matter before the sub-committee were heard. The witnesses included researchers, medical experts, government officials, and representatives from each of the five leading American automobile manufacturers.

FAVORS SEAT BELTS

The complete text of these hearings soon should be available, free of charge, to the public, so that anyone who wishes to read the data exactly as it was presented to the subcommittee may do so and may form his own opinion on the value of seat belts. The subcommittee, after careful study and consideration of all the testimony presented at the hearing, also filed a report which contained its own opinion on this safety device. In its report, the subcommittee stated its conclusion "favoring the installation and use of this safety device." This is an example where the subcommittee, I believe, has performed a valuable service though immediate legislation was not its purpose.

I would like to state, however, that I have personally sponsored a bill in the House which would provide that any automobile seat belts shipped in interstate commerce meet certain specifications established by the Bureau of Standards, so that when the public does buy a seat belt it is assured of purchasing one which will truly provide safety. It is my hope that the subcommittee will have an opportunity to give careful study to this legislative proposal in the next session of Congress.

Another legislative proposal I hope will become law in the next session of Congress is the bill to provide Federal funds to assist the individual states in establishing driver education courses. The subcommittee held hearings on this bill in the last session, but a shortage of time prevented the subcommittee from taking any further action.

In my opinion, the inclusion of driver education in the school curriculum can be of considerable value in teaching future drivers good habits and good manners as well as developing their mechanical skill in handling today's powerful machines. This training would naturally contribute to greater highway safety. As one witness testified, we can not challenge the value of driver education without also challenging the value of education itself.

I would also like to point out that several studies made of young people who had had driver training indicated a substantial reduction in accidents and traffic violations. Recognizing this fact, some insurance companies now do not raise the rates in families with young persons driving the family car, providing the young persons have had driver training. Several states by law also now require that young persons seeking driver licenses must take a driver education course first.

Due to the fact that some states can not afford to establish such education courses, and because I believe that such education will be of great value in increasing safety on the Nation's highways, I expect to work hard in the next session of Congress to have this legislation adopted.

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In supporting his bill, Congressman Beamer told the subcommittee: ". . . It is essential that the laws regulating traffic safety be brought up to date. It is of equal importance that there be some method of making these laws more standard among the many states in order that people traveling distances will have a better understanding of the laws and rules governing the flow of traffic."

The enactment of Mr. Beamer's resolution would grant the consent of Congress to the several states to join in the formulation of a body that would have authority to legally prepare and promulgate legislation and regulations, if needed, to meet the serious problem of such losses in human life and property now occurring on the nation's highways.

Through such an interstate compact, the states could act jointly and cooperatively to solve a considerable portion of the highway problem and would not have any of their state sovereignty or state's rights usurped or jeopardized. The idea for such an interstate compact is not new. Precedent was established by the Interstate Oil Compact and the Interstate Compact for Crime Prevention, both of which have worked successfully.

Considerable interest in Congressman Beamer's proposal has been expressed by a number of the states' governors. It is my hope that the subcommittee will give serious study and consideration to H. J. Res. 221 and act on this bill in the next session of Congress.

LABEL AUTO FITNESS

Congressman Abraham Multer of New York has introduced legislation known as the "General Motor Vehicle Act of 1957," which is now pending before the Traffic Safety Subcommittee. One section of this bill provides that automobiles shall bear a Certificate of Fitness label. The label would insure that the vehicle had been inspected and found in good working order and in complete accord with all specifications as set forth in descriptive and advertising matter, as well as that the vehicle had been road-tested and found in good operating condition after such a test. It is my hope that this bill, also, will have the further study of the subcommittee in the next session of Congress.

In addition to these bills, in the next session of Congress the subcommittee expects to continue its investigation and work, and will study specific problems of traffic safety in the general areas of the human factor in accidents, vehicle design, enforcement, and legislation.

Studies of human factors contributing to traffic accidents will include the effect of alcohol on safe driving, the licensing of drivers and further consideration of driver training.

Vehicle design, safety research and medical research projects will be gone into also. I was very pleased to note in a recent magazine article that the Cornell accident injury research statistics do show a reduction in injuries due to improved design in certain safety features of the automobile. This is encouraging news to your subcommittee and I hope that time will continue to show greater progress in this area.

I have frequently stated, since becoming Chairman of the Traffic Safety Subcommittee, that it was my deep personal hope that safety features would be included voluntarily by automobile manufacturers in their cars as I feel that they are essential to the public's health, but that if such action were not taken voluntarily, I would urge Congress to enact the necessary legislation.

The sole purpose of the Subcommittee on Traffic Safety is to work for greater traffic safety. It is our sincere desire to join efforts with established safety groups in making greater traffic safety a reality for all persons wherever they may live or travel.

REPORT ON PLANS FOR

1957 PUBLIC OFFICIALS TRAFFIC SAFETY CONFERENCE

by BURTON W. MARSH

chairman, Planning Committee for the 1957 & 1958 Conferences, President's Committee for Traffic Safety

"Time for Decision" indicates that by 1966 traffic will have increased by almost one half and if accident rates continue unchanged—54,000 will be killed in traffic crashes and 1,900,000 will be injured per year.

"Highway traffic and traffic fatalities in 1975" by S. T. Hitchcock, chief, Div. of Highway Transport Research, Bureau Roads, analyzes various growth factors and trends and comes up with a projection of 51,000 fatalities. But this statement ALSO recognizes that "T'AINT NECESSARILY SO" (apologies to the writers of "Porgy and Bess"), if certain things are done, then a better fatality record will result.

It's going to take a lot of doin' but if we and others do what we're capable of doing, not only can the fatality rate continue to reduce but the 1966 fatality toll can be less than it is today—substantially less! I'd say ⅓ less; one whom I greatly admire says ½ less!!! And at the same time, traffic can and will be more orderly and flow can be expedited.

But against the anticipated continuing rapid growth of traffic and an at-best too slow "catch up" program of highway improvement (despite the great expanded program now getting up full steam) reducing traffic injuries and fatalities will be a big, challenging job. It's up to us to get on the job.

NEW KNOWLEDGE WANTED

There is much that we don't know but need to know about doing this job. That's one reason we have high regard for the potential of the Robert's Committee work—and why we enthuse over the Bureau of Public Roads Highway Safety Study (under capable Charles W. Prisk.) as called for in Sec. 117 of the Federal Aid Highway Act of 1956. That's why we are encouraged to learn of plans for a group of highly intelligent specialists in non-traffic fields who are going to take a fresh new look at this overall problem in an intensive one-week "brainstorming" idea discussion get-together. Yes, these and numerous other new analyses, new researches, new approaches and experiments are fine—and much benefit will be derived!

PRESIDENT'S COMMITTEE DECISION

Yet we already know enough about what many of the main measures are which need to be taken. The President's Committee for Traffic Safety's action program contains excellent program proposals.

Our great need now is not in the what-to-do line but in two other "areas":

1. Which to do next.
2. How to get sound needed known measures effectively applied.

WHICH? I say which next advisedly, because one of our troubles is that there are so many needs that a priority schedule is called for.

HOW? I would also emphasize the point that we must give great attention to how to get sound measures into continuing effect. We would do well to stop quibbling about details and technicalities (except in our professional inner councils) and get into high gear on how to get results.

These or somewhat similar views impressed the President's Committee for Traffic Safety (of which Harlowe Curtice, president, General Motors Corp. is chairman) and the executive committee of its advisory council (under the vigorous leadership of Joe Mattson, President, Automotive Safety Foundation) who it should be stated is enthusiastically backed by advisory council chairman, William Randolph Hearst. Indeed so impressed were these leaders and the other key National leaders associated with them in the President's committee and its advisory council that they set up a special committee to plan actions which would help on the which and the how problems.

First, they decided, the various national organizations of public officials should be called upon to give important information and answers. Then, based on what the public officials proposed, civic leadership should be mobilized to get most needed jobs done.

By what mechanism could these objectives, involving on the one hand, public officials, and on the other, civic leaders be best advanced, considering limitations of staff, time, and funds, and the need for country-wide coverage? The planning committee proposed a program which would be tied into and lighted by:

1. A public officials traffic safety conference in December 1957, and
2. Four regional traffic safety conferences for civic leaders in the spring of 1958.

The President's Committee approved the proposal.

Let me hasten to state (without disparaging conferences) that the conceived program goes far beyond the holding of the indicated five conferences. Preparatory and follow-up work such as has never been done before constitutes one of the reasons why I am convinced that uniquely favorable results will be achieved in this program.

It's not only the fact that much new work of preparation and follow-up is being and will be done, which enthuses me, but it's also the caliber of the persons involved and to be involved!

THE TOP COMMAND

I have already mentioned these national figures: Harlowe Curtice, Bill Hearst, Joe Mattson. Let me now go to the top and tell you that the President personally will participate, as will his aide, former Governor Howard Pyle. While we shall miss Admiral Min Miller, long conference director, there will be key leaders as directors or chairmen of all five conferences. Bill Bethea has been advanced and is now executive secretary of the President's committee (and its advisory council). Bill will give great staff leadership.

PUBLIC OFFICIALS CONFERENCE PLANNING

Let, me tell you a bit about the program tied into the Public Officials Conference in Washington D. C. on December 9 and 10, 1957.

First, all planning work is and has from the start been under the direction of representatives of organizations of public officials. Charles Schwan of the Council of State Governments, is chairman of that planning committee. Vice chairmen are representatives of county and municipal officials—Keith Seegmiller, National Association of County Officials and Wilber E. Smith, American Municipal Association. Other committee members are representatives of police, educators, motor vehicle administrators, highway and traffic engineers, judges, etc. As consultants, they have Tom Boate, Norman Damon and Bill Johnson. John Gibbons, of ASF is chairman of their publicity committee and Sonty Sontheimer of ATA and Bill Simon of NHUC are co-chairmen of a committee on arrangements.

PREPARATION OF REPORTS

That this is not going to be just another conference will I think be clear when the preparatory steps are understood.

More than 30 national organizations of public officials and in addition a group representing federal government agencies have been invited to participate actively in unique preparatory measures. All are invited to prepare (or cooperate in preparing) a report covering four matters which are to constitute the purpose of the 1957 Officials Conference. These are:

1. To assess the status of traffic accident prevention in relation to recommendations of the Action Program.
2. To establish (or identify) immediate and long-range needs to control traffic accidents.
3. To recommend practices for these needs.
4. To indicate those for which public support is particularly needed.

"Fact Sheets" have been sent out to organizations of officials providing main needed information—and material has also been sent as to the type of report and style desired. Thus, each group is asked, of course, to deal primarily with its own primary area of interest and responsibility.

However, each group is also invited to present any comments and proposals it wishes, on any aspect of traffic safety. In particular, each group is requested to present views and proposals on accident records, public information and research which subjects apply to all groups and aspects of the traffic safety field.

Various groups will report under most subject headings. Take engineering as an example. The following organizations have been invited to submit reports: American Association of State Highway Officials; Institute of Traffic Engineers; Highway Research Board; American Bridge, Tunnel and Turnpike Assn.; American Public Works Association; American Society of Planning Officials.

Attendance at the December 9-10 Officials Conference will be exclusively by invitation —and exclusively officials (with exception of a few staffing aides who will take no part in the decisive action or voting). Each organization of officials will nominate up to 20 representatives—and if the organization contains officials and non-officials, only those who are public officials will be eligible. Thus this is to be an exclusively public officials conference.

CONFERENCE WORKSHOPS

At the conference the groups will quickly break up into subject workshops at which will be hammered out decisions as to major findings, proposals, priorities etc. to submit to the final general session.

To aid conference participants in doing this important highlighting job in the time available, copies of the reports will be sent out in advance.

It should be understood that the plan is to have, for example, enforcement persons in each workshop—so that all groups of specialists will know what the others are deciding and will have an opportunity to make amendments, suggestions, alternate proposals, etc.

The plan is that in the final session, decisions will be reached as to major points—these to be assembled promptly as a highlights report. However, additional matters which are approved in workshops, will not be lost but will be included in summarized materials which will be prepared after the conference.

It was realized by the planning committee that a few matters should be covered in the Public Officials Conference, which are not within the scope of public officials' duties—such as safety engineering of the motor vehicle, safety education in non-public schools, and organized public support.

Steps are being taken to have these matters treated so that reports concerning them can be brought before the Official's Conference.

BASIS FOR REGION CONFERENCES

What then will be done with the material resulting from the Officials' Conference? Many follow-up procedures will be employed. The reports will be widely disseminated. Many national oragnizations will want to study them. Newspapers, magazines and other public information media will use them. Legislators will be greatly interested.

And of course, these materials will constitute the main bases for the programs of the four regional conferences of civic leaders in the spring of 1958. It is of course planned to get at least summaries from the Officials' Conference into the hands of the civic leaders invited to participate in regional conferences, sufficiently in advance so that their contents may be known, and their impact and implications realized.

But even more important, it is planned that prior to the regional conferences each state will determine its own top priority needs (adapting or modifying the overall proposals) from the Officials' Conference, and that those materials will also be placed, well in advance of the regional conference in the hands of invitees.

While work is under way for the 1957 Officials' Conference, I want you to know that advance planning has long been in progress for the 1958 regional conferences.

Again, permit me to stress the high quality of the planning leadership and of the teamwork involving all the major national organizations active in traffic safety. Indeed, as an aside, I regard this spirit of teamwork and of mutual understanding and respect, as one of the highly valuable by-products of this undertaking.

Here is the planning talent:

Program Committee: Norman Damon, V. P. of ASF, Chairman; Dick Bennett, NAA MIC, Vice Chairman

Program Presentation Committee (on methods of effective programing—to sell civic leaders): Bill Johnson, NSC

Arrangements Committee: (Hotel meeting rooms, etc.) Co-Chairmen Sonty Sontheimer, ATA; Bill Simon, NHUC

Attendance Committee: M. R. ("Bud") Darlington, I-IHSC

Publicity Committee: Harry Martin, American Red Cross

Finance Committee: Vestal Lemmon, N. Assn. Independent Insurers.; Tom Boate, ACSC,; Ray Ashworth, IACP,; Charles Schwan, CSG, also member of Exec. Committee

WHEN and WHERE

The regional conferences are scheduled as follows:

Chicago, Ill.—April 1-2, 1958

San Francisco, Calif.—April 8-9, 1958

Atlantic City, N. J.—April 15-16, 1958

(Perhaps needs reconsideration—conflict)

Miami Beach, Fla.— May 29-30, 1958

The purpose of these conferences is broadly the stimulation or motivation of effective public support for sound, top-priority traffic safety measures—based on findings and proposals of the Officials' Conference. The need for effective organization and administration will be stressed—and there will be discussion of how to go about these jobs back home.

TOP CIVIC LEADERS WANTED

Great emphasis will be given to measures to get top civic leaders to participate in the regional conferences. It is hoped to have a field representative of one of the majorly interested national organizations assigned to each state to work with one key civic leader (or a few) selected by President's Committee for Traffic Safety in developing the invitation list and then in taking suitable steps to get definite acceptances.

Let me emphasize that these are to be invitation affairs—and that the objective is not huge numbers, but selected quality. About 1,000 at each conference is the objective—and with about 12 states per conference, that's an average of less than 100 per state.

Also, let's remember that these are conferences especially tailored for civic leaders who are so greatly needed to take really active parts in state and local traffic safety programs. These are not conferences where traffic safety folk should talk to themselves. Nor are they conferences which should be too loaded with public officials.

Of course a limited number of chosen representatives of public official groups will be on hand to present the top priority needs of their respective states. Such state priority listings will be requested from governors early in 1958. These state priorities will thus be important companions to the overall nationwide appraisals.

The few traffic safety professionals invited will be for staffing purposes.

FORMAT OF REGIONAL CONFERENCES

How will these regional conferences be programmed? Here's the pattern:

a. Opening breakfast and opening session—to be called perhaps the President's breakfast.

b. Break-up to separate meetings by groups—agriculture, business and professional, labor, media, civic and fraternal, military, religious, women, public officials, organizations.

c. Meet by state groupings morning of second day.

d. Concluding general luncheon session.

These regional conferences cost plenty—and in addition to the federal government share, there are about 15 National organizations which are joining together in financing them.

The planning committee is determined that these conferences shall pay off in results. Consequently, the most careful and by far the best preparatory work ever done is being carried out for these conferences. The advice of top experts in how to get best results in such meetings, is being obtained, Weiss Kulp of Kudner Agency, N. W. Ayer.

Appropriate advance materials will go to invitees. At the conference, the best presentation methods will be used in carefully planned, fast-moving, highly summarized manner.

Delegates will have "take home" materials —check-lists, graphic charts, etc. They will be impressed with needs and with practical action steps they can take, without unduly loading themselves up.

Well, now, there you have it, except for one point. Can you help? Yes, you can—and your help is wanted. Here are some things you can do:

- Study the reports which come from the Public Officials' Conference. Counsel *with your own officials about the findings* and proposals. Then, still cooperating with your officials, develop some specific action steps which you and your organization can take. Then go to work.
- Counsel with others active in traffic safety in your state or local community. Agree among yourselves who the few top civic leaders are who would be likely to be willing to devote their personal time and attention to a greatly improved traffic safety program. Write out who these few leaders are, what their past performance has been, and why your group believes they are the ones to lead in traffic safety.

  Send such information to J. W. Bethea, Executive Secretary, President's Committee for Traffic Safety, Washington, D. C. Do not approach or contact the civic leaders. Send your suggestions in time so they can be studied and compared with others—to the end that the best possible civic leaders will be invited to attend the regional conferences.
- Promote the regional conferences for what they are—not general open-to-all meetings, but highly selective, specialized conferences with very specific objectives.
- After the regional conferences, offer your help to the delegates from your state or local community.

THE HIGHWAY SAFETY PROGRAM OF THE GOVERNOR'S CONFERENCE

by FRANK SMOTHERS

director of publications, The Council of State Governments, Chicago

In government and politics there are few subjects so sacrosanct that they are above controversy. I might even go so far as to say that if we didn't have controversy we wouldn't need government. When everyone agrees, we don't need a law, we don't need a referee, and we probably don't need enforcement.

Some may say, when they first think about it, that safety, including safety on the highways, surely is a safe and uncontroversial subject—for government, governors, legislators and everyone else. And in the abstract they will be right. We are all for safety. It's like the sanctity of the home, the dignity of motherhood and the glory of the flag.

But as a matter of fact quite a few battles have been fought, in legislative halls and elsewhere, as you'll recall, when someone has proposed doing something specific even for those things—about the conditions of homes, for example, or the things mothers need to be dignified, or the measures required to defend the flag. It is the same with traffic safety. When you get down to specifics it is full of controversy.

For it isn't uncontroversial to send people to jail. It isn't often agreeable to take away their licenses. You don't change the courts without an argument. And you can get a big debate on your hands when you propose to limit speed, or even to control access to the public ways.

THE CONFERENCE

So, ever since the governors and the Governors' Conference began to come to grips with what they recognized as a crisis of mass carnage on the roads, there have been some fights in this area. There probably will be more. But there is no program on which our governors are more united in their determination to get results than they are on their highway safety program. What is more to the point, they are getting results.

The turning point in highway safety action by the Governors' Conference came in 1956. Year after year the governors had recognized the growing problem. They had exchanged views and experience about it and had adopted resolutions calling for state action that bore good fruit. As early as 1949, at the direction of the Governors' Conference, the Council of State Governments undertook a study of the subject, and the following year published an extensive report. Its recommendations were reflected in many helpful legislative and administrative acts thereafter.

But, meantime, the problem took on new dimensions—the vast increase in the number of cars on the road, the vast increase in miles driven on a network of highways that hadn't kept pace with needs. By 1956 the governors knew that the situation amounted to a national emergency. At their conference that year they decided that it called for entirely unprecedented measures.

In that 1956 meeting, held at Atlantic City, several things stood out:

1. The discussion was comprehensive as regards facets of the problem examined. The governors pointed up not just a few but a long series of factors. They dealt with licensing, vehicle inspection, driver education; with engineering, limited access, road surfaces; with the uniform vehicle code and reciprocal arrangements. They discussed the effects of speed—of fatigue—of drunken driving. They looked at "the horsepower war" among automobile manufacturers—concerning the effects of which there was some disagreement, and at competitive advertising that emphasizes speed—concerning the ill effects of which there was no disagreement. They pointed up the role of the courts. And they put heavy emphasis on enforcement.

BALANCED PLAN NEEDED

2. Out of that discussion came a consensus that a balanced program was needed. No one, two or three approaches among those discussed would do the job. The causes of accidents were complex. A broad program had to be developed to deal with it, when developed it had to have public support, and the features requiring enforcement had to be enforced.

3. The discussion, the spirit in which it was conducted, the wide participation and intense attention of the governors in it, all testified to a determination on their part to give leadership. One of the governors, summarizing his view of the session, said he had been coming to the meetings of the Governors' Conference for six years, and "this," he said, "has been the most practical and informative session that I have attended." He spoke, certainly, for a great many there.

As a result, the governors decided that they needed a special Highway Safety committee, and they created it there at Atlantic City—a committee that would set to work immediately to study and draw up specific recommendations; a committee, we can now report, that has led the way to the widest and most promising state action—by legislatures and by administrators—that the country has ever had in one year for highway safety. And the work continues.

THE PROGRAM

The committee was—and is—a strong one, under its Chairman Governor Ribicoff of Connecticut. He had led an exceptionally effective traffic safety program in his own state, and he has given the work of the committee unstinting time and energy. Working with him as committee members are eight other governors, representative of all sections of the nation.

The committee set to work rapidly and intensively in the summer of last year—rapidly and intensively because it knew that early results were essential, that many of *these results would require legislation*, and that if the committee was to give effective leads to the legislatures in the big legislative year of 1957, it would need to have its report in all the state capitals well in advance of those sessions, most of which began in January.

Furthermore, although the committee recognized that much remained to be learned about the ingredients of traffic safety, a great deal was known right then. Continued study had to be pursued. But, meantime, leadership and action were required at once. The people who might die on the highways in 1957 couldn't be saved by research addressed to 1960.

And so, using the staff services of the Council of State Governments for fact find-

ing and assembling, and taking the counsel of organizations long qualified in the traffic field—prominently including the National Safety Council—the Governors' Conference committee held a succession of meetings, weighed the relevant proposals, and reported in November, 1956. Its report—a tersely written brochure—went to every governor and, through the governor, to every legislature in the country. It presented a series of specific proposals. Many of you have examined the report, and I shall not go over the whole program here. But I shall emphasize some guide lines.

TWO COURSES OF ACTION

The report presented, in fact, two sets of recommendations—one for immediate action, the other a long-range program. The committee recognized that they overlapped, that many of the recommendations labeled "immediate action" had long-range aspects, and that some of the "long-range" proposals could be put under way very promptly in some states. Nevertheless the distinction was in general a valid one.

The program for "immediate action" had several types of proposals—all of them addressed to every state in the Union.

Certain recommendations dealt with machinery to coordinate traffic safety programs at the state level, under the governors' leadership, and involving the action of other state executives and legislatures. Proposed also were annual conferences of judges, prosecutors and police concerned with traffic cases.

Heavy emphasis went to means for improved enforcement. These included enlargement of highway patrols, use of modern devices such as chemical tests for alcohol and radar for speed, better investigation of accidents, use by the state police of the uniform no-fix traffic ticket, suitable minimum fines and penalties for all serious violations, review of license suspension and revocation procedures, and interstate exchange of information so that action could be taken in one state as to drivers who violate traffic laws in other states.

Closely allied with enforcement were recommendations to improve state records of accidents and violations. And the need for better organization, qualifications and procedures in traffic courts received attention.

Drivers' licensing procedures, the committee underlined, should meet or exceed the revised 1957 standards of the American Association of Motor Vehicle Administrators.

Recommendations were set forth both for development of sound driver education courses in the high schools and a driver improvement program for those whose need for special attention is indicated by accident records.

A broad program of uniform legislation was proposed—on rules of the road and vehicle equipment, in line with the Uniform Vehicle Code, and so was legislation to enable cities to adopt a uniform traffic ordinance by reference.

The committee suggested means of obtaining informed and effective public support. And finally it proposed that the states "provide the funds necessary to implement all the elements of a balanced program."

Such, in general, was the "immedate action" program, summarized in eighteen recommendations and spelled out in the text. The long-range program—similarly summarized, and similarly spelled out—proposed among other objectives that each state:

—thoroughly study its highway patrol—its organization, selection, training and operation

—strengthen the staffs of highway and traffic engineers

—establish a vehicle inspection program as soon as the other elements of a balanced program had been developed

—insure that the state department of education—and colleges that train teachers—improve the safety education program

—see that the organization and personnel of all agencies responsible for traffic safety are adequate to the task

—determine what further contributions the state can make to promote research on the causes and prevention of highway accidents.

THE RESULTS

And the results? Well, I think that an examination of them would be instructive to a gentleman who talked with us the other day. The gentleman represented, shall I say, the man in the street. He came into the office to fix some telephones. He had a little time on his hands while waiting for the janitor, so we asked him if he would like something to read. Specifically, we offered him something on taxes, explaining that we had much literature on this subject, and it might interest him since his bill would be paid out of taxes. That reminded him of something.

"Just what," he asked, "does this organization do?"

"We try," I replied, "to help make government better."

"Well, our man in the street commented, "you don't seem to be having much success."

We in government don't resent that sort of thing. We expect it. People are always hard on government—partly, I'm sure, because it belongs to them, partly because they all pay for it, and partly because they depend on it for so many things. But I don't think our man in the street gave a completely balanced verdict. I'm sure that if he weighed what has happened as a result of the Governors' Conference lead for highway safety he would think better of government.

Here are a few facts:

By the middle of 1957—with a number of legislatures still to report—the Highway Safety committee was able to report to the Governors' Conference that 15 states had increased the size of their highway patrols, one had established a program to permit automatic increases in its patrol to keep pace with rising vehicle registrations, another had adopted a requirement that all highway patrolmen and licensing examiners take intensive college-level driver education courses.

NEW LICENSING LAWS

Among numerous other acts affecting enforcement, six legislatures had enacted or revised laws on chemical tests for intoxication. Several states had authorized use of radar and admission of radar evidence in court, and a number had increased their penalties for serious traffic offenses, especially drunken driving. Use of uniform traffic tickets and uniform accident report forms likewise increased.

In the area of licensing, two states had passed the country's first law providing for provisional licensing. One had adopted legislation requiring re-examination of all drivers every four years. Several had tightened their provisions on licenses for teen-agers and had adopted stronger license examining procedures. At least one state was added to the list with point systems for license suspension or revocation. Meantime, other states were making more use of license suspension. Connected with certain of the license systems, driver improvement programs were being started or expanded.

Speed also came into attention, and in several states absolute, fixed speed limits replaced "reasonable and proper" limits.

Driver education advanced markedly. Half a dozen states launched new state-sponsored training programs for high school students and four others improved or extended programs already in effect.

There was significant advance involving many states in adoption of features of the Uniform Vehicle Code, and more states were exchanging reports of accidents and violations.

Rising attention was directed to the traffic courts, and one state abolished the fee system for the justice of the peace courts and provided for salaries instead.

Probably as important for permanent results as anything else, numerous states strengthened their administrative machinery for highway safety. For example, at least five set up coordinating committes of officials to provide overall direction for traffic safety. One initiated a department of public safety, another a public safety division in the highway department, and two more established independent motor vehicle departments. Several states reorganized or reactivated citizen support organizations.

Meantime, legislative councils or special legislative committees in various states began assigned studies of such factors as periodic examination of drivers, vehicle inspections, justice of the peace systems, causes of accidents, and motor vehicle administration. Support was increased for safety research programs at certain of the state universities, and one state established a driver research testing center to study causes and frequency of accidents among various categories of drivers.

Therefore, the record shows that government is having some success on this nationwide problem of traffic safety.

But the job is never ending. The Governors' Conference knows that. At its 1957 annual meeting, at Williamsburg, Va., in June, it commended the Highway Safety committee highly, hailed the forward strides that had resulted in legislation, administration and enforcement, and then declared, "*there still is a most* urgent need to reduce the carnage on streets and highways which, unless checked, will claim half a million lives during the next decade."

The conference accordingly continued the committee on highway safety, and added the request that with its other work it "seek to develop recommendations for legislation requiring safety design features to be incorporated as standard equipment on all new automobiles."

THE CONTINUING TASK

There will be more contributions, and important ones, from the Governors' Conference and from its committee under Governor Ribicoff. There will be continued administrative action, stemming from the governors' offices and the state executives working under them, to tighten enforcement, improve driver education, strengthen licensing and attend to other key aspects.

As a result of the legislative interest engendered in 1957, and the legislative studies now under way, there will be more constructive legislation, next year and thereafter. Through the efforts of leaders of the judiciary, the bar, the governors and the legislatures, we are going to make progress in the traffic courts.

One reason for my confidence is the new climate of opinion about traffic safety that is now apparent. The National Safety Council *has contributed greatly to it* year after year. The Governors' Conference has contributed a great deal to it. The movement has spread rapidly at the community level, among officials and among citizen leaders.

One of the evidences of this new climate is a new direction of thought within the automobile industry itself, as indicated by its recent announcement that henceforth horsepower, speed and racing performance will not be emphasized in their advertising. This is an aspect on which governors had expressed much concern. The announcement of the manufacturers is important in itself. It is perhaps more important as a symbol of what's going on in public opinion.

For the fact is that, given leadership—which it has now received—the public wants and will support the measures that are required for traffic safety. But the leadership must not lag. It must continue in government, at every level, and it must continue outside government. I am confident that we will have it from the governors and state government.

REPORT OF THE TRAFFIC AND TRANSPORTATION CONFERENCE

by T. N. BOATE

manager, Accident Prevention Dept., Association of Casualty & Surety cos., New York city

The lifeblood of an association is membership participation in its activities.

During the past two years as chairman of the traffic and transportation conference, I have observed in detail the workings of this national association dedicated to traffic and transportation safety. If there is a weakness in the operation of this conference, it is the failure of members to participate in the formulation of policy and in guiding the traffic and transportation department in its program of traffic accident prevention.

Some progress toward stimulating active participation on the part of conference members was accomplished during the past two years by the organization of an executive committee, which met four times each year. The executive committee has made some notable contributions.

But despite this improvement, the significant aspect of the conference is still the noticeable apathy on the part of its members. We of the executive committee receive no comments or complaints about our activity or lack of activity. We receive no constructive criticism and virtually no recommendations on how the traffic accident problem should be attacked by the National Safety Council.

Needless to say, no organization—and this particularly applies to one that is trying to cope with a problem as vast and complex as highway traffic safety—can function at its peak level under these conditions.

This is by no means a criticism of the staff of the traffic and transportation department. I am fully convinced that the traffic accident prevention work of the National Safety Council is growing stronger day by day. However, we owe it to the Council management to participate actively in its affairs and strengthen, wherever possible, its continuous attack on the traffic accident problem. Unless we do, the full force of the national traffic safety effort cannot be brought to bear with maximum effectiveness on the problem.

CONFERENCE ACTIVITIES

Now I would like briefly to review some of the more important program activities and planning of the Conference that originated within the executive committee during the past two years:

Plans have been made and arrangements are underway for the distribution of a "Back the Attack" leaflet on pedestrian safety by state government in connection with the issuance of the 1959 automobile license plates.

With a view toward broadening the scope of the Council, brochures entitled "A Time for Decision," were written and a special committee has been created to study the services of national traffic safety organizations.

The National Committee on Uniform Traffic Laws and Ordinances has been requested to amend the Uniform Vehicle Code to include the "implied consent" feature recommended by our committee on Tests for Intoxication.

The executive committee members and staff are working constantly with the President's Committee for Traffic Safety in planning and organizing the 1957 officials' conference and the 1958 regional citizens' conferences.

Work is continuing on the development of an enforcement manual, the speed committee report, the accident records manual, and the revision of summary forms and tally sheets.

The 1957 Directory of National Traffic Safety Organizations with full-time field staffs has been completed and distributed.

A great step forward was recently taken when the "Public Safety" magazine and "Operation Safety" were combined to form the new periodical, "Traffic Safety." This new monthly publication, offering a more focalized area of coverage and a new design and format, has been well received throughout the country.

After considerable deliberation, the executive committee recently recommended that the scope of activities of the Traffic and Transportation Conference be confined to *street and highway traffic and transportation* and that hereafter the Conference be identified as the Highway Traffic and Transportation Conference. This, of course, requires Conference action and subsequent approval of the Council Board of Directors, with appropriate assignment of rail, air and water transportation to other Council components.

A new organization chart of the Traffic and Transportation Conference was developed with a view toward streamlining its operation, in the event the proposal—that the work of the Conference be confined to highway traffic safety—is approved.

The organization and administration of the "Back the Attack" program has occupied much of the Committee's attention during the past two years. "Back the Attack," representing a new approach to traffic safety by the Council, has amply proven itself as the first effective year-round national emphasis program.

The executive committee has urged that more releases be prepared by the Council for press, radio and television on the causes of accidents and what is being done to prevent

accidents . . . and that information on causes be reported in greater detail. It is the unanimous belief of the committee that a constant flow of news from the National Safety Council on these subjects will increase the influence of the Council with the public and produce definitely beneficial results.

Under the heading of Controversial Subjects, the executive committee reached agreement on the much discussed subject of hot rod clubs and drag strip races, thus enabling the Council to adopt a forthright policy in opposition to such activity.

During the past two years a number of workshops have been held which proved very effective. Two workshops were held in 1956—one devoted to a discussion of special emphasis traffic safety programs, and the other laying the foundation for our "Back the Attack" program. Two workshops also have been held in 1957—one to discuss ways to implement the highway safety recommendations of the 1956 Governors' Conference and the other to discuss the services and needs of national traffic safety agencies.

Looking back over these past two years, I think we can conclude that the executive committee has performed a valuable and needed service to the Traffic and Transportation Conference, and its members are to be commended for a good job well done.

To terminate my tenure as Chairman of the Traffic and Transportation Conference, I would like to leave a few thoughts with you. Some of them may sound familiar but they are worthy of your repeated consideration.

Today in the traffic safety field we face a grave and serious problem, the proportions of which we know will grow with the passing of time.

The situation on our streets and highways —present and future—must be brought under control.

TRAFFIC IS GOV'T JOB

Primarily, this is a job for government because in a situation where the health and welfare of the entire population of a country are placed in jeopardy, it becomes incumbent upon government to cope with the situation. I mean, of course, state and city government.

Unless firm action is taken soon by local government, one more function of the states will pass to the national level.

After 33 years of experience in the field of highway traffic safety, I sometimes think that it is already too late to salvage state and local government from the morass of our highway traffic accident mess.

The techniques of traffic accident prevention have long since been developed. These have been cut to fit the pattern of each state, and of communities of varying size, and of our rural highways. There only remains implementation.

Herein lies the role of the National Safety Council and all business, industry and civic groups—and leaders concerned with the problem.

We must provide inspiration, encouragement and professional assistance to responsible officials of state and city government to help them do the job.

We must provide the motivating force in organizing the public to back all necessary traffic safety measures.

Education is a fine thing but after 25 years of trying, we still do not have a sustained public education program on highway safety, and moreover, we have little more than scratched the surface of high school-youth driver training. We now know there is by no means enough potential strength in educational methods to stem the onrushing tide of ever-increasing accidents, deaths, injuries and loss of economic wealth.

We must take our cue from air, rail and water transportation where, regardless of the elements or varying peaks of traffic, we do not experience the catastrophic results constantly being realized on our streets and highways. The reason is that in these forms of transportation, we live by rules.

In highway transportation, there must be at long last effective rules, and these rules must be obeyed. There is no other road to successful traffic accident prevention. This implies a militant public determined, in spite of all obstacles both real and false, to adopt adequate laws on a uniform basis and see to it that they are enforced.

Are we of the National Safety Council capable of the kind and quality of leadership necessary to lead our nation out of this serious predicament? Is state and city government equal to the task that lies ahead?

One thing is certain. The day of decision lies just ahead.

A PRACTICAL APPROACH TO POLICE TRAINING

by ERVIN H. WARREN

director, Illinois Police Training Institute, University of Illinois, Champaign, Ill.

We can profit by repeating the importance of proper training of our officers to keep abreast of ever changing conditions facing us and to keep the proper goals ever before us. What goals are our proper goals today?—improving our service to our people by adequate pre-service training and regular in-service instruction, using more uniform curricula and finally the goal of professional recognition.

Years ago F.B.I. Director Hoover said, "Police work by untrained men is as obsolete as the practice of medicine by sorcery." As time passes, trying to take care of our growing responsibilities in the law enforcement field without comprehensive training schools is more and more obsolete. Sometimes we like to refer to the "horse and buggy days" form of justice in our lower courts when our own operations are just as antiquated.

Thousands of men are wearing the badge today who literally stepped into their jobs without any preparation at all. We find in our work officers all the way from the illiterate to the genius. Yes, we can still find bums cloaked in the uniform that should be looked upon with a feeling of respect, trust and security. If you want to read a real disturbing account on this, get a copy of Albert Deutsch's book "The Trouble With Cops."

POLICE ADMIT IT

You might question some of the reports of the writer, but study them more closely and you will find that he received his information from the best authorities, the cops themselves. And Deutsch's last sentence I repeat to you now: "Well what are you going to do about it?" Do you know any police training program that did not have a practical approach?

I do not, and I am willing to rely upon the ability of any persons in police service who are sincerely attempting to set up courses of training for their departments, or for others, to use a realistic or practical approach to this task.

As long as we continue to study and to seek out the weakness in our various operations that can be corrected only by raising the competence of our forces through training, we should be credited as using only the practical approach. Are we satisfied with our own sporadic efforts to improve police status by training programs where courses are attended by only our own personnel?

Expansion of training programs is our responsibility. We must do more missionary work and enlist administrative and supervisory personnel in those areas where training is unknown. Today we are following the same unsound and unwise course taken by the manager of a baseball team who attempts to raise the team's batting average by concentrating on improving the hitting of only his top sluggers.

TEAMWORK ON FORCES

Teamwork is needed in police work too—and we might find some top-notch hitters in some small town police department or among the deputies of some County Sheriff. We can get the results we want by setting up courses where law enforcement officers at all levels of government may attend and learn their work the easiest and the cheapest way of all—from experience of others. The same pitfalls await the unqualified rookie today that baffled and embarrassed the untrained officer a generation ago.

Let me quote some lines which list some of the subject matter for police schools:

Education of a Modern Police Officer—1957

"I believe that I can best bring this matter to your attention by just looking, first of all, at the things a policeman needs to know: the history of policing, the organization of our national, state, county, and city governments, stressing especially jurisdiction of each, the organization of the particular police department into which they are going, the work of the several divisions and bureaus, the rules, regulations, reports and what-not that they have to know there, the duties of a policeman on beat or patrol, the handling of traffic, crowds, fires, riots, strikes; the different ways of protecting property, the methods of protecting life; courtesies due from the police.

"Then they have to learn a lot of law, the law governing arrests and the law governing

evidence. A whole string of legal definitions must be mastered, larceny, burglary, robbery, blackmail, homicide, a whole chapter on misdemeanors, and another whole chapter on city ordinances. He must know also about the procedure of the courts; about the use of search warrants, summonses, statements and confessions, dying declarations; extradition; the law governing assemblages and free speech; additions; political gatherings; gambling; peddlers; drug addicts; auto thefts; treason; kidnaping; forgery; dwelling house, boarding house and hotel regulations; restaurant regulations; sanitary laws; arson; perjury; slot machines and lotteries; and bogus tickets.

"After the above few simple things, the various processes of crime detection, what is done by specialists through the use of fingerprints, bullet markings, footprints, pictures in the rogues' gallery, lie detectors, truth serums, chemical work, stains, odors, handwriting and forgery detection by microscope; and thorough knowledge of different kinds of wood. Parts of jiu-jitsu, or boxing, of wrestling, of the Texas Ranger's method of disarming, of the London police system, should be mastered by all policemen, a system of exercise and of correct habits of posture, so that he may keep fit for hard service at all times.

"He must learn some of the military formations, the handling of automobiles, the radio, first aid, life-saving, local information about institutions. He must learn to write reports, and to draw reliable maps and diagrams. And I still have not covered the field. There is the question of crime prevention. That is getting to be a large field, and in the future ought to be perhaps the largest field of police operation. I cannot go into details. That is what a policeman needs, and a policeman needs every bit of it and more."

I'm sure that all of us would buy this sort of thinking. Probably the only changes we would suggest would be the addition of several more specific traning needs. A close scrutiny of the Uniform Crime Reports of the F.B.I. or a careful study of our annual statistics on traffic accidents can result in but one obvious conclusion—namely that we are slated for busy days ahead because we have permitted our work to get out of hand—our controls need revamping.

Everywhere we hear laymen, on the street, in the coffee stops, and on the job discussing our traffic conditions, and the most of them are talking either about accidents, arrest tickets or delays on traveling our crowded streets or highways. Truly we have become not only a nation on wheels but also a nation of traffic experts. Do you recall some 20 years ago when, in most instances, only the police in our large cities were being forced by a conscientious study of their duties and by public opinion to work out an improved traffic control program?

Today police chiefs everywhere are conscious of their responsibilities in traffic supervision and except in rare cases are looking for help in today's most aggravating dilemma. These rare cases, either because of lack of interest or know-how are still retarding progress in effective traffic supervision. We still hear the time-worn alibis that "the police can't do everything," "we don't have enough men," we are too busy handling crowds and directing traffic to do anything else.

You are all familiar with the Annual Inventory Program, yet how many times when the presentation of the analysis is underway do you find the proper officials there? This highly constructive program can be effective only when the proper authorities show an active and a wholesome interest in the reports. Too often we find persons with authority to carry out the recommendations in the analysis, absent with some subordinate substituting for him.

This reminds me of many cases where an officer has been sent to a special training course on traffic and after his return to duty he resumes his former patrol of the municipal parking lots. Or where an F.B.I. National Academy graduate qualified as a fingerprint expert finds himself back with his buddy in the prowl car on the late shift. A practical approach to police training must be training for a purpose and not merely the rewarding of some members of the department for some fine bits of police work.

SKILL IN ALL RANKS

To build and maintain a high degree of efficiency in traffic supervision is to develop the skill, the intelligence and the sound judgment of every police officer in the department. This can be accomplished by a proper balance between pre-service and refresher courses. Recently I spent a few hours in a department headquarters and was shown an impressive records and planning section.

A short time after I left the offices I was talking with one of the officers in a patrol car and mentioned what I had seen in headquarters in the form of spot maps, charts and files. He informed me that it was used mostly to show the public that the department was "on the ball." Now here perhaps was an officer who was disgruntled because

of his assignment or his progress toward the next rank, but I strongly suspect that he seldom heard an explanation by his superior officer of the manpower distribution.

One question Gordon Shehee asked me 15 years ago when I was being interviewed for the long course of the Traffic Institute at Northwestern was, "Have you ever heard the expression 'selective enforcement'?" My answer was "no," and I still receive the same sort of reply when I put that question to officers all over our state. No successful campaign can ever be conducted unless the officers know why. No man can succeed at anything unless he believes in the work he is doing.

MUST KNOW REASONS

Any officer of the law should be convinced that his present tour of duty places him where he can do the most good and he should not only be fully informed of the reasons for his assignment but capably trained in the tasks he is to perform. If it were your responsibility to choose the type of training course most needed by your department, which would it be? If yours is an average situation you doubtless realize that the great weakness in police operations today is at the management and supervisory levels.

Effective policing today calls for command personnel who not only know how to handle basic police duties but more important how to handle police men. If you tried to outline the various qualifications for, and the duties of, for example a police sergeant, you would agree that it wasn't an easy job.

Now I wonder if we picked at random a dozen sergeants just how many of these commanding officers would measure up to accepted standards as befits that rank. Only a few, and we find this same unhealthy condition in all ranks in many policing agencies. These and many other observations after much study have caused me to place schools for command and supervisory personnel at the top of the list.

The commanding officer who can direct, supervise, evaluate, and improve those men assigned to him is a department's greatest asset. For various reasons there have been many projects carried out by police in an all out effort to reduce traffic accidents either in a given area or over a set period of time, or both. If we are to believe the recorded accounts of such experiments then we must agree that the results were convincingly gratifying and successful.

A closer look at these accounts often written up in magazines shows that seldom was any strange or novel plan for accident reduction instituted. It's usually the same technique that has worked time and again—selective enforcement.

The broad plans in our efforts to provide a practical approach to police training and traffic supervision and control are: first, higher standards and requirements in the selection of personnel for the police job; second, a program for advancement in rank based upon merit, performance and ability; third, training courses for all personnel of all law enforcement groups with responsibility in traffic regulation.

Only these three basic steps, but we still have a rocky roadway to travel before policemen everywhere can have equal opportunities to prove their worth. It is our responsibility—and our privilege—to extend our assistance and to enlist those who cannot or will not help themselves. It is also our privilege to serve this nation by dedicating ourselves to help provide our people with the best police service possible.

A great early American, William Penn, said, "as governments are made and moved by men, so by men they are ruined." "Therefore governments depend upon men rather than men upon government."▲

RURAL ENFORCEMENT PROBLEMS AS THEY RELATE TO SPEED

by FRED J. BLY

assistant commissioner, Calif. Highway Patrol, Sacramento, Calif.

Before proceeding, it would appear appropriate to review national figures indicating the magnitude of the traffic problem.

In 1956 there were 77 million licensed drivers operating 64,500,000 registered vehicles. During the year they consumed close to 48 billion gallons of gasoline, amassing untold miles of travel. These vehicle movements resulted in 40,000 traffic deaths and 1,400,000 injuries, of which an estimated 120,000 resulted in permanent impairments. The total estimated cost of traffic accidents in 1956 was 5 billion dollars, including $1,800,000,000 property damage and $3,200,000,000 in wage loss, medical expense and insurance overhead.

Where does speed fit into this immense and costly problem? Of the 40,000 traffic deaths, 30,400, or more than 75 per cent, occurred in rural areas. Of these rural traffic deaths 43 per cent were non-collision, such as ran off curve, ran off the straight road or overturned on the roadway. In 81.3 per cent of the non-collision rural fatal accidents the car ran off the roadway.

While fatal accidents rose 20 per cent during the period 1946 to 1956, deaths from non-collision traffic accidents increased 65 per cent. These figures show the clear and prominent presence of speed too fast for conditions and speed in excess of posted limits.

AVERAGE SPEED

An October 1956 survey, conducted by the California Division of Highways, revealed an increase in the average speed of all vehicles of 4.3 miles per hour when compared to a similar survey made in 1951. A comparison of critical speeds (speeds at or below which 85 per cent of the traffic is moving) reflected an increase of 5.2 mph.

On six rural freeways in California the average speeds of 1955 and 1956 model passenger cars were compared to similar speeds of 1954 and older model cars. The survey showed that 22.7 per cent of the 1955 and 1956 models were traveling 70 mph as compared to 12.3 per cent of the older models. Similar differences were reported at the various speeds above 70 mph.

These surveys, together with the already reported increases in single vehicle fatal accidents of the "ran off roadway" type, confirm many law enforcement administrators' apprehensions regarding increased horsepower in automobiles.

HIGH HORSEPOWER

During recent years there has been a continued advancement in the advertised horsepower of automobiles; with predominant competitive publicity directed to that item ahead of many other fine engineering changes.

When properly employed, increased horsepower *can* be a safety factor; however, the increasing emphasis placed on higher horsepower is a concern to enforcement officials. In the *mind of most motorists*, power and speed are synonymous. There seems to be some psychological quirk in the makeup of man that requires him to test and re-test the maximum power output of the mechanical machine he controls.

On June 6, 1957, the board of directors of the Automobile Manufacturer's Association unanimously recommended to the member companies that they take no part in automobile racing or other competitive events involving tests of speed and that they refrain from suggesting speed in passenger car advertising and publicity. This is indeed a very gratifying step; however, it *will require acceptance and implementation* to be effective.

Indications are that the new 1958 models will have increased horsepower and several makes will offer fuel injection. Item 5 of the resolution recommends that passenger car manufacturers:

"Not advertise or publicize actual or comparative capabilities of passenger cars for speed, or specific engine size, torque, horsepower or ability to accelerate or perform in any context that suggests speed."

In that regard it was interesting to note in a full page ad in the September 3 issue of a California newspaper the following: "The Edsel is powered by the newest V-8 engines in the world—The Edsel 400 and the Edsel 475. Specifications: 400 and 475 *foot-pounds of torque; 303 and 345 horsepower*; 361 and 410 cubic inches of displacement; 10.5 to 1 compression ratio. You have never handled this kind of power before."

We are today building straight, level highways which make speeds of 100 mph a blatant possibility. Many drivers, unable to handle vehicles at such speeds, seem unable to turn their backs to the challenge.

In considering the human equation the slightest deviation from ideal driving conditions can spell disaster when the vehicle is traveling at high speed.

I recently had the opportunity to peruse a "Mileage and Expense Record" distributed to patrons of the Conoco Oil company. At the bottom of the printed form they had listed the general highway speed limit requirements of the 48 states. Among them were 14 different regulatory speed listings ranging from 40 mph to "reasonable and proper" and "reasonable and prudent."

DEFINITIONS HAZY

This did not consider for a moment the multitude of special requirements each state has. What is "reasonable and prudent" or "reasonable and proper"? Most here have read several court cases dealing with this definition. In the main the courts have held that "reasonable and prudent" is that action which a reasonable man would have taken under a like set of circumstances. Webster defines *reasonable* as rational or not beyond the bounds of reason.

The word *proper* has many meanings. The one most applicable is "befitting one's nature, qualities—right, fit." *Prudent* means capable of directing or conducting one's self wisely and judiciously. This, then is the maze provided the motorist and the officer as a guide to driver behavior and enforcement action. It is no wonder the nation's drivers are confused and irritated when arrested for violating statutes so difficult to interpret.

The present controversy over which type of speed limit is the better appears to have been engendered by popular misconception as to the intent and meaning of prima facie type laws. This misconception is not limited to the average motorist. Members of law enforcement, the judiciary and attorneys must also be included.

REFUTABLE IN COURT

The adjective "prima facie" means "adequate to establish facts or raise a presumption of facts." This fact or presumption of fact as it pertains to the prima facie type speed law is refutable in court if a defendant establishes by competent evidence that the speed charged did not constitute a violation of the basic speed law. The prima facie type law does not afford to the enforcement officer the prerogative of the judiciary in determining a competency of evidence.

The obligation of law enforcement is the same under a prima facie type law or a fixed limit type law. The difference between these laws is the latitude permitted in the court in the interpretation of the evidence presented. The misconceptions previously referred to have resulted in the application of unreasonable tolerances. Confusion to the motorist and general disregard to speed signing and zoning are weaknesses inherent to any prima facie type law.

A fixed limit speed law would appear to overcome the major problems of a prima facie type limit. Tolerance is required in speed determination as in many other facets of law enforcement. This required tolerance, however, is for the sole purpose of *overcoming human and mechanical error and not* to provide for individual enforcement policy by the officer in the field.

SPEED CONTROLS

The principal requirements of a properly functioning speed control program are:

1. *Intelligent* and proper *zoning*.
2. Adequate signing.
3. Vigorous enforcement (with tolerances as described herein).
4. Public understanding of law.
5. Public support of enforcement.

The above requirements are amenable only *to a fixed limit type speed law. A fixed* limit type law does not obviate the need

for a basic speed law. The proper application of a basic speed law is obtained when adverse conditions require the reduction of the speed limit, not when optimum conditions permit the raising of a speed law.

Recognizing the great need for a review of the speed problems, the National Committee on Uniform Traffic Laws and Ordinances in early 1954 appointed a new subcommittee on speed regulation. The function of the committee was to review the provisions relating to speed found in Sections 56 to 62 of Act V of the Uniform Vehicle Code and to recommend to the National Committee changes or additions. The first meeting of the new subcommittee was called for March 30, 1954.

Following considerable work by the subcommittee and the entire National Committee on Uniform Traffic Laws and Ordinances, Section 11-801 of the Uniform Code was amended to provide a maximum fixed speed limit of 60 mph in rural locations during the daytime and 55 mph during the nighttime. The Department of California Highway Patrol feels that the five mile differential is impractical and creates an enforcement problem for the administrator.

In consideration of the elements contained in Section 11-802 of the Uniform Code, a maximum speed limit of 65 mph appears reasonable. This recommendation is supported, at least in California, by a statewide speed survey, conducted on state highways during October 1956. The survey showed that passenger cars averaged 59.8 mph on rural freeways as compared to an average speed of 55.6 mph for all locations. Comparable critical speeds were 67.1 mph and 64.9 mph, respectively.

The need for the individual states collectively to adopt uniform, reasonable, intelligent, enforceable speed laws has never been more apparent.

For the first time, the National government recognized the gravity of the traffic conditions by incorporating into the new Federal Aid Highway Legislation, provisions for the study of traffic safety needs. Items to be considered are:

1. Need for federal assistance in the enforcement of safety and speed requirements.
2. The advisability of uniform state and local highway safety and speed laws.
3. Possible means of promoting safety in the manufacture of vehicles.
4. Educational programs to promote highway safety.
5. Design and physical characteristics of highways.

Study findings will be reported to Congress in 1958.

As recent as the August 26, 1957, issue of *Newsweek*, the following was noted in "The Periscope" column:

"Senate Office Building—Sen. Albert Gore and his Public Works subcommittee are considering a federally fixed speed limit (no figure set yet) on the interstate highway system, and perhaps even federal police to patrol it."

NO SAFETY PRIDE

The reduction of traffic hazards through traffic engineering and development of adequate roads and streets is essential to any sound traffic control program. The importance of engineering and education should not be minimized; however, experience indicates that few people take pride in being safe.

Industrial safety programs have shown that safety discipline is essential. Improved highways and expanded education have not erased the common errors of driving that have always persisted in traffic accidents. On the highways the most immediate remedy remains in adequate traffic law enforcement.

Traffic law enforcement is a deadly serious business and not a sports contest between the officer and the motorist played by a set of illogical and prejudicial rules. The duty of the traffic law enforcement administrator is to utilize weapons available to him.

Traffic officers, probably more than all others in the economic structure, are in a more vulnerable position to suffer the condemnation of the public in a mere discharge of a duty. The more effectively this duty is discharged the greater the opportunities for emotional conflict.

Significant in this respect is the observation that traffic violations are common to all classes and levels of society. No striking evidence has been found to indicate any particular section of society is more ready than any other to accept traffic law enforcement for its true worth and purpose.

INVENTORY—A TOOL FOR IMPROVING TRAFFIC PROGRAMS

by CAPT. E. L. BUTLER

Traffic Bureau, Dept. of Police, Denver, Colo.

The City of Denver has participated in the Annual Inventory for Traffic Safety Activities since its inception and generally the recommendations of the inventory have been sound and have assisted the city in putting into effect a strong traffic safety program.

Preparing the questionnaires for the inventory takes considerable time and effort. The compilation of the statistics, examples, exhibits and the effort expended in getting other official agencies to complete their sections, is by no means a small task. However, I know of no other facet which allows a comparison of traffic safety activities, with other cities in like population groups, other than the Annual Inventory.

The various sections of the Inventory include:

1. Death and injury record
2. Accident records
3. Police traffic supervision
4. Traffic engineering
5. Traffic safety education
6. Traffic courts
7. Public education
8. Organized public support

These sections afford the opportunity of factual comparison with cities of like size. The recommendations in these sections can secure a better understanding of the objectivity of each city's program and can be a tool to acquaint our city legislators and public support groups with specific problems.

The title of my subject—Inventory—A Tool for Improving Traffic Programs is, of course, very broad. Through the use of the inventory information, our traffic programs can be bettered so that we may make better use of our accident records in formulating and administering a sound enforcement, engineering, and educational program to better our overall standing in the traffic field.

The Inventory furnishes us with a yardstick to measure our overall operation against the same performance data presented by other cities in our classification groups. We obtain a comparative look at personnel assignment, an evaluation of training methods and number of trained personnel assigned to like activities, and a comparative analysis of administration policies and operative procedures utilized by other departments.

A complete look at the accident investigation operation can determine whether quality investigation and reporting is being accomplished, how well investigating officers are evaluating evidence and placing of correct charges, and how well enforcement activities are matching the accident picture on a selective basis.

By a check of the court's section you can determine and get a second check on the thoroughness and completeness of investigative procedures and the ability of the officers to match their evidence to correct charges through the court's conviction and dismissal record. We can also judge the adequacies and inadequacies of our court procedure and are given information to guide us in correcting any difficiencies that might exist.

In the field of school traffic safety education, an evaluation of the activities of your own program carried on at home can be had, as well as a comparison of your program with schools all over the country. Valuable information is available on this comparison basis to assist you in gaining ground in this field for public support of enlarged programs, in the traffic field, in the schools of your city and mine.

COMPARE SIGNS, SIGNALS

The Inventory, gives you a comparative look at the safety environments of school properties as related to cross walks, school stop signs, signal lights, crossing guards, safety patrols and parking restrictions. It also opens for serious discussion items such as driver education and behind the wheel

training, as well as safety media for the elementary grades.

It has been said many, many times that engineering and enforcement are important tools in the control of a traffic problem; being in the enforcement field myself, I concur. However, I am sure that everyone has experienced difficulty in some phase of enforcement because the driving public has not been properly informed on our need for this type enforcement.

Through study of the Inventory section relating to public education and safety organization, we can determine factually how well our news media is giving this important message to the population of our community and how well our safety organization understands our problem and can disseminate the needs to the right channels.

We have a factual tabulation of the number of column inches in our newspapers; the number of spot announcements and other stories on radio and television; but unfortunately, we do not always know the quality and receivability of the stories; in other words, how do they fit our own local picture. The evaluation of the Safety Organization Section aids in the answers on values.

PUBLIC SERVICE MATERIAL

The news media, throughout the United States, have been most generous with their "public service time," but this "time" is limited and the competition is extremely keen. All worthwhile health and welfare organizations are aware of this fact and consequently many have secured competent talent for the preparation and presentation of their messages. It, therefore, behooves us to take a good look at our safety organizations and a better look at the material they present to our news media so that each is sure that the material has news worthiness and presents a true picture.

Any police department, with the proper use of records, if the records are good, can determine the quality and quantity of their activities; but only through the Annual Inventory can we compare our activities to other departments of like size and determine how effective our program might be.

I feel that the value of the Inventory lies in the systematic evaluation and comparison of like activities it affords. As you know, each section analyzed by experts in each field and the refinements made in the Inventory the past few years lend added weight to its importance.

The Annual Inventory of Traffic Safety Activities is a tool, and a good one. However, the extent of its value is measured by the intelligent application of the information.

INVENTORY TOO COMPLEX?

Although the Inventory is a tool of great usefulness, its complexity and area of coverage is fast making it a contest in figures. The police departments overburden statisticians and analysts try to get answers to many superfluous questions, which might mean something to the person asking them, but which have a very small value to the Inventory Representative.

To get a complete overall picture, you must have a report from all interested organizations; but who are we to demand that public or parochial school officials institute into their curricula driver training and safety training courses which pose a financial problem? Why should a police department be graded down in effectiveness of a program for things over which it has no control?

We in the enforcement field are very much in sympathy with this kind of reporting and Inventory; and feel that we again will begin to move back to a good, sound evaluation of the traffic programs of all cities and regain the complete value of the Inventory, rather than having a misleading contest in figures.

Yes, the Inventory is a "tool," and a good one, if kept sharp and in useable condition. ▲

URBAN ENFORCEMENT PROBLEMS AS THEY ARE RELATED TO SPEED VIOLATIONS AND THEIR APPREHENSION

by CAPT. GEORGE WARNER
Police Dept., Lansing, Mich.

The carnage of collision has not been reduced over the past years and the police generally can blame themselves by their lack of positive police action. 40,000 killed —1,400,000 injuries—five billion dollars in costs from traffic accidents last year. Law enforcement does more to keep motorists out of trouble than any other single factor. Let's have more of it.

I think there are two areas to explore when trying to attack the problem of speed law enforcement in cities.

1. Is speed law enforcement needed?
2. How can we get it?

The answer to the first question—is speed law enforcement necessary—can be answered "yes" by all communities and all police agencies. Is speed a factor in causing collisions? If it is, then speed law enforcement is needed.

Last year 38 per cent of all fatal accidents were caused by speed law violations. If the fatal accidents caused by speed had been prevented, the loss of life would have been reduced to 24,800 persons, or to a figure corresponding to 1928. Who must assume the responsibility for speed control? We are the only arm of the government that can control the movement of vehicles and beyond that it is our sworn responsibility to protect life and property.

SPEED LAWS ESSENTIAL

Information as to the causative factors of speed in accidents at your area level is needed and necessary before any program of speed law enforcement should be instituted. It may vary from 20 per cent to 50 per cent in different locations. To do a good job we must know what is needed before we start. In accident prevention work the question of causative factors must be known.

In our community we know that between 45 per cent and 50 per cent of all our collisions each year are caused by speed violations. This tells us that in accident prevention activities in Lansing speed law enforcement must receive number one priority.

What the causative factor of speed is in your overall accident problem should be determined by accident studies and summaries. Is speed law enforcement necessary in your accident prevention efforts? Where, when and how much is needed can be arrived at in no other way.

The answer to the second question—how to get speed law enforcement to match the causative factor of speed in accidents—is the only problem left to solve. However, it is the most perplexing and difficult of all traffic law enforcement problems.

PROBLEM MOUNTS

The problem of traffic management and control in its broad aspects has become more complex and acute each year. In the past 10 years the problem has doubled and redoubled. It continues to get progressively worse each year. Registration continues to increase about 10 per cent each succeeding year.

Few, if any, police departments have been able to keep up with the job. A few do not realize there is a job to be done. What can we as police do in the face of this dilemma?

We are never going to get the man power we need until we do the best job possible with what we have. We, collectively, must go to work.

Before any enforcement is applied (if you have not been doing your best) or the quantity increased, the public must be informed as to your plans and the reasons for the action. An informed public can be most helpful in any police function. Especially is this true in matters of traffic law enforcement. We, as police, forget at times to keep the public abreast of the problems and why we, as its police agency, are involved

in some of our activities. It has the right to know and our work is made easier by its knowledge of our functions.

Public information should be fed to the citizens regularly and in some communities the police do a good job. I believe a better job can be done by a local safety council or similar organization. A membership of interested, safety-conscious citizens in such an organization can be far more effective in conditioning the public to accept and demand traffic law enforcement by the police agency. The local safety council supports the official agencies charged with the responsibility of doing the job. Matters of policy must rest with the official agency and the local safety organization must not attempt to dictate it.

MUST INFORM PUBLIC

This local safety council can keep the public informed as to the public problems and can do a good job of selling the police department when they are doing a good job, which does not look too good when done by members of the police department.

If the community is properly conditioned, the citizens will accept and demand an enforcement action by their police agency. The police agency must do a good job. The biggest problem in traffic law enforcement is the activation of all the available police personnel in your community.

This activation of the police and the desire to do a good job in accident prevention must, of course, stem from the administration head and permeate down through the ranks to the men in the field. The men must know that it is an expected police function. The very nature, the lack of glamour in this police activity, makes it a tough administrative job.

POLICE OFTEN RESPONSIBLE

However, if the executive officer recognizes that the principal function of a police agency is to protect life and property, if he is informed of the problems, and shown that accidents are taking a toll far greater than any other reasonable police responsibility, he can be impressed and become enthusiastic.

The police themselves are in many cases totally responsible for the success or failure of the vital police function. All too often the department-head is insecure and feels that this added police action without public clamor will hasten his demise. This may be true in some locations. It would seem to me that if it were true the job would not be attractive nor could a chief hope to remain if he did anything. An honest, sincere police action is generally accepted and approved by the public if they are kept informed.

It is true that all strata of society are and must be treated by the police for these accidental violations of the law. If an impartial position is taken by the police, little danger of reprisal can be anticipated. What the public believes is important in a good accident prevention program.

A high contact rate by individual officers with motorists is necessary. Many contacts may be for verbal warnings but the passing motorists who witness the contact readily believe an arrest is being made. The good of traffic law enforcement is in its deterrent effects and not on the fines collected.

In Lansing, as a matter of policy, we encourage and investigate all citizen's complaints as to speeding violations. A cycle is immediately dispatched to the location complained of and the complainant at least sees the police respond. This takes little time and it helps to instill in the mind of our citizens that their police are interested and on the job.

CONTINUAL ENFORCEMENT

Police administrators should not sit back and be pushed into this business of traffic law enforcement. In our hands are the tools to reduce this carnage of collisions. Constant enforcement pressure is necessary to assure continued public acceptance of such a program. We have found that short drives on specific violations are not acceptable by the community, nor do they reduce the accident problem. Constant day-by-day traffic law enforcement by all uniformed police officers can, and will, reduce accidents and the public will approve.

Engineering and education are both effective in accident prevention, but both or either will fail without the assured knowledge by the public of police enforcement action. Enforcement does more to keep the average citizen out of trouble with his car than any other single thing. Let's have more of it by enthused police officers.

In no other facet of police activity can we accomplish so much in the protection of life and property by following these ideas:

1. Find out what per cent of your total enforcement efforts must be aimed at speed law violations.
2. Keep the public informed as to your efforts for their personal good (not police, but a safety organization).
3. Encourage citizens to report violations—respond. Have high contact rate with motorists.
4. Don't wait to be pushed into this vital police business. Discard the thinking that police operate on a complaint basis. This is not modern enough to meet modern problems.
5. In training schools and at roll call keep men on job every day.
6. Traffic law enforcement does more to keep the average citizen out of trouble with his car than any other single thing. So—Let's go to work as police officers.

ARE SCIENTIFIC DEVICES IMPROVING TRAFFIC ENFORCEMENT?

by ANTHONY L. SCHMEIG
chief of police, Highland Park, Ill.

In January 1956, the Saturday Evening Post published an article describing the first attempted use of mechanically controlled "speed checks" in this country in 1903. This article relates how police were having troubles with speeders on a road leading from the Bronx into Westchester County, New York. These speeders were driving so fast they eluded the bicycle police officers. The Police Commissioner set up three dummy tree trunks along the road, with a policeman with a stop watch in each of these hollow trees, which were equipped with telephones.

As a speeder passed the first station, the policeman phoned the time to the officer in the second tree, who set his stop watch accordingly and computed the speed as the driver passed his station. If it was above the limit, he phoned the officer in the third tree who lowered a pole across the road, stopping the driver. This was certainly more reliable than estimates of speeds as formerly made but was open to the objection that it was hearsay evidence.

In our small community we used a new Radar Speed Timing Device on our main arterial. With no wires, no hoses across the road, just by looking at a small black box, we gauged accurately the speed of each car as it went by. Those violating the speed limit were stopped by an officer a quarter of a mile down the highway, who was advised of the violation by radio. An interim of 54 years, but what a vast improvement had taken place.

MODERN MIRACLES

The relating of the various scientific devices in common use in our modern day law enforcement sounds like the science fiction writings of yesterday, Jules Verne's fanciful dream of life on a submarine, which is a reality today and Buck Rogers' space ventures which will be a reality tomorrow.

Such developments as the radio, which the ancients would have classed as miracles, have become a part of our everyday life. And the law has slowly but surely utilized these modern inventions and scientific devices in the detection, pursuit and conviction of criminals. Our Crime Laboratories today are a collection of marvelous scientific "know-how and skill."

Such things as color moving pictures, faithfully recording every detail of a scene of an accident or a crime; ballistics tests, by which the identity of a firearm from which a fatal bullet was fired can be determined beyond question; the wonders of

modern photography, taking photographs in the dark with infrared film by cameras tripped by the force of sound or air waves —all part of our life today.

And there are more: the amazing advances in the field of chemistry even to the point of determining the amount of alcohol in a person's blood; the principles of physics applied to skid marks left on the highways to determine the speed of an automobile; the polygraph which combines the use of psychology and physiology to detect deception and television with which we can sit in one room and watch the every move of our subject several miles away or a program half way across the country.

All one has to do today to get an idea about the scientific devices available (at a price) to Police today is read our magazines —they are full of graphic advertising depicting the multitude of gadgets and devices guaranteed to make our job easier and our street safer. The well trained, experienced investigating officer of today can tell quite accurately what happened in an automobile accident just by studying the physical evidence found at the scene of the crash.

SCIENCE AIDS INVESTIGATIONS

Students of the science of momentum and force can tell by studying photographs of damaged cars, how the damage was done, how the cars came together, whether both cars were in motion at the time of the collision and the approximate speed of each. Even our courts are beginning to take judicial notice of the stopping distances and to accept the average reaction time as three quarters of a second. Science has demonstrated the truth of these principles to a point where reasonable doubt no longer exists.

In June 1956, an article was published in the FBI Bulletin wherein Colonel Sanders of the Nebraska State Safety Patrol describes the use of the airplane in traffic control. Airplanes are being used by many state organizations to spot traffic congestions, and conduct air patrols. Colonel Sanders tells how the airplanes clock speeders from the air, communicate the information to nearby patrol cars who close in and make the arrest.

This is a far cry from the days I can remember chasing a speeding automobile at 90-95 mph for 18 miles on a motorcycle before it finally became involved in a traffic congestion and had to stop, so I could catch him. It took two hours for my knees to stop shaking. Today, we use three way radios, airplanes, electronic speed timing devices to accomplish many more times the amount of work as we did in the "old" days with less risk to the officer and less argument from the violator and greater acceptance from our courts.

DRUNKEN DRIVER TESTS

The problem of the "Drunken Driver" has received much attention from those trying to solve the problem of automobile accidents. Many devices have been invented for testing degrees of intoxication. In fact, so much attention has been given to this one type of driver, that there is an impression that this is a major accident cause. The problem of proof of intoxication has intrigued the various law enforcement agencies, often times to the exclusion of other important and even more prolific accident causes.

I can remember our early Alcoholic Influence tests which are familiar to all of us—picking up coins from the floor or the "accidental" dropping of the drivers license to see if the suspect could pick it up without falling on his face; walking a straight line; from an arm outstretched position to touch the nose with the index fingers while the eyes are closed; judging his impaired ability from the sound of his slurred speech or the blood shot eyes and/or the order of his breath.

While these same symptoms are still observed and related, they are now supported by the accurate evidence of a chemical testing device which chemically measures the percentage of alcohol in our suspect's blood and prevents the police officer from falling into a trap of testifying to symptoms that may be caused by some 70 or more pathological conditions which are in no way linked with alcohol.

The use of chemical tests of body fluids began in Sweden in 1914 and these Scandinavian countries are well in advance both in the exploration and experimentation in this field and in the enforcement aided by chemical testing.

Our courts and laws have progressed relative to these improvements. Today 28 states have laws providing for the admission in evidence of the results of chemical tests with presumptions as to their effect. These tests are also a protection for the sick who though they have all the symptoms of the drunk are in dire need of urgent medical attention.

In another field, our electrical accounting and tabulating machines have done wonders in the rapid, accurate assembling of information providing the supervisor as well as the traffic officer with that much needed information to tell them what is happening, where, when and why.

These machines are also a great boon in speeding up the compilation and dissemination of drivers license and motor vehicle registration information to the men in the field who rely on this intelligence to guide them in their daily operations. With the quantity of material to be processed, to do it even mechanically as we had to 15 years ago, would be a physical impossibility.

The police officer himself has no idea how far advanced he is today in his general knowledge increased through the simplification of learning through movies, television, training aides and working models.

MAN IS IMPORTANT

With greater emphasis being placed on training every day and more and more departments both large and small, realizing and accepting the fact that without training we will get nowhere, both the caliber and type of police officer is improving rapidly. And of course, the man himself—the police officer—is the crux of the entire situation. Regardless of the miraculous nature of scientific devices invented, they are no better than the men who use them.

High on a bluff overlooking Omaha Beach, in Normandy France, there is a graveyard which is the final resting place of some 10,000 of our American soldiers who fell during the first agonizing hours of the invasion of France during World War II.

Prior to the actual landing of the troops, all of the latest weapons of war in our planes and ships, unleashed an unmerciful bombardment of the coastal barricades, pounding this beach area for some 90 minutes. Yet the loss of life of our foot soldier storming these beaches afterwards was staggering.

With the development of each new military weapon, one hears how this new scientific discovery will eliminate the foot soldier. Yet, in Korea, just five short years ago, it was the foot soldier who marched up and down the continent back and forth across the Yalu river and it was the foot soldier who held the 38th parallel. I believe that our wars will always be settled in the final phases by the foot soldier—the man behind the gun—the man in the field.

NEED BETTER TRAINED MEN

And so it is in traffic law enforcement. In spite of all our scientific devices to improve our operation, to simplify and make our job more accurate, the success or failure will always lie with the man using these devices. The speed clock or radar unit used as a "speed trap" by unethical "Cops" preying in a defenseless public, is certainly no step forward.

The chemical testing device used by an unscrupulous or untrained person who twists the operation to answer his purpose does nothing to aid the cause of pushing forward the police profession. We must make sure that we have the right kind of a man in this profession—a man properly motivated, trained and dedicated before we can achieve the heights of professionalism which we are all striving to win.

Scientific devices will and are helping us to reach this goal and no one will question the statement that today, traffic law enforcement is greatly improved because of these scientific devices. But, as the scientist provides us with more and better equipment, we must provide better trained and highly motivated men to use it.

PROMOTING PUBLIC RELATIONS OF TRAFFIC COURTS

(Panel Discussion)

THE GFWC TRAFFIC COURT PROGRAM

by MRS. B. V. TODD

safety chairman, General Federation of Women's Clubs, Lake Arthur, La.

The General Federation of Women's Clubs was honored last year when the American Bar Assn., acting through its special committee on Traffic Courts Program and the Junior Bar Conference, asked our cooperation in its program to improve conditions in the traffic courts. As club leaders we are ready to recognize, study and try to cope with the everchanging situations that face our families and homes, our communities and country, and of course the world.

As the national chairman of the safety division, I was particularly pleased to pledge our organization's cooperation, for by your action, you have proved that your association recognizes the contribution that women can make—and are making—in traffic safety. Certainly, the more women become aware of the appaling conditions existing in many courtrooms today, the sooner corrective steps will be taken.

I shall discuss the role of federated clubwomen in the traffic court program as a preliminary foundation to the subject of improving the Judge's public relations. However, I believe background information of our Federation's program will be of interest.

The General Federation of Women's Clubs is the world's largest international organization of women with more than 11 million members—5¼ million American women are members in 15,600 clubs.

FEDERATION'S EFFORTS

Since 1938, the General Federation has given far more than just lip service to the crusade for traffic safety. Annually, seminars and leadership institutes for state leaders are conducted. Information regarding accident statistics and problems facing leaders in this field are discussed. Guides, leadership programs, workbooks, and promotional materials are developed, printed and distributed to the thousands of federated clubs.

Close contact is maintained with state safety chairmen through monthly newsletters and releases and our national monthly publication *The Clubwoman*. We have a state safety chairman in each state, in addition to the regional, district and club safety chairmen.

Our program of action is handed down from the national level. Definitely that is the reason we have been successful in our national campaigns for public welfare programs.

In order that our efforts may be channelled in the proper direction—that is, where they will be most effective—prior to embarking on a particular project, surveys are made to determine the need. The proposed project is discussed with representatives of leading national safety organizations.

PROMOTING TRAFFIC COURT

For instance, our program "Better Traffic Courts, Key to Safety" was not undertaken simply because we, and the American Bar Association felt it an area needing attention. Conferences and meetings were held with representatives of the Automotive Safety Foundation, the Northwestern University Traffic Institute, representatives of the Bar, and others. When the need was confirmed, we accepted the challenge presented to us by the American Bar Association.

Our purpose in the program—our objective—is to help build an understanding and appreciation of the role of the traffic court as a necessary prelude to court modernization. The heart of the project is a large scale effort to get citizens to visit their court as a *visitor* rather than a *violator*, to see how it works and how it measures up to the nationally recommended standards for court operation.

We believe this project will have important and far reaching consequences. We know that with it any judge can improve his public relations. All he has to do is to cooperate.

The women's clubs of the General Federation have long experience in rallying community support. They organize effective action at the local, state and national levels.

Since the General Federation announced its participation in the nation-wide crusade to improve conditions in America's traffic courts, representatives of various organizations have asked: "What's wrong with America's traffic courts?"—"Why is the Federation promoting traffic courts?" and "How do you expect to further this project?"

MORE TRAFFIC—MORE ACCIDENTS

First, let me state that I am not only a federated clubwoman, but also a wife, mother and grandmother. All of us know and realize what the passage of the Federal Aid Highways Act means—more and more highways being built across our nation—yes, more and more automobiles being manufactured. It has been predicted that by 1966, less than nine years away, there will be more than 90 million drivers traveling over our highways.

Need I tell you, what it will mean—more accidents, more traffic violators, and more cases brought before our courts. Unfortunately, many of these violators will be members of my own sex—my daughter or granddaughter. I believe I speak, not only for myself, but also express the honest opinion of every woman when I say "I want my daughter—my granddaughter—my son, and my grandson—to come away from the courtroom with greater respect for law and the enforcement officials.

I want the courtroom and the judges to be such that I need never be concerned about the people with whom she will come in contact. Certainly, when judges are allowed by the public, to call traffic violators before them, in groups of 10 and 15—ask if they are guilty—NOT as individuals, but as a group—and dismiss the violations with five dollar fines, we cannot expect our children—or our children's children, to have respect for law and order.

We cannot expect them to be considerate of others when the courts undermine respect for law and hamper efficient and impartial enforcement. Here is an excellent opportunity for judges to improve their public relations.

Today, the majority of Americans come in contact with the administration of justice in the traffic court. So it is important that these courts be well-administered, honest and dignified. Experience in the traffic court can make or break the individual citizen's respect for the laws that govern his conduct behind the wheel and his conduct toward his fellow men. A well-administered court should serve as a preventive of traffic accidents. The driver who leaves the court with respect is less likely to take chances with the law and become a chronic violator or an accident repeater.

The General Federation of Women's Clubs believes that traffic court improvement has the double-barrelled goal of preventing traffic accidents, and increasing good citizenship by building respect for the basic institutions of the community, the state and the nation. Now, "How do we propose to go about bringing needed changes in the courts?"

First, a special period—May 13 through June 7, was set aside as National Kick-Off Week for the Traffic Court Program. During that period clubwomen in many local areas attended sessions of the court. Working with the American Bar Assn., they talked with the judges. Using the check-list prepared by the American Bar Assn., Special Committee on Traffic Courts, the clubwomen judged the courts, its personnel and procedure.

As observers in the courts, the women gained knowledge pertinent to court practices and procedures. They determined objectively if:

—the traffic Court was dignified
—cases were handled with dispatch
—the Judge was impartial
—penalties were consistent
—records were kept of violations and the disposition of the cases
—ticket fixing prevailed.

WHAT WOMEN LEARNED

Here are some of the results from this visitation to the courts, and what the women actually found out:

First, they learned the things you—the lawyers and judges—say and do in your courts.

Second, they learned that generally speaking, the public does not hold proper respect for the traffic court. Why????

Third, they learned that in some communities, judges granted special favors and that the court failed to meet their responsibilities, and that penalties were not consistent.

Fourth, they learned that in many cases, enforcement of the law was for revenue rather than safety.

Fifth, in many instances, judges dispensed their cases hurriedly in order to get on to a more interesting one.

Sixth, the women found out that many offenders were assessed fines and placed in jails and nothing was ever done or said to help the attitude of the accused.

Seventh, they learned many people were not represented by counsel.

I need not tell you why the courts in many instances fail to meet their responsibilities. Nor am I here to criticize what has been done. However, I do feel that by the Bar and General Federation, working together to build a healthy understanding for good courts, we will have them. You, through public relations, must assist in building this phase.

The police and the traffic court make up the enforcement machinery of the traffic program in any state or community. The court occupies a key position. It can make or break any community program of law enforcement and the judge holds this power in his hands. The judge is, and will be, only as good as you and I want him to be.

HELP PUBLIC RELATIONS

Public support is a necessity if a traffic court judge is to achieve his proper objectives. If he is doing a good, conscientious job, he deserves that support. He deserves to have a decent courtroom, in proper surroundings, for it is the "people's court" where most Americans get their impressions of American justice. You must romance our nation's women through better traffic court performance. Sell yourself. Help us sell traffic court justice.

SMALL TOWN TRAFFIC COURTS

by MRS. O. G. RUSHING

safety chairman, National Home Demonstration Council, Shawnee, Okla.

Promoting the traffic court in small towns and improving public relations could be instrumental in raising the standards of traffic courts in our smaller communities.

Those who administer traffic court justice in these small communities have an almost overwhelming problem. They need help in finding working solutions. They need informed citizens who can give intelligent assistance in gaining support to carry out recommendations that come from such meetings as these.

They need people in their own home towns who understand their problems and how they are attempting to solve these problems. They do not lack critics but there is a short supply of those willing to help interpret new concepts of traffic law enforcement when the local judge tries to change the system.

Coming from a state of predominately rural population, I am interested in small town courts. This interest is not confined to my home state for as national chairman of safety for the National Home Demonstration Council, I represent a group of five million women who disseminate safety information to a vast nationwide audience. We are always looking for new findings and original thinking on our common problems.

CRITICIZE RURAL COURTS

All of our traffic courts have been more or less under fire but the heaviest blasts have been aimed at the rural courts. Here I use the official disignation of rural as referring to towns under 2,500.

Most traffic courts in these small towns are conducted by the Police Magistrates and Justices of the Peace—some good, some even excellent. Others are not so good and some tend to blacken the reputation of all such courts. Most institutions seem likely to be judged by their failures rather than by their successes and virtues, and courts are no exception to this human tendency.

A highway patrolman of a western state tells of escorting a motorist whom he had arrested for speeding to the home of a nearby magistrate late one night. He aroused "His Honor" who "held court" sleepily through a barely opened door. "That's ten dollars," he said when told of the charge, and pushed the door just far enough to thrust his grasping hand through.

The "victim" paid without a chance to say anything at all. The "magistrate" took the money, closed the door, leaving the two men standing on the porch, dazed and disgusted. As they walked back to the road the motorist asked the officer, "Is that justice in your state?"

The officer, recently graduated from a police training school which stresses that educating the offender is more important than fining him, offered no defense. "I never would have taken you there if I'd known that such shabby practices are still tolerated," he said.

This is not presented as typical but as a horrible example of how one "court" can damage the reputation of all. Motorists who feel persecuted never seem to suffer from being tongue-tied and they air their grievances far and wide and often!

POLICE PROBLEMS SAME

Perhaps we should clarify our terms. Some towns have their own police magistrates while in others the local justice of the peace serves in the same capacity. The problems of the two—whatever their titles—are substantially the same. They are elected or appointed in each township or village and are usually untrained in law enforcement. They handle such small volume that court facilities are frequently of the makeshift variety.

But the basic philosophy of modern traffic court administration should be the same whether the presiding officer is called a justice of the peace, a police magistrate, or a municipal judge. Jurisdiction and titles vary but the principles undergirding good traffic courts are the same in villages as in the larger cities.

We who are closer to the rural problem must regretfully reflect that most of the progress toward improvement in traffic courts has been made in the cities, not because their people are more honest and sincere but simply because their larger volume has demanded improved techniques. Then too, their volume has justified specialization.

The judge who handles the traffic court has to learn the newer approaches to the problems that confront him every morning when he enters his crowded courtroom. He must follow decent consistent policies or his community would demand his replacement, while the rural magistrate deals largely with persons he will never see again. He does not have to face his "public" every morning as the city judge does.

RURAL ACCIDENTS WORSE

While the number of accidents is greater in the cities, many of these are fender-benders or minor collisions while the rural accident is likely to be more serious due to higher speeds on highways. Accident facts, 1957 edition, cites traffic deaths in urban areas at 9,600 while the rural deaths in the same period were more than three times higher 30,400.

These disquieting figures make us realize that the rural highways, country roads and farm-to-market roads need good policing, good law enforcement backed by honest, fair and consistent courts, and, conducted according to modern standards developed by the American Bar Assn. In many states, particularly those which have adopted the uniform vehicle code, the arresting officer is required to take the violator with his citation "to the nearest or most accessible magistrate."

In most cases this means to nearby justice of the peace, or perhaps a police magistrate in a neighboring village. Unlike city courts, which hear cases at stated hours, these rural justices operate around the clock and hold court at some astonishing places. Stores, filling stations, garden patches, barns, living rooms and even cars have been the scene of many court decisions.

A South Carolina highway patrolman told me of hailing arrested violators before barefoot "magistrates" who leave their work in the corn field to hold court in the fence corner! This "housing" problem has faced rural courts since Henry Ford made us nomads on wheels wandering about the country.

One of our biggest challenges is how to improve the quality of justice at this level. How can we persuade these men to realize the need for improving their public relations in traffic safety courts. They have a responsibility in gaining respect for the American system of law and order.

They must realize that many people have their only court experience at the traffic court level and they judge the whole American judicial branch of government by what they see there. Their future respect or disrespect for law enforcement may rest upon what some J. P. or police magistrate does. Does he realize this? Here is where they must learn to practice public relations.

MUST IMPROVE SELVES

Are magistrates and justices willing to seek help? Judges of city courts, Keenly aware of their inadequacies in handling the staggering loads, often feel compelled to seek help. Many are willing to attend traffic court conferences such as those conducted jointly by the American Bar Assn. and Northwestern University Traffic Institute. Sometimes the judges are backed by their local communities in the form of financial aid in attending these training sessions.

I cannot think of a better way to spend money. Most rural magistrates do not have such financial aid nor do they have an incentive supplied by the community and coordinated enforcement agencies. The local magistrate or justice is on his own, without benefit of expense account, and meeting expenses from his own pocket may deter him from seeking further training even though he may realize his need for it. This I think would be a place where local civic groups—Kiwanis, Lions, Elks, etc. could help. They must be stimulated by your public relations approach.

CITIZENS SHARE BLAME

It would be unfair to load the blame entirely upon these men when we, the public, are reluctant to share the expense. But are we to blame when no one tells of the need? City courts pay their judges salaries fixed by the legislature or city governing body, and they are not dependent upon fees for their pay. Most justices of the peace get their only compensation in the form of fees which they impose in cases of conviction. Many of these men are but part-time public servants who combine this sideline with some other employment or private business.

Now let me be entirely fair about this. There are many conscientious rural judges who do recognize their local responsibilities and seek to uphold the American promise of "justice for all." Let us give full credit to those who fight daily for better standards and training and to those who every day, every night, in every state pass even-handed judgement in traffic cases throughout rural America.

Not many states require these men (and there are some women) to have legal training. Few of them handle enough cases to justify without adequate study the expense of setting up respectable court-rooms. Cases are hauled into poor court rooms: some are heard between the cracker barrel and stove in the crossroad store. Many of these magistrates do not even have access to a copy of the statutes, and some of them consult the arresting officer in the presence of the defendant about the proper disposition of the case. With such informality scanty (if any) records are kept by some of them.

LAW IMPRESSIONS FROM COURTS

Other speakers stress encouraging voluntary compliance with traffic regulations by setting up adequate deterents. This is the aim and purpose of the traffic law enforcement program to which you and I are dedicated. In this coordinated effort the court occupies the key position realizing that the defendant's experience in court climaxes his experience with the law enforcement program.

What he observes, hears and feels forms his impression of law in action. If the impression is good then the chances are he will respect the integrity of the court. Our hope in this whole effort is gaining his confidence in the good purpose of the police and the judge.

If he believes their aim is to protect him, to teach him better rules of the road, he will not leave the courtroom feeling resentful even though he has been fined. Some of these have later become the strongest backers of the educational approach to safer driving. To do this use your public relations.

Since the basic function of every well conducted traffic court should be to educate better and more responsible drivers we may well ask ourselves if this function is served when he leaves the courtroom feeling that he was the victim of an unfair arrest and trial and that the fine was unjustified.

My purpose is not to cast blame on the untrained men and the unequipped courts. We are groping for means of helping magistrates to a better understanding of their role in this national campaign to save lives and to strengthen respect for their own positions.

Those conducting traffic court conferences point to an encouraging indication. They report that an increasing number of justices, magistrates, mayors and county judges are attending these meetings. But those seeking even this brief training are still too few. Therefore, means must be found to reach more who need it. Some of them have been asking if trained sessions, especially tailored to their needs, could be provided so that they can learn approved procedures suitable for their courts.

The traffic court conferences have brought vast improvement over the past two decades, but at most they are only for five days' duration and many of them meet for but one or two days. Effective as they have been it is obvious that no legal education can be compressed into so short a time. The rural magistrates need a realistic approach to their own set of problems which differ from those of city policemen and judges.

FINANCE COURT IMPROVEMENT

In considering the part of our subject which deals with how improved public relations could help raise the standards of traffic courts in smaller communities may I suggest some measures that might be considered. First, we and the judges can undertake the job of getting the ideas across to the residents of our communities and to convince the taxpayers that it would be money well spent to provide training.

At public expense rural judges could be offered a short course in the fundamentals of judicial administration and at least the basic principles of law. These people are expected to administer the law, and many of them have no acquaintance with it. They need to understand what is expected of them.

Second, we could work to abolish the fee system: third, we can urge the use of a uniform, nonfixable traffic ticket. Fourth, we can advocate the establishment of county courts of record. The same automobile that makes these courts so necessary now also make it unnecessary to have so many justices so close to hand. People can drive a few miles to one central county court that is properly staffed, and equipped. The number of justices was determined back in the days of the horse and buggy or even walking to see the magistrate.

A few states have already replaced some local courts by courts of a wider jurisdiction. Fifth, we can try to persuade the judge to explain his rights to each defendent as he comes before him. He should also explain the reason for the fine, being sure that the person fined understands why he pays. The judge should establish consistent policies and practice strict impartiality toward all who come before him.

Sixth, we can help by supporting those who are doing a good job. It has been said that some of our best traffic judges are to be found in rural areas (may their tribe increase)! But many still need help and encouragement and training. These we can sponsor.

However, the long-time solution lies in changing the court system at this level. Some states have already made a beginning by putting at least some of their magistrates on a straight salary (Indiana, Arizona, California) and requiring some legal training. In one state (New Jersey) such courts have been made a part of the overall judicial system under the direct supervision of the chief justice of the state's Supreme Court.

These welcome symptoms of progress represent only a slight beginning. But the movement is gaining and we can help accelerate it. In most states the justices and magistrates are constitutional officers and cannot be eliminated except by constitutional amendments. Those of you who have worked for judicial reform through your state legislatures know that it is a long, slow process.

JUDICIAL CHANGE SLOW

One reason that change in this area comes so slowly is that many consider the justice courts, "the poor man's court," dispensing justice after working hours, within walking distance of home, etc. Often, too, the rural people cherish the tradition of the "friendly" squire in their midst giving homely advice along with legal services.

Perhaps we can urge our home communities to accept some readjustments in our legal and judicial system. But we must face the fact that change is always resisted and we may have to accept some temporary compromises. Many rural courts can be improved even within the present limitations. They must be improved. We must see that never again can a leading women's magazine publish an article entitled, "Traffic Courts: Blot on American Justice." (McCalls, June 1956)

JOB OF EVERYONE

We must all undertake the job of public relations in teaching the philosophy of traffic courts that has been evolving and growing, a philosophy based on the idea that improving drivers' attitudes is more important than punishing them. We can offer the judge our help in understanding his problems and his needs, and communicating his hopes for his court to his constituents.

We can applaud his efforts in the right direction. We can all back the judges who are trying to feel their way forward. Perhaps they would take the next step if they knew the public would accept it. If you and I work and we all work to improve our traffic courts we will speed the day when no police officer or patrolman will have to apologize to anyone for taking him before a justice or magistrate.

Let us work toward the time when every motorist who appears in any court with a citation will leave with a clearer insight into the overall program for safe driving, this we must do! But you, too, must explain, and help us to understand what needs improving.

Practice good public relations, teach us your problems by using public relation techniques to help all of us get better traffic courts.▲

REMARKS OF MRS. AGNES D. BEATON

director, women's div., Automotive Safety Foundation, Washington, D. C.

I certainly need not dwell upon the importance of good traffic courts to safe highway travel. We know that without good courts, enforcement and indeed respect for laws generally can be materially weakened. Conversely, good courts strengthen our entire traffic safety effort.

I will direct my remarks particularly to the public relations aspects of a traffic court program—the job of building public understanding and support and how women can help.

When I use the term public relations, I have in mind something other than mere publicity or what we usually think of as the work of press agents. Public relations for the traffic court begins with the court itself. There is nothing that communications, civic organizations, or anyone else can do to "sell" a court, unless the court itself is operated on a sound basis. Public relations is in no sense a magic art. It can't make something out of nothing.

To use a simple parallel: we all agree that it's a waste of time, effort and money to try to build public acceptance for something that is inferior. Take a product, for example. By a high-powered promotional campaign we might be able to sell a homemaker a new brand of soap, for instance. But as soon as the customer had sampled the product, used it and found that it was inferior, that it failed to measure up to claims, there would be no more sales, no matter how artful the hucksters.

CAN'T SELL INFERIOR GOODS

The same thing applies in the case of institutions. If we want to build good will, understanding and support for a traffic court, we first have to make sure that we have a quality product to offer. Otherwise we're wasting our time.

Because I have been privileged to work with a number of our major national women's organizations on this matter of traffic courts, I would like to approach the subject with particular emphasis on the role of women's clubs.

Suppose that a women's club, through its safety committee or its public affairs committee, wants to be helpful in support of the traffic court. How does the club begin?

The first step is fact-finding. Careful thought and study should precede any other action. The members should first understand what they have at present in their traffic court operation. Before seeking to bring about what they think of as "reform," they should determine that there is something which really needs changing. It is not safe to assume that any change necessarily would be a change for the better.

It may well be that the court is a good one but needs understanding friends to help promote its objectives. If it is not good, what needs correcting? Perhaps the judge is doing the best job that he can under limitations which are beyond his own control. Is the judge simply imposing fines, when he thinks the offender should be jailed, because his authority is limited?

Maybe the judge is fighting a lone battle to have such a statute or city ordinance changed. He may recognize the inadequacy of his penalties but be powerless to change them without help from the community at large.

Is the judge's case load so heavy that he lacks adequate time to develop a more constructive court program? Does he have a dignified court room? Is he interested in seeing that the violators who come before him become better drivers in the future? Does the court have facilities for showing safety films to assist with driver improvement? At the opposite pole, does the judge say, as some do, "I'm running a court, not a school. I've no time for these new fangled notions that traffic courts should be educational institutions."

PUBLIC'S ATTITUDE

What about the attitudes of local citizens? Do the people in the town favor a cafeteria court instead of something better? Do they want moving violation cases to be tried in court? Or do they favor a system which permits a forfeit of collateral even for serious moving violations?

On the other hand, does the public regard its traffic court as an important source of revenue? Does it force the judge to run a fining mill? Is the court willing to have juvenile sessions aimed at correction more than at punishment? Or does the public look on this as coddling the offender? These and many similar questions should be investigated and answered before any other action is taken.

After looking over the court situation and deciding where they can help, where do the clubwomen turn next? Are they competent to judge how much reorganization, or what kind, is needed? They are not lawyers. So perhaps one wise step would be to talk to some of the lawyers who practice in traffic court and get the benefit of their thinking. Surely, these members of the bar are in a position to determine whether the fault lies in the limitations of the system or the indifference of the judge.

Members of the bar will be in a position to know whether the judge is compelled to operate his court under rules set up by unrealistic state law, city charter or ordinances.

If an inflexible city ordinance is the obstacle in the path of modernization, perhaps the place to start working for a change is with the city council. On the other hand, if the court operates under the provisions of state law, then the approach may have to be with the state legislature.

ENLIST GOVERNING BODIES

Understandably, if a club is dealing with a city ordinance, the job is likely to be easier than if the state legislature is involved. Local governing bodies are usually more approachable by community groups and more aware of and responsive to local needs. City councils are accustomed to hearing the petitions of local people.

One way to approach the problem is to have members of the club talk with the strongest member of the council—report to him what they have found and discuss with him the various remedies that may be possible. If he is responsive, offer him help in enlisting the support of other organizations and townspeople generally for whatever action needs to be taken. If he is not persuaded, approach other members of the council.

When the fault lies, not in the legal organization, but in the attitude of the judge, then an entirely different method of procedure is called for. Assume that the judge has been on the bench for years, is set in his ways, is unreceptive to new and better ways of court administration. What can a women's club do in a situation like that?

MEET WITH JUDGES

One approach is to have several members of the club, selected for their tact and good judgment as well as their knowledge of the court situation, meet with the judge and talk things over. Even jurists, who had previously resisted change most stubbornly, were won over when they became convinced that through traffic court improvement they could do the community a real service and at the same time do credit to themselves as men of insight. In their desire to have their services to the community recognized and appreciated, most judges are just as human as any of the rest of us.

But let's assume that the judge refuses to move out of his established rut—what then? If he is an elected official, the sponsors of court reform might well begin looking around for a strong candidate to oppose him in the next election. The need for court modernization should be made a prominent issue of the campaign.

If the judge is appointed rather than elected, the club should meet with the appointing officer—the mayor, the governor or whosoever it might be.

Let me emphasize that the replacement of an incumbent judge by a better qualified individual can best be accomplished if the ordinary considerations of partisan politics are left aside—if the campaign is conducted in terms of principles rather than personalities. The real issue of community well being and traffic safety must always be kept in the forefront.

QUOTES JUSTICE VANDERBILT

The late Justice Vanderbilt, who was one of the pioneers in the traffic court modernization movement, once said: "Laws and courts have never been changed by judges or lawyers, but by the overwhelming demands of laymen."

Justice Vanderbilt advised: "If you really believe in law, if you really believe in respect for law as a necessary foundation of good government and of safe living, if you believe those things, you will start with your traffic court and you will change it, you will modernize it, you will simplify it, you will make it effective. And how will you do it? Not by asking the chief justice to do it, not by asking the governor to do it, not by asking the legislature to do it. You will do it by organizing laymen—the influential laymen in all walks of life—to do the job. The forces of inertia, the forces of conservatism are all stacked against us, and we have to appeal, and we should in every state for the aid of competent laymen and laywomen."

The task that is outlined in the paragraph I have just quoted is anything but an easy one. It can't be accomplished by a single organization, working alone. But everything has to have a beginning, and a single organization can provide the initial impetus that will rally others. In this light it seems appropriate to mention the work that one of our major national women's organizations now is carrying forward.

WOMEN HITTING COURTS

The General Federation of Women's Clubs, representing more than 1,500 clubs, now is carrying on a nation-wide traffic court improvement program. It has extended citizen support and sponsored community action toward improving traffic courts in many areas.

Federation members have enlisted other civic-minded groups of women, sometimes cooperating through local safety councils. In other instances they have taken the project to the Interclub Council in their community and made it a united effort of many women's organizations.

The General Federation has stressed that better traffic courts are the key to safety and has urged citizens to go to their courts as visitors and not as violators.

This program was initiated by the American Bar Assn.'s Traffic Court Program with special cooperation from the Federation. It is an invitation to citizens to view the administration of justice in the traffic courts of their home state and home community. The judge may speak briefly to these visitors, explaining what he is attempting to accomplish, and answering such questions as may be asked.

Citizens who go to court as visitors are given a check list of recommended standards of court administration. Thus they are able to evaluate what they have seen at first hand, and form some judgment as to how well their local court stacks up.

At the same time, this program gives the judge both the incentive and the opportunity for a critical self-appraisal of his own institution and its operations.

Many judges might be glad to reorganize their outmoded courts if they had some assurance that the public would accept and support some of the changes that might be required—and some of these might be fairly drastic changes. It is certainly understandable that no judge would want to cut himself off from community favor by running too far ahead of public opinion.

So it is readily apparent that through its current program, the Federation is helping to build a climate favorable for modernization of an increasing number of traffic courts. It is a program that holds great promise for the future and that may bear fruit for years to come.

It is a perfectly human trait to become impatient when something we are seeking is slow of realization. But I think that it is important to recognize—and I think that most clubwomen do realize—that it is futile to try and force something before the citizens of the community have been adequately informed both as to the need and the desirability of what is being sought. I think that we women recognize the need for patience, for hard work and for perseverance if we hope to bring about traffic court improvement or any other major advance in the realm of traffic safety.

In whatever community you may live, whatever your local traffic safety program may be, may I urge all of you, if you haven't already done so, to enlist the support of your various women's organizations. I can assure you that they will rise to the challenge and you will find them valuable allies in any program that will make your community a better one for its citizens.▲

REMARKS OF MRS. JOHN E. KRUEGER

Wisconsin Governor's Traffic Commission, Madison, Wis.

I shall discuss driver improvement schools as an effective public relations and safety promotion instrument of our traffic courts. Before commenting on Wisconsin's experience in this field, permit me to quote briefly from three notable sources . . .

First, a statement by J. Stannard Baker, director of research, Northwestern University Traffic Institute, from the book, *Judge and Prosecutor in Traffic Court:*

> "Traffic Schools conducted in cooperation with the courts are an aid to driver improvement.
>
> "They have not been fully developed and we are therefore not getting as much as we can out of them. Unfortunately, too many of these schools are viewed by the court and citizens who are sent to them, not as training, but as punishment.
>
> "Going to school for punishment is bad education."

Next, a statement by George Warren in his book, *Traffic Courts*, published under auspices of the National Conference of Judicial Councils. Says Warren:

> "The success of a violators' school depends on the manner in which it is operated, the enforcement of sentences to it, and the manner in which it is used by the court.
>
> "Experience has shown that well designed 'courses' are not only effective educationally, but are interesting to those in attendance and leave an imprint that is carried away."

TYPES OF VIOLATORS

Warren says that the general types of offenders for whom the school is most effective are:

> Violators who lack mechanical driving skill.
>
> Those who are ignorant of important traffic regulations.
>
> Drivers who show an inability to meet traffic situations.
>
> Offenders holding erroneous attitudes toward safety and who appear to be amenable to educative methods.
>
> Violators on whom a fine would be an undue hardship, or whose fine would be paid by another, or whose family

would suffer as a consequence, and who —at the same time—need a human appreciation of the traffic problem.

Violators to whom a fine means little

Warren concludes that the school is basically "an appeal to reason and conscience that will be accepted appreciatively on the part of those who are traffic offenders through either ignorance or thoughtlessness."

Now let me refer briefly to the National Safety Council's *Public Safety Memo No. 89*, which is a 21-page report on driver improvement schools. The Council emphasizes in this memo that driver improvement schools "are designed to instruct and educate and are not intended to be used as punishment."

The prime objective must be to prevent accidents. This is done by instilling proper attitudes in the violator or the volunteer who attends the driver improvement school; and by improving his knowledge of traffic laws and safe practices, his driving techniques, and his appreciation of many other factors involved in safe conduct at the wheel.

The results of a well-planned, effectively-administered driver improvement school are: an increased number of well-behaved motorists, a good working relationship between the court and other agencies in accident prevention, and excellent public relations for the court.

Before this type of school is undertaken, there are a number of steps that must be taken:

1. There must be a good instructor. He must be completely "sold" on the importance of his job. He must be well-informed on traffic matters. He must be enthusiastic. He must cause the students to feel they have been enrolled for the purpose of self-improvement, not punishment.

2. The school should not be called a violators' school. Students should include both those persons referred by the judge and additional citizens who voluntarily attend because of their desire to improve themselves in their role as motor vehicle operators.

3 The time and meeting place should be appropriate and convenient. Scheduling can be set up on advice of a school administrator. The place should be in a centralized location, with an educational atmosphere, parking space, and facilities for outdoor demonstrations.

4 Secure adequate financing. A definite budget should be set up. The instructor should be compensated for his services, and materials may have to be purchased. The expenses might be shared by the police department and the educational institution. Safety councils and insurance groups might provide some assistance, particularly in donating equipment.

5. Arrange for proper equipment and supplies. For illustrative and testing purposes, a school may use motion pictures, film strips, picture slides, magnetic boards, photos, spot maps, blackboards, posters and psycho-physical testing equipment—secured on loan without fee from various sources. Demonstrations can be effective —especially those which show how radar is used, how chemical tests determine degree of intoxication, and how many feet are needed for bringing an automobile to a stop from a set speed. Of course, the school also has need for booklets and pamphlets, attendance records, paper and pencils for note-taking, and some sort of certificate giving recognition for successful completion of the course.

ATTENDANCE CONDITIONS

Normally, a traffic court judge refers a violator to a driver improvement school under one of the following conditions:

—Suspend the fine or jail sentence on condition that the violator satisfactorily completes the school.

—Suspend the driver's license until the school course is completed.

—Attend school with no suspension or other conditions.

—Or—continue case with proposal that it be dismissed as soon as the violator successfully completes the school course.

The course outline should be flexible enough to permit use of occasional guest instructors, but fundamentally—the course should cover an orientation period, a presentation of the national and local traffic problem, causes of accidents, laws and ordinances, the purpose of enforcement, the role of traffic engineering, public education and cooperation, driver attitudes, and a question-answer period.

Now—permit me to describe briefly what is being done in Wisconsin. Under state law, a trial court judge may require a convicted motorist to attend a traffic safety school. The law specifies that the course of instruction must be approved by the Commissioner of the Motor Vehicle Department.

In Wisconsin, we have schools for driver improvement in Appleton, Beloit, Manitowoc, Sheboygan, Stevens Point, Superior, West Allis, and Milwaukee County. The Milwaukee County Safety School is for juvenile traffic violators only, but plans are being laid to enroll adults as well. In the spring of 1954, when the Milwaukee County Safety School was started, *The Milwaukee Journal* Radio Station—WTMJ—put a series of six weekly sessions on the air, which is a splendid example of public service by a broadcasting station.

BELOIT SAFETY SCHOOL

In Beloit, Municipal Judge Arthur Luebke reports an average attendance of 22 persons in the safety school held at the Vocational School. Five weekly sessions comprise the course, with each session lasting two hours. A small fee is charged for attendance. The fee of $2 is paid at the court.

The average age of the Beloit student is 20. The instructor, Noah Shaw, says, "My students come to me with a chip on their shoulders. They have a feeling that the other guy — not themselves — should have been arrested. At the first session of the class, I just ask them if they have any questions. The questions reflect the resentment that they have with being arrested and sentenced to my class. Pretty soon, the whole class is talking; everybody is itchy to get in his opinion. And they start educating themselves."

When Shaw was interviewed recently by John Newhouse, a staff reporter for *The Wisconsin State Journal* (Madison), Shaw said, "Generally someone gripes about truck drivers, cabbies, and the old ladies who drive too slow. When they get off base, I ask them what their insurance rating is. It seems to slow them down."

Shaw has a good way of turning the tables on any student who sleeps or pretends to sleep as a protest at being in school. He says, "I point a finger at the person and wait until he wakes up. Then I tell the class about the man who slept through one of my classes and the next night went out and slept in his car, while driving. He was killed. A lot of people knew him. It makes a pretty effective example."

Shaw also tells of a boy who habitually drove around with three older boys. He was in the Beloit Safety School the night that the news came through that his three friends had been killed in a head-on collision. That boy would have been with his friends had it not been for a session of the Safety School that night.

Judge Luebke reports that less than one per cent of the people taking the Beloit Safety course are brought before his court a second time. At Manitowoc, Judge Harold Mueller says less than five per cent of that city's Safety School students come into court a second time for violation of traffic laws in Manitowoc County.

I have spoken to Wisconsin's Motor Vehicle Commissioner, Melvin Larson, about the value of driver improvement schools. Commissioner Larson told me, "It is my hope that many more traffic judges will soon endorse a school of this type in their communities. I feel strongly that in many cases, paying the penalty of a fine does little to make the defendant a better driver."

Commissioner Larson's concern over the need for additional driver improvement schools in Wisconsin is heartening to me as a citizen, because this motor vehicle administrator heads a department which includes the State Patrol, the Driver License Examiner force, the registration and licensing of motor vehicles and operators, and the public information and safety promotion activities in the field of traffic accident prevention in Wisconsin.

The safety division of our Motor Vehicle department has just published a booklet called, *Trial by Accident*. This pictorial publication was especially designed for judges to present to traffic violators. It was distributed to every judge in Wisconsin, with the promise that driver improvement schools may have as many copies as needed

—plus any other assistance that the Safety Division can provide.

Let me read from this letter issued by our Governor, Vernon W. Thomson, dated September 25, 1957, and addressed to traffic court judges, chiefs of police, and directors of vocational education:

Gentlemen:

It is generally recognized that public education is as important as traffic law enforcement in any realistic approach to the traffic death problem. For this reason, I am writing to you, as responsible authorities in the communities of Wisconsin, to urge your serious consideration of a program of public education through Traffic Court Violators' Schools.

The purpose of these schools is not punitive in nature. Emphasis is placed upon the re-education and re-training of drivers who have been brought to court because of traffic law violations.

Naturally, not all traffic law violations are deliberate. Many drivers fall into dangerous and illegal driving habits without realizing it. However, fatal traffic accidents caused by careless violations are no less tragic than those caused by deliberate recklessness. These schools serve a constructive purpose in "refreshing" the drivers' awareness of their personal responsibilities on the highway and of the need for careful driving habits at all times.

Several Wisconsin courts are now requiring certain violators who come before them to attend special traffic court schools conducted in cooperation with local vocational schools. One of these courts reports that less than one per cent of the students attending its school have ever been arrested again for a traffic violation.

Recognizing the value of such schools, the recent legislature adopted changes in the law to authorize them and make them more acceptable to everyone concerned.

Since the ultimate purpose of our traffic laws is the prevention of accidents which may result in injury or death, such schools can and do serve as constructive a purpose in the promotion of safer driving as the collection of fines in arbitrary punishment.

May I personally urge you, if you have not already done so, to consider seriously the establishment of such a school in your jurisdiction. The Safety Division of the State Motor Vehicle Department will cooperate wholeheartedly in supplying information concerning successful schools in Manitowoc, Beloit, and Sheboygan, and will advise you as to how an approved school may be established in your community.

I am confident you will agree that in view of our responsibility to the public, the growing traffic accident problem makes it necessary to use every possible means to eliminate the causes of senseless and tragic highway deaths.

With kind regards,

Sincerely,

VERNON W. THOMSON
Governor

ARE DRIVERS FAILING OUR NATIONAL SAFETY MOVEMENT?

by ARTHUR S. JOHNSON

vice president and manager, Engineering Dept., American Mutual Liability Insurance co., Boston

Unfortunately, the answer to this vital question is both yes and no. From a standpoint of statistical analysis, remarkable improvement in accident control has been effected through better law enforcement, better highway engineering, better automobiles and better drivers.

In 1941 the number of persons killed in highway accidents per one hundred million miles driven was 12.1. In 1956 the figure was 6.4. If there had been no improvement in accidents and controls, if the 12.1 death rate had held true in 1956, more than 76,000 people would have been killed on the highways. On this basis the National safety movement has been successful.

But, the fact still remains that the National death toll from highway accidents is holding at the 40,000 level, the injury rate at close to one and a half million and the number of accidents per year in the vicinity of ten million. On this basis our National safety movement is falling short of success.

CAUSES OF ACCIDENTS

In tackling the problem of how to stop these 40,000 deaths a year and cut down on the appalling number of accidents occurring, our National safety movement must find positive answers to two very basic questions—first, what is it that drivers are doing that causes the accidents and second, why do drivers continue to do these accident-making feats? Actions describe the first question; motivation, the second.

Much has been done in investigating and statistically analyzing what any given driver has done that led to his highway accident. In its statistical report for the year of 1956 the National Safety Council estimates that in every 100 fatal accidents 64 per cent of the drivers violated a safety regulation. From the standpoint of all accidents, six out of 10 drivers committed some violation.

Here are the reasons stated—excessive speed, failure to yield the right of way and failure to keep to the right of the center line and under influence of alcohol. In a special study of Christmas holiday accidents the Council reported that 55 per cent were due entirely or in part to alcohol; over Labor Day the comparable figure was 48 per cent.

To get a clearer picture of the behavior of drivers, the Institute for Safer Living of the American Mutual Liability Insurance company conducted an extensive survey which included the drivers of *both* sexes, all ages, and in all sections of the country. It was evident from the answers that a vast majority of American drivers look upon highway regulations casually. Many look upon them with disdain.

In answer to the first question which asks, "Can you honestly say that, when you are behind the wheel, you never violate a highway rule or safe driving practice?" Nine out of 10 drivers admitted that they broke rules of safe driving. For example, 50 out of every 100 drivers decide for themselves what their speed limit shall be, regardless of the posted limit. Of the 50 drivers who take matters into their own hands, 10 exceed the speed limit occasionally, 30 exceed it as a practice and the remaining 10 drive under it.

EXCEEDED SPEED LAW

In a special investigation of violators made by Massachusetts state police, out of 212 drivers stopped, 160 were exceeding the speed laws. One-half of these had received *previous warnings for speed violation* and 91 per cent admitted that they deliberately exceeded the speed limit.

How do drivers behave in regard to passing on curves? Only 60 out of 100 said they never passed under any conditions —40 out of 100 said that if traffic were light, they would and did pass on curves. Just about the same relationship held true in regard to attitude about passing on hills—

60 per cent always stayed in line, 40 per cent would pass if conditions seem right.

How does the average driver behave in regard to "stop street" intersections? Seventy out of 100 drivers stated they always came to a complete stop, but 30 per cent said no—they only "slowed down enough to make sure that cross traffic was not coming."

On the question of drinking, respondents were asked, "How many drinks do you estimate you can take before your driving skill and judgment are affected?" Only seven out of 100 drivers said they never drink if they are going to drive; 32 out of 100 felt they could handle one drink; another 27 believed they could have two drinks; 18 saw no problem in driving after three drinks; and 13 felt that four drinks were safe enough and three could take more.

POLICE TOO EASY

The investigation took a look at driver attitudes toward highway law enforcement. This is what it showed—75 per cent of the drivers felt that not only were there not enough highway police, but that they were too easy on violators. As for attitude toward courts, 88 drivers out of 100 felt that the courts were too easy on violators.

The final question in this investigation had to do with attitude toward professional driver training—43 per cent believed that it is essential for all drivers, 48 per cent necessary only for some, and a scattered few feel that driver training is not needed at all, is a racket, a waste of time and money, or can be done better by parents or friends.

On this subject of driver training, important information was revealed by the State Police investigation of the 160 speed violation cases, which indicates a "good idea but I don't need it" attitude. Only 13 per cent of all these erring drivers had had driver training; 80 per cent had received their driving instruction from a friend, a member of the family and the remainder were self-taught.

There is much evidence here and, in all other available statistics, to indicate a regular, continuing violating of highway regulations and safe driving practices. It is most interesting to consider why this is so. Alfred L. Moseley, consulting psychologist, for the Institute for Safer Living, who has been conducting parallel research on the subject with drivers already involved in serious accidents and with police who handled them, attributed this widespread attitude to three factors:

1. Widespread unconcern about being "pinched" on the highway.

2. A lack of fear of being in an accident.

3. A conviction that being required to drive safely or obey the law is an infringement on their personal rights.

These conclusions are not superficial thinking or academic theorizing, but rather are based on roadside interviews with drivers involved in fatal accidents. Such would come closer to representing the truth than if it were secured after "advice and counsel."

As background for the attitude of no fear of the law, Moseley concluded that it exists because drivers find it relatively easy to get a violation fixed, or because they know that the local police and courts tolerate reasonable excesses, or because they have attained either a social or a job status in life which makes them feel they are bigger than the law, or they deliberately take a calculated risk of being caught.

BIGGER THAN LAW?

On the attitude of having no fear of being in an accident, Moseley found much evidence that drivers, unless they had previously been involved, could not visualize the possibility "that I could have an accident" or its impact on them and others. He found that drivers who were stopped for a violation had no notion that their actions were unsafe.

A certain percentage of the drivers included in Moseley's investigation made it quite clear that they resented being told by sign, by control light, by police, how they should drive their automobiles.

It may be that the big job to be done in understanding the causes of accidents lies in the psychological and psychiatric fields. Surely these three conclusions seem quite common sense.

Equally important in finding out why drivers do the things they do to create accident situations is to find out effective answers of control. While driving behavior has not been explored psychologically, and needs a great deal to be done, it is sufficiently clear to indicate some measures that can be taken along with improvement in older safe driving controls.

I do not believe that the answer lies solely in more enforcement. Safe driving is essentially a right behavior that lies between free uncontrolled exercise of one's rights and obedience to exact law. Since no one can possibly do as he pleases on the highway, there is little free choice beyond where to go, when, and in what vehicle. How one behaves getting there has to be very much controlled.

DRUNKS OFF ROADS!

Where statutes apply, such as all are familiar with or must be in the motor vehicle law and traffic ordinances, enforcement must be made sure. This may be unlikely so long as people seek privilege. I will not crusade this point, except to say that serious accidents will not be stopped until drunken driving is stopped.

The most of the answer lies in everlastingly hammering through educational processes the rightness of safe driving practice and that safety lies in obedience to safe driving practice.

It is not funny to pass a red light, on a hill, or fail to bring one's car under control at an intersection. Neither should these regulations be difficult to accept as self-imposed control.

In considering the vast strides forward of the past few years in highway engineering and building, and in automobile engineering and manufacturing, we may well ask, "What is wrong with our National highway safety movement?" The answer appears to be: "Nothing that cannot be fixed by the drivers themselves."

HUMAN BEHAVIOR AND ITS RELATION TO TRAFFIC ACCIDENTS

by EARL D. HEATH PH.D.

assistant professor of education, div. of general education, Center for Safety Education, New York University, New York city

There is considerable evidence to indicate that the primary cause of the majority of traffic accidents lies neither in the vehicle as such, nor in the condition of the roadway, but rather in that combination of personal factors which make up the driver. Accordingly, in recent years the human factor has been a major consideration in vehicle and roadway design as well as in the establishment of licensing and employment standards and in the establishment of training and retraining programs.

During the past few years there have appeared two exceptionally significant and complementary contributions to the field of safety which have pointed up the emphasis in this direction. One of these is the compendium of research entitled: *The Human Element in Industrial Accident Prevention* prepared by the staff of the Center for Safety Education at New York University; the other, *Human Variables in Motor Vehicle Accidents* prepared by the staff of the Harvard School of Public Health.

These two publications did much to focus attention on what had been done, the limitations of findings reported, and what remained to be done in the area of human behavior and its relationship to accident causation. They acquainted many with the results of hundreds of man years of research. Further, they point the way to the numerous relatively untouched areas which individuals or groups may desire to explore.

RESEARCH CONCLUSIONS

Representative of the findings reported are: 1) that the more reliable studies are consistent in their inability to find significant relationships between psychophysical functions, as currently measured, and traffic accident and violation involvement; 2)

that the search for explanations of driving performance is being channeled more toward psychological and sociological lines and away from those of a psychophysical nature; 3) that much more knowledge is needed about the effects of drugs on driving performance; 4) that knowledge of recommend ' driving practices is no guarantee of their faithful observance; 5) that the development of driving skills above a certain minimum represents an investment of time and effort which possibly could better be spent in developing attitudinal and other factors; and 6) that the bases upon which drivers are now labeled as either "good" or "poor" may well be open to question.

When it is remembered that most traffic accidents are the result of a combination of variable factors most of which are not readily identifiable, the varied approach to the problem which is in evidence today becomes quite understandable. It is difficult to find an area of interest in which traffic safety is not a topic of discussion, if not an object of activity. Over the past several years we have seen a steady increase in the number of groups, professional and nonprofessional, which have directed efforts toward this problem. The intensity of this activity, likewise, is increasing.

What are some of the newer developments in the search for more information on the driver and what are some of the techniques being used in the application of reliable research findings? While numerous individuals and groups are undertaking such investigations and applications, I shall confine my remarks to the work of the Center for Safety Education, work which is being guided by Dr. Leon Brody, Director of Research at the Center.

PERCEPTUAL ABILITIES

One of the projects now underway has to do with the development of perceptual abilities . . . teaching drivers how and what to see rather than indiscriminate seeing . . . developing in the individual the ability to interpret the driving scene for what it is and to select his driving actions accordingly. Among the methods by which this problem is being approached is the medium of film slides.

Color slides of driving situations representative of those encountered by the motorist in his everyday activities are made, then analyzed, and potential hazards identified. As the slides are presented to the subject, he is taught to interpret the driving scenes depicted and to indicate the necessary adjustments a driver would make in such a situation.

Attitude Assessment and Improvement

The search still is underway for improved ways of identifying, assessing, and improving attitudes which are believed to have special application to driving situations. A staff research currently underway and which is expected to last for three years is exploring this area. Unfortunately it is not possible to report procedural details or results at this time. It is the hope of the Center staff that the approach being used, which is novel, will also be fruitful.

A new approach to the problem of teaching for attitude improvement has been reported by Arthur Mahony. Formerly of the Bureau of Traffic Safety of the State of New Jersey, Dr. Mahony used the neurological approach in analyzing driver performance and in suggesting methods for the modification of attitudes. A guidebook containing suggested methods for applying the findings of this study is being prepared and should prove of considerable interest to those responsible for the education of driver personnel.

Licensing Standards for Commercial Driving School Instructors

To give some idea as to the breadth of the attack on traffic accidents through efforts directed toward the driver, I would like to mention a new evaluation technique developed by the Center staff at the request of one of the states for use in screening applicants for licenses as commercial driving school instructors.

A three-phase examination, which supplements the conventional requirements, consists of: a) a test of the applicant's driving ability, b) his ability to instruct others, and c) his ability to evaluate the driving performance of subjects so instructed. Such a requirement in the licensing of instructors is believed to be a much needed addition to the knowledge tests of driving practices and of the state motor vehicle code, physical qualifications and the search of the applicant's driving history.

Seeking to improve teaching techniques by applying research findings, the Center has been experimenting with the possibility of attacking traffic accidents through the medium of group discussion-decision. Decision-making has been defined by French and Willerman as being primarily a process of setting goals for the future behavior of the group members, rather than a problem-solving discussion concerning means.

GROUP DISCUSSION—DECISION

It is believed that this approach may prove of considerable value in tackling problems which heretofore have seemed rather inaccessible and for which conventional teaching methods seemingly were not the answer. The use of an educational method such as this in the effort to reduce traffic accident offenses is based upon an assumption that there are personal attributes which can be conditioned so as not to result in accidents.

Still another study being conducted by the Center is concerned with the performance of license applicants on the road phase of the examination procedure. In addition to this, the Center is providing consultative services in the design, operation and evaluation of traffic court schools and traffic accident prevention clinics.

Work also is underway on a publication which will popularize the findings of the Symposium on the "Medical Aspects of Motor Vehicle Accident Prevention" held at the New York University-Bellevue Medical Center in the spring of 1956. The Center for Safety Education is cooperating with the American Medical Association in the development of this brochure which will be made available to physicians throughout the country.

During the past year, these theses on the doctoral level, which dealt with the driver, were completed. One of these, entitled "Teaching for Attitudes Conducive to Safe Driving," is the study mentioned earlier which was conducted by Arthur L. Mahony, in which the neurological approach was used.

My own study, entitled "The Relationships Between Driving Records, Selected Personality Characteristics and Biographical Data of Traffic Offenders and Non-Offenders," gave indication of the impulsive and the highly sociable nature of the traffic offender, as well as the value of biographical data in identifying offender populations. The complete studies are available on microfilm or they may be obtained from New York University on an inter-library loan basis.

GRADUATE CONTRIBUTIONS

Several other researches are underway. These are being conducted individually by graduate students and each ranges from one to two or more years in duration. Among areas being investigated are many of those problems suggested in the research reported in the two summaries of the literature mentioned earlier.

I know that I haven't fully answered the question: "What's New in Traffic Safety Research" from the standpoint of the human element. The professional journals contain an increased number of reports of investigations underway, and we at the Center share in the hope that these studies will contribute to the solution of the traffic problem.

We are pleased to learn of the extent of developments at the Highway Traffic Safety Center at Michigan State University and the increased activity by other institutions and agencies, for it is through such efforts that many of the problems of human behavior and its relationship to traffic offenses will be reduced in complexity, if not solved.

AUTOMOBILE CRASH SAFETY RESEARCH

by EDWARD R. DYE

head, safety design research dept., Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y.

One of the basic principles of protecting a passenger during the automobile crash period is to keep him from becoming a free missile. As a free body, he could injure himself by striking some object within the car or he could be thrown out where he would have twice the chance of being injured.

Last year I prepared a report on "The Development of the Automobile Safety Belt." The seat belt, we all agree, is just a preliminary but effective step in packaging the passenger. It has its advantages such as ease of installation and it can be installed in any car. But, we must admit it will never be used by 100 per cent of those who ride in automobiles.

We know many will not take the trouble to put on a seat belt. Others believe that death and injury statistics are something that is computed around the other fellow. They are not interested in this safety business at all. Therefore, the best crash safety improvements (as measured by total number of death and injuries reduced) will be those which are installed in the car ready to serve when the crash does occur.

Ideally, these devices should require no attention at all from the passenger (he gets his protection whether he wants it or not). Doorlocks, padded instrument panels and padded windshield headers are in this category. None of them, in my estimation, are nearly as effective as a good seat belt, but they have the real advantage in that they are there.

UNGUIDED MISSILE

To find how best to protect the lazy or careless passenger who won't wear a seat belt, engineering information must be obtained upon which to base the design. First, we have to consider such a passenger as a free body or "unguided missile" during the crash period. To get engineering design data on where and how much protection should be provided, we had to make a time-motion study of the passenger's action. The time-motion studies were made using anthropometric dummies inside an automobile snubbed to a regulated crash stop.

We made a short movie of crash snubbing tests on the Liberty Mutual Insurance Company sponsored project. Through frame by frame studies of the high speed movies, we were able to determine probable hit points, flight path, velocity of striking, attitude of body at instant of impact and the angle of the impact surface with the flight path.

Flight path data was useful in determining the possibility of hitting an area. From the velocity of impact, the total energy of the human could be determined. From the attitude of the body at instant of impact and the angle of the impact surface with the direction of motion of the head, the energy of the blow could be determined.

By allowing a dummy to fall free against an impact surface set at various angles with his attitude duplicating those picked from the movies, we were able to obtain the influences of body attitude and impact surface on the magnitude of the head blow.

CUT CAR HAZARDS

A study of such information suggested several things which could be done to reduce the hazards inside the car.

1. Control the attitude—keep away from the swan dive.
2. Shape the inside surface to make all blows glancing blows (small angle of 0).
3. Pad surfaces having high impact level.

One slide of plotted data showed the probable head travel and magnitude of head blow for a given crash condition. The angle of impact surface and attitude of the body have both been taken into consideration in the computations. It clearly shows the high danger zones where the greatest amount of padding protection is needed and where objects of high injury potential should not be placed.

From some 27 different projects such as these, bearing on the protection of the human against impact blows, considerable detailed basic engineering information has been obtained. The projects cover research on padding materials, development of instrument panels, safety door locks, shock absorbing steering wheels, windshield distortions, kinematic performance of the human body, injury potential of various items found inside the automobile, protecting the human head from impact blows and seat belts.

Last year the Liberty Mutual Insurance company, sponsors of our crash safety research work, and Cornell Aeronautical Laboratory, Inc. deliberated on the best manner to present this bulk of information so that it could be easily understood and used as soon as possible. It was decided to build a safety show car as an instrument of education.

SAFETY CAR

With the exception of having no radiator ornament, headlight shades, bumper guards or extended door handles, the exterior of the car is much like that of an ordinary sedan. It has a complete wrap around bumper system designed to encourage deflection blows, and the front and rear bumpers have some energy absorbing characteristics to take away initial shock.

The interior of the car is quite different. The bucket seats are located to give the best possible arrangement for the six passengers,—first as individuals and then as a composite group. The driver, the one who has the greatest exposure to an accident, has been located in the center of the machine. Two front seat riders are placed slightly to the rear and slightly lower than the driver to avoid visual and physical interference.

All front seat riders have pull-down panels which serve the same purpose as the automobile seat belt. By design, the windshield and instrument panel have been moved out of contact range. The two rear seats are located inside the wheel wells to give the passengers additional structural protection and are staggered between the front seats. The rear seat riders have the safety advantage of retractable seat belts and full head movement clearance space. A rearward facing seat for a child is located behind the driver.

One of the obvious changes is that the steering wheel and post have been replaced with a handle operated full hydraulic steering system. Another change is the folding type door which furnishes full opening and, when closed, bolts securely in place.

All in all, the interior of this human package has been cleaned up of injury producing items and possible head impact surfaces have been eliminated or padded to reduce their injury potential. The body of the car has been made structurally strong against roll-over collapse with the addition of two roll-over bars.

Several plans have been made to show this car so that our findings will be available to you. We hope that this dissemination of information will encourage others to think and act along crash safety design lines. If this has the effect of bringing your additional thinking into the problem to improve upon our initial meager findings, it will have served its purpose.

RESEARCH IN VISION AND TRAFFIC SAFETY

by DR. WENDELL E. BRYAN

chairman, Motorists' Vision and Highway Safety Committee, American Optometric Association, Denver, Colo.

This is an age of miracles. The miracle of the automobile makes us think in terms of power steering, power brakes, shatterproof glass, puncture-proof tires. Yet perhaps the most miraculous thing as we speed along the highways is that we still use the same visual processes as in the days of the covered wagon!

The Motorists' Vision and Highway Safety committee of the American Optom-

etric Association has been doing research to relate visual problems to traffic safety for 25 years. Early research was simple and limited. Our traffic problems were also relatively simple in comparison with today's problems of the highway.

The findings emphasize that vision is a key factor in managing a car. To drive properly one must see properly. Ninty per cent of our reactions when driving are based on what we see.

The National Home Demonstration Council, in cooperation with the Woman's Auxiliary to the American Optometric Association, has conducted a pilot survey on visual abilities of drivers. In this survey 3,000 persons in 22 states were screened.

Most states consider 20/40 vision adequate at the present time. Using this lenient figure as the minimum standard for testing, one out of every five, or 21.5 per cent, still failed the test for distance visual acuity.

20/20 NOT PERFECT VISION

Contrary to what people think, 20/20 vision does not mean perfect vision. We cannot stress this point enough. 20/20 vision is only one step of a dozen or more visual functions and performances. Many of these are tested in the present study. For depth perception testing we used the Howard-Dolman Peg Test on the Porto-Clinic instrument with a give and take of three inches in lining up the pegs. Twenty-two and one-third per cent failed this test.

Lateral phorias showed a failure of 16.9 per cent; vertical phorias showed a failure of 13 per cent. Simultaneous vision tests were also given to determine if the person was seeing with two eyes all the time or whether he would alternately suppress one eye or shut vision when fatigued. Fourteen per cent failed this test. Color tests given were failed by seven per cent.

In the peripheral vision test we considered a minimum of 140 total degrees or 70 degrees to the temple side of each eye. This was an easy test, considering that average side vision is 90 to 95 degrees out of each eye, a total of about 190 degrees. Yet using a minimum of only 140 degrees, 10 per cent of the people still failed.

In tests for glare resistance recovery, five per cent failed. Another 5.4 per cent failed tests for suppressions of one eye or the other. Tests for reaction time were taken on the Porto-Clinic and 51 hundreths of a second was considered normal. Thirty-two per cent of those screened on the Porto-Clinic failed this reaction test. This is a remarkably huge percentage, considering that the test is explained to the individual and he is prepared for what is coming.

A record was kept of all accidents the tested persons had had. These did not include scraping a fender or minor accidents —only those which were recorded. Twenty-two and four-tenths per cent of the persons tested had reported accidents. Of those a great number explained, "I didn't see the car," "I didn't see the child," or "I didn't see the stoplight."

Most officers and judges believe these statements are only excuses. However, many persons actually did not see in time to avoid the accident. There may be other factors involved. We know that visual alertness is related to mental alertness. Therefore, every time we make persons more visually alert, we are also improving mental alertness.

Let us next consider the implications of speed with regard to vision. Our research shows that as speed increases, the angle of driver vision decreases. This is known as the narrowing angle of driver vision. To illustrate, at 30 mph the driver can see his surroundings with far greater accuracy than at increasing speeds.

GREATER SPEED—LESS VISION

We cannot convince people to drive at 20 mph. Speed is here to stay. Consequently, we must teach people how to see properly at higher speeds. Research shows that at 60 mph, while looking straight ahead, the driver can actually see little on either side of the road.

Therefore, we must train ourselves and others how to make the most of vision. One publication on visual training recommends that we "get the big picture." This means that the driver should view the car ahead just as a tiny part of the roadway scene. He should view all objects for a block ahead in town and half a mile ahead in the country. But he should never watch anything in sharp detail. The sharp central vision should never stay fixed on one object.

By moving the eyes up and down, side to side, and by glancing at the ground near every object, split-second timing judgment may be made. This "foresight" not only aids mental alertness but gives one wider angles of driver vision. These rules of safety apply to the housewife going to the corner grocery and to the salesman who drives along the highway.

Thus far we have not mentioned the person with inadequate visual acuity. How complicated the seeing task on the highway is if vision is below normal or below Snellen 20/20 rating. If a person with 20/20 vision comes to a crossroad sign bearing names of towns and villages, how many do you think he can read at 60 mph? He will be doing remarkably well if he can decipher just the top one, since most signs are printed in five-inch letters.

In reading this sign with 20/20 vision at 40 mph, he could see about 280 feet. His stopping distance is approximately 143 feet on dry concrete. This driver is probably safe. But all drivers do not have 20/20 vision. Since most states consider 20/40 vision adequate, let us use this figure. This driver with 20/40 vision can read 113 feet before he reaches the sign. We have just seen that 143 feet are required to stop under the best road conditions. Even the 20/40 standard, then, is not stringent enough to allow adequate stopping time.

Let's go one step further. We know there are drivers on our highways with 20/50 vision. The person with 20/50 vision needs 90 feet before he can see what is on the sign. The implications are obvious. This driver is a potential murderer on our highways.

VISION CAN BE CORRECTED

Fortunately, this serious problem of visual acuity may be remedied. Most vision can be brought to normal or near normal by modern visual science. In a recent clinical study, Dr. Henry Hofstetter of the Indiana University Division of Optometry showed that 90 per cent of the population can have 20/20 vision by wearing proper prescription.

We do not wish to take the license away from any driver because of inadequate vision. One important result of vision testing and vision care is to make drivers more conscious of their visual capacities. We should warn people who do not have adequate vision, adequate depth perception, adequate side vision, or adequate reaction time so they can compensate with proper prescription and education. The driver who knows he lacks adequate depth perception can compensate by being especially cautious in situations where good distance judgment is needed. He can look to the side more frequently if he knows that he does not have good peripheral vision. If glare bothers him, he may reduce speed and/or his amount of night driving.

We are not the only ones bothered by accident rates. The public is tired of homicide on the highway. A recent Gallup poll reveals that 80 per cent of those questioned favored stricter licensing examinations on vision, general health, and driving ability.

The screening of vision is one of the few things that we can measure in determining an individual's ability to drive an automobile. Therefore, we should do the best job possible in screening that vision. We can also help see that these laws requiring a uniform type of vision screening are brought to our state legislatures and passed.

NEED SUPPORT OF VISION LAWS

There will be those who will haggle over who shall receive an unrestricted license, thus making it difficult for any action to be taken. We believe in taking small steps before large ones. In other words, we wish to secure public support for the minimum of 20/40 vision rather than have the legislatures oppose a requirement of 20/20 and leave us with no uniform rulings. In our heart we believe persons should have 20/20 vision to drive safely, but a nation-wide minimum of 20/40 is the necessary first step.

The best way to assure at least minimum acuity requirement might be to require a certificate of visual ability. This certificate would be made out by the vision specialist prior to the issuance or renewal of a driver's license. This method of certification must be the outcome of a long-range program. But, we cannot start too early in our crusade for more adequate driver vision. Many patrol chiefs and chiefs of police feel that certification is the answer.

Also, many legislators feel this is the answer since it is so expensive for the state to educate driving examiners and conduct

vision screening examinations. Some day we may be required to have a certificate of physical ability and a certificate of visual ability before we are issued a driver's license. Until that time, however, we must continue with programs to screen the individual driver and make sure he has adequate vision to safely operate a motor vehicle. Remember that visual alertness corresponds to mental alertness and that alertness saves lives.

Individuals, communities and organizations seeking an action program on traffic safety may direct their activities toward these driving goals:

1. Periodic re-examination of the vision of all drivers. Millions of drivers have had their licenses repeatedly renewed since the days when no eye tests were required for licensing; more millions who had an original test have never been tested again.

2. Thorough vision examination for accident repeaters.

3. More extensive use of licensed vision specialists as consultants to licensing examiners, traffic courts and other government agencies dealing with highway safety.

4. Adoption of minimum standards for the tests relating directly to vision problems of driving, such as, glare, vision in dim light, visual acuity, peripheral vision, color vision, diplopia, distance judgment, fixation changes and tachistoscopic vision.

5. Dissemination of more information on the fact that drivers lack necessary visual skills without knowing it; and that almost all shortcomings can be corrected with proper vision care.

Voluntary screening, voluntary correction and voluntary caution can bring immediate results.

ROAD DESIGN AND ITS RELATION TO TRAFFIC ACCIDENTS

by CHARLES W. PRISK

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The assignment I have in this discussion of what's new in safety research suggests that a review of the proved benefits of certain street and highway design practices would be in order. All of you are acquainted either professionally, or at least as a driver and pedestrian, with the features that distinguish modern highway design. I shall not confine myself to a safety résumé of the latest refinements in highway design. I am convinced that highway improvements of themselves can be powerful weapons in the fight against traffic accidents.

Therefore, I shall suggest a few ways in which the design of still safer highways may be achieved, and show how fresh ideas can modify some of our past and present impressions concerning the responsibility of the highway as an accident-producer. In short, I shall attempt to justify highway design improvement in a general sense as a step toward accident prevention.

The engineer usually works with concrete facts and figures. This preoccupation with measurable quantities undoubtedly accounts for some of the engineer's difficulty in highway safety. The total dimensions of the traffic accident problem are measured by more than one unit. Deaths and dollars are two measurements we use.

How do you logically add units of grief-stricken tragedy to the dollar units we attach to property damage, insurance, medical expenses and the like? It isn't readily done, and I would say that the failure to have a good understandable yardstick for the total distress that arises from traffic accidents has retarded the improvement of highway design from the safety standpoint.

Initially the highway designer gave almost complete attention to structural requirements. Then, gradually the demands of traffic service began to make themselves felt. Traffic services, measured in such terms as travel habits, volume, speed, and traffic capacity, now have a major impact on highway design. And as better knowledge of the needs of the man-machine-roadway relationship becomes available, safety seems sure to get greater consideration than ever before in future highway designs.

The growing emphasis on inherently safe highways was given strong impetus by passage of the historic 1956 Federal-Aid Highway Act. We can say strong impetus for several reasons. First, and without any material change in the Federal-State highway partnership that has been successful for more than 40 years, a substantial increase in federal funds was authorized—more, in fact, in the first four years than in the preceding 40 years.

The enlarged highway building program, now well under way, will continue the regular primary, secondary and urban federal-aid work at an accelerated pace. In addition, the program will be highlighted by construction of the 41,000-mile interstate system. Safer design, tailored to the needs of traffic on this new mileage, will be a continuing asset to our increasingly mobile civilization. It has been estimated that completion of the interstate system alone will bring about a saving of at least 3,500 lives annually.

HIGHWAY SAFETY STUDY

In providing for the massive program of highway construction, Congress also took specific recognition of the traffic accident threat as a factor in the nation's welfare. Section 117 of the 1956 Federal-Aid Highway Act calls for a broad investigation and study of highway safety. The Bureau of Public Roads now has this Highway Safety Study well started.

The important objective, briefly stated, is to determine what federal action can be taken to improve highway safety. Its scope extends through all branches of the traffic safety field, involving many disciplines in addition to highway and traffic engineering. The fact that Congress has authorized this comprehensive study is unmistakable evidence of concern on a national scale for the future of highway safety.

Questions bearing on traffic safety research are involved, of course, as well as the critical issue of whether the federal government should now take up new responsibilities in highway safety, and if so, what, where, and how. Similarly, there is the question of possible need for federal legislation of a regulatory nature. In working toward these ends, we believe that research has unique value in the design of accident prevention strategy and we are giving it chief emphasis in our study program.

RESEARCH FOR SAFE HIGHWAYS

Occasionally you find those who think you can buy research much as other services are purchased. Engineering can be bought, but the enlightenment that research brings is not always as easily acquired. Dr. Hafstad, General Motors' research head, recently defined research as "—the effort of the mind to comprehend relationships which no one has previously known." Adequate financing is essential to progress in safety research, but we must remember that special human capabilities, qualifications, and interests are at the real core of any research accomplishment.

The Bureau of Public Roads has been conducting fundamental researches in vehicle performance and driver behavior for the past 20 years. In most of these studies, we have enjoyed the cooperation and collaboration of state highway departments, Highway Research Board committees, city traffic engineers, universities, or other research personnel. The results have been of vast importance, first to the understanding of highway design, and subsequently to its improvement.

For example, the width of a traffic lane was standardized at a minimum of 12 feet when the findings showed that on nine, ten, and 11 foot lanes drivers of vehicles moving in opposite directions veered toward the edge of pavement as they met. This was especially true when commercial vehicles were involved.

The few drivers that did not veer away from the center of the roadway had an abnormally small lateral clearance between the side of their vehicle and the vehicle moving in the opposite direction.

This knowledge had direct application to design. At the same time it represents a safety development, since by increasing the lateral distance between meeting vehicles the possibility of head-on sideswipes or collisions is reduced, and by avoiding the veering action toward the edge of pavement, the chances of running off the roadway are also lessened.

OTHER SAFETY PROBLEMS

In the studies of passing practices, speeds, headways, lateral positions of vehicles on bridges, opposite piers and abutments, in tunnels and under many varying conditions of traffic, other principles of operation applicable to design have also been developed. Actually, the detailed studies of traffic behavior are observations of the potential accident situation before it happens. As such, they contribute in many ways to safer road design.

During the last two years, new traffic study equipment has been designed and built at the Bureau especially for research on expressway traffic operation. This latest equipment automatically records on a tape suitable for use with electronic computers the speed, lateral position, and time of passage to the nearest thousandth of an hour of each vehicle moving by the study site. By simple operation of a manual key, the equipment operator can classify vehicles according to type, car occupancy, sex of driver, state of registration, or any other obvious characteristic for which data are required.

With such information, the potential hazard of many roadway design and operating practices can be examined on a scientific basis without waiting for a statistically adequate sample of accidents to accumulate. The highways being built today incorporate many design refinements that were originally conceived as a result of these studies of operating experience.

BENEFITS OF ACCESS CONTROL

One aspect of modern highway design, which is perhaps the outstanding feature of the interstate system now under construction is that of access control. By this term, we mean the limitation or denial of the rights of owners or occupants of abutting property to have direct access to the highway. With the cooperation of more than half the state highway departments, the Bureau of Public Roads has explored the safety benefits of this design refinement.

In most cases, comparative data were obtained for pairs of routes serving the same general area, one a highway with full or partial control of access, and one without control—in other words, a conventional route.

We find that highways with full control of access, usually referred to as freeways, are roughly two and one-half times safer in terms of accidents, injuries, and fatalities than the usual major highway with roadside driveways, commercial establishments, intersections at grade, undivided roadways, and other built-in hazards.

The safety advantage of the freeway is outstanding in the prevention of rural traffic deaths. Contrasted with the nationwide rural highway rate of 8.7 deaths per 100 million vehicle-miles of travel, the average rate for rural freeways included in the Bureau survey is only 3.4.

This 3.4 is a pretty important figure for at least two reasons. First, it's only 39 per cent of last year's countrywide rural rate. And did you ever think how far a 100 million miles is? The Russian "Sputnik" circling the globe every 96 minutes at the fantastic speed of 18,000 mph will have to stay up there close to eight months and make almost 4,000 trips around the world to accumulate 100 million miles.

This vast amount of travel is producing about three deaths per 100 million vehicle-miles of travel on our modern rural freeways, perhaps not a record to gloat over, but one of no little consequence as compared with the much more serious situation on highways of obsolete design.

The other reason that makes the low rate on rural freeways worth mentioning is the fact that three-fourths of all our deaths in traffic occur outside of urban areas. As far as accidents and injuries are concerned, the freeway rates are better too, but its greatest margin over conventional routes is in urban and suburban areas. Since these areas, rather than the rural highway, are the scene of most of our accidents, freeway design is proving to have a double-barreled advantage.

Safety research has documented the merits of many other features of modern highway design. Halfway design measures are not satisfactory. The payoff in safety comes only when the design is uniformly adequate throughout. Special attention is being given these days to median design and width. Recent studies have indicated that there is no real substitute for width, and accidents involving the median appear to decrease rapidly with increased width up to about 40 feet, after which the improvements are smaller.

Wide medians also protect motorists at least partially from the discomfort and hazard of headlight glare. At the roadside as well as in the median, it is desirable that motorists have some reasonable recovery area within which they may regain control of their car in the event they run off or are forced off the roadway. Eventually this may involve more deliberate provision of suitably sloped and graded "landing areas," as at the bottom of roadway embankments, for example.

NEED SERVICE STATIONS

Only limited study has been devoted to the critical problem of servicing the motorist and his vehicle on controlled access highways. The indications are, however, that the average motorist wants and needs to have gasoline and related services, food, and lodging conveniently at hand even though he may not use all these facilities during any given trip.

For example, a composite compilation for more than 500 miles of eastern toll roads showed that about one-fourth of the gasoline consumed on these toll roads was actually purchased at the toll road service stations. Disabled vehicles and sleepy drivers may seem harmless but the record shows they loom large among the accident producers.

On the New Jersey Turnpike where an excellent safety record has been achieved, these two factors—disabled vehicles and sleepy drivers—appear to have been involved in nearly one-third of the fatalities that occurred during the past few years. Road design and control to relieve the frequency of these and the serious chain-reaction expressway accidents are today's big challenges.

Much other research is needed to provide the driver with improved information on the roadway and traffic conditions for his safety, comfort and convenience. The magic of electronics is likely to have a part in the solution. Recent tests in Nebraska, where a "Merging Traffic" sign is automatically illuminated as two vehicles approach on a near-collision course, one on the entering ramp and one on the expressway, are only a start on what may be accomplished in this general field of improved communication from driver to driver and from roadway to driver.

HUMAN FACTORS

We have often heard it said that most traffic accidents can be attributed to human failure. I am not so sure but that we might say all. However, in most accidents, the circumstances are not as straight-forward and simple as many think. Take the case, for instance, of a driver in a vehicle with poor brakes who has a right-angle collision with a careless driver at an intersection where the corner sight distance was limited. Where is the fault? Would it be the faulty vehicle brakes, the careless driver of the other vehicle, or the highway sight distance restriction?

It is likely that one or the other of the drivers would be charged with a violation, and it would end up in the records as another human failure. Now, let's look at that accident again. The circumstances described suggest that if the brakes of the first vehicle had been in proper working order, or if the careless driver in the second vehicle had exercised caution, or if the corner sight distance restriction had not been present, the accident could have been avoided.

If these are all factors, and the removal of any one would have prevented the accident, then they are all equally to blame. In that case, one-third of the responsibility should be assigned to each element, the brakes of the first vehicle, the driver of the second vehicle, and the sight obstruction at the intersection.

This crude example illustrates two observations: first, that more meaningful research into all the factors involved in traffic accidents is long overdue, and that only by this process can we aim our accident prevention efforts at the real targets. The second observation is that there are almost as many specialized areas of knowledge legiti-

mately bearing on traffic safety as there are specialists. Road design is an important one but it is only one.

We will do ourselves, and the vital cause for which we work, a high service by creating more opportunities for interdisciplinary discussion and evaluation of the many approaches we follow in the hope of greater highway safety. The unity of all our knowledge is little enough to throw against the grim statistics that are the Nation's highway accident problem.▲

THIS QUESTION OF SPEED

by LINDA SHULER
Linda Shuler Productions, Dallas, Texas

We shall consider the public in general and the feminine half in particular in regard to this matter of traffic safety, especially speed. Why do we speed? What can be done about it? And how can we get it done?

There are a number of reasons why we speed, but it all boils down to attitude and ignorance. We speed because we think it's all right to speed, so long as we don't get caught. There is no social stigma against it. In fact, it's considered a bit dashing. Both men and women are ignorant of the tremendous risk involved. They do not understand the chances they are taking.

Not enough is being done to *explain* to the public exactly *why* speeding is dangerous. You assume any person who knows enough to read or who can understand a picture should have sense enough to know speed is dangerous.

So it isn't a matter of intelligence. It's a matter of convincing *information*. Until a person knows exactly why it is dangerous and understands the laws of physics involved, you aren't reaching him.

EXPERIENCE SHOULDN'T TEACH

Of course there is always a stupid minority who can be persuaded only by force, or who can learn only by tragic experience. But people *can* be convinced by public education and propaganda that speed *is* dangerous for *them*. However, the recognition for the necessity of such education must come first.

A person knows fire is hot because he can feel its heat before getting burned. But he can't know the danger of speed by experience unless something happens that illustrates it—and that's what we are trying to avoid. We must substitute convincing information for experience. And such information is not forthcoming in degree and quantity to do the job.

I feel propaganda and information is most important because that happens to be my field. Others believe law enforcement is most important, and still others feel engineering is most important.

However, no field stands alone; each is dependent on the other for good results.

What can all these various fields do in regard to reduction of speeding? And the big question, how may these proposals be carried out?

Regardless of what the proposals may be, regardless of their value or necessity, their ultimate success rests with the public. The public must understand and cooperate; the public must authorize by vote; the public must pay with taxes. And half of this public is women.

For years you've heard that we do not use women as we should in the traffic safety field. There are women directors of women's activities, and the work they and their organizations do is necessary and valuable. But it's just a drop in the bucket to what is needed.

What we need is *active*, enthusiastic, intelligent support from the women. But that cannot be obtained unless men wish it to be so. For we are not deceived—this is still a man's world. Women like to be advised by a man, like a man to help them accomplish an objective or solve a problem. Many women prefer to be led and guided by a man.

These women will work hard for men if men do two things—sell them on the necessity and importance of their job and help them do it, with plenty of encouragement and a little recognition when deserved.

In considering the problem of traffic safety and speed, how can women help you? They have the time, the cars, the influence and the natural inclination for humanitarian projects. They have a husband and children whom they look for every day to come home safely. Get a woman stirred up about something endangering her children and you have fury. The subject of traffic safety and speed especially in areas with children, is a natural for appealing to women.

There are many good men in the traffic safety field. Intelligent, dedicated, patient—wonderful to work with. And what are they doing? Working with men, of course. Women must follow along as best they can, or be ignored altogether. A woman wants male leadership, but she also needs male recognition.

For example, in the Dallas Citizen's Traffic Commission no woman may serve on the executive committee or be chairman of any committee, no matter how well qualified.

The women resent this. As a result, the women of Dallas are not doing as much as they could for traffic safety. Perhaps the traffic commission feels it is struggling along quite well without them, since the commission is accomplishing some fine things. But no matter what they want, they can get it better and faster if the women of the city want it too.▲

THE ENGINEER'S VIEWPOINT

by DONALD S. BERRY
professor of civil engineering, Technological Institute, Northwestern University, Evanston, Ill.

Before discussing why people drive fast, we first must agree on what we mean by "fast." If "fast" is defined as speeds of 70 mph. or more on open rural highways, then I offer the following possible reasons:

- In my opinion, most people who drive on rural highways are driving with the primary purpose in mind of getting to their destination and getting there without wasting time. Drivers are in a hurry. With increasing traffic they lose time and few like being delayed. They are willing to pay to drive on roads where they can save time—an example is the success of the toll road.
- Highways are better. With the expanded construction program, we are getting longer sections of highways designed for 70 mph. It's now almost possible to go from Chicago to New York with no stop for traffic signals. There are also fewer roadside obstructions to let driver know how fast he is driving; fewer poles alongside the edge of the pavement.
- Vehicles are quieter and more powerful —Twenty years ago, our speed was generally limited in part by vehicle vibration and noise—shimmying at 60—vibration at 65. Not so now—we can drive 80 without any telltale vibrations from modern cars.
- With better cars and better roads, there is more and more of a tendency to forget about speed. On a turnpike, for example, a driver will plan to drive at 65 mph. In time, his speed may creep up to 75 or 85 mph. without his realizing it. The monotony of some of our new roads may be a hazard.

What can we do about this problem? From the standpoint of engineering, we can do several things:

1. Design highways with no unexpected hazards, and at the same time, avoid monotony. This may mean for expressways, the use of designs which vary the width of the median, and which avoid long, monotonous, straight sections.

2. Provide realistic zoned speed limits, adequately marked, for existing highways.
3. Encourage use of devices in automobiles which will give drivers indications of their travel speed. Some models now have as optional equipment, lights or buzzers which operate when a pre-set speed is exceeded. In 1958, some models will have devices which can vary the spring tension under the accelerator pedal.

If the device is set for 65 mph., the driver can travel faster than the set speed, but the extra pressure is tiring on foot muscles to keep the car at a speed above the pre-set value.

Such a device would be helpful in my own case. My wife is normally a careful driver, and usually drives at speeds slower than the average on most streets and highways. On long-distance trips on toll roads, however, she sometimes is astounded when I tell her she is going 80 mph. A spring tension device would be ideal as a reminder—not only for her, but for me also.▲

IOWA DRIVER IMPROVEMENT SCHOOLS COURSE OF STUDY

by BERT L. WOODCOCK

director, Safety Education, Iowa State Teachers College, Cedar Falls, Iowa

SCHOOLS IN OPERATION IN IOWA SINCE JULY 15th 1956: Waterloo, Mason City, Dubuque, Marshalltown, Sioux City, Des Moines, Ottumwa, Council Bluffs and Davenport.

SCHOOLS TO BE DEVELOPED: Fort Dodge, Creston, Cedar Rapids or Iowa City, Decorah, Spencer, Carroll or Denison and Burlington.

PURPOSE OF SCHOOL

Approximately 43,000 drivers licenses are reviewed in Iowa each year. This search of the records discovers hundreds of drivers with bad records of accidents and/or convictions of traffic law violations.

In many cases, however, no single accident or violation may have been of a nature to cause a court to recommend that the state safety department suspend the driver's license.

The accumulation of a lengthy record of accidents and/or violations indicates, however, that the driver may be accident prone or an accident or violation repeater. The present traffic death and accident record makes it imperative that an attempt be made to help this driver and to protect other drivers with whom he may come in contact. This is the purpose of the Iowa Driver Improvement Schools.

Selection is the work of the Iowa Department of Public Safety through its divisions of driver licensing, highway patrol and safety education.

The driver whose license carries numerous accidents and/or violations is asked to appear before a representative of the highway patrol for a hearing. In some cases, this action may be enough to cause the driver to change his pattern of driving. In other cases, more work is necessary.

Each driver who appears for a hearing is given a voluntary choice: he may have his license suspended or he may attend a driver improvement school and be placed under license probation for one year.

Those who chose to attend a school are notified to appear at a certain time and place. Those who do not agree are placed on 30 days suspension. Those who agree to attend school but who fail to appear or to complete the course also are immediately suspended.

It is the intention of the department to place these drivers in a situation that, as nearly as possible, resembles a school situation. It is understood that the drivers who are mentally deranged, criminally inclined, or physically handicapped will not attend. The schools will consist of drivers who, through misjudgment or misdirection, have either been involved in accidents or who have been convicted of traffic law violations. The recommended size of classes is 20 to 30 students.

The school consists of three sessions, each at least two and one half hours in length and all held within a period of one week. The sessions should be divided so that the lecture, film and testing on the psycho-physical equipment be divided properly. Monday, Wednesday and Friday nights are suggested; however, there is nothing wrong with three nights in a row. The following course of study will clearly indicate the time equal for all parts of the school program.

PLAN OF THE SCHOOLS

It is intended that all schools will be approximately the same throughout the state, a set pattern for the course of study and time element seem very important. However, it is presumed that certain instructors may deviate from the lectures as necessary, and will be duty bound to insert some of their original thinking into the lectures.

Basically the lecture should be approximately one and one half hours in duration, with a 10 minute break. The film should run about 30 minutes, and the rest of the time should be devoted to testing on the Psycho-Physical testing equipment.

Films: "DAY IN COURT" is recommended for the first session. "LOOK WHO'S DRIVING" should be shown at the second meeting, and "INCREDIBLE JOURNEY" should be shown at the last meeting of the class. ("INCREDIBLE JOURNEY," $75.00, Wilding Picture Productions, Chicago, Ill.; "LOOK WHO'S DRIVING," $50.00, Public Education Dept., Aetna Casualty & Surety co., Hartford, Conn.; "DAY IN COURT" $65.00 Black & White, $210.00 Color, Consumer's Relations, International Harvester company, Chicago, Ill.

Keystone tele-binocular (with test cards) —$278.+

Psycho-Physical Testing Device: distance judgment, reaction time, peripheral vision, and general vision testing equipment should be used. The Porto-Clinic, or the AAA testing equipment will fulfill the requirement. The results of the use of this equipment may at some future time reveal many deviations from the norm, thus care should be taken in administering the tests.

Detonator (If Available)

CLASS CARDS

The instructor is requested to make notations on the student's card that will reveal his measurements. The attitude marking is purely subjective, but the Psycho-Physical marking will be an actual grade of the subject.

Attendance may also be kept on the subject's card.

The course of instruction should be carefully laid out by the local instructor. Included in this manual will be outlines of three lectures that seem to fit the program best. The instructor in charge of the program should make all necessary arrangements and double check them before each session to insure interesting and informative periods. The object and intent of the school should be explained at the start of each course, and restated at the beginning of each session. The fact that the school is not intended as any form of punishment must be impressed upon all or their attitudes toward traffic laws or toward enforcement agencies will not change.

COURSE OF INSTRUCTION

It is necessary that men trained not only in teaching but in the driver education area do the instructing. This we feel is most important as many questions arise that cannot be answered by the average lay teacher. The instructor should plan the sessions to include as much student participation in the course as possible. It must be remembered that students learn in various ways, so different methods of learning should be provided. These include learning through listening, seeing, reading; testing and participation.

At the beginning of the first session some time must be taken, perhaps 20 minutes, to acquaint the violators as to the purpose of the school, its history, and the general procedure that will be followed. At this time it is well to inform them that they are expected to attend all three sessions and that

if they do not their names will of necessity be sent to the Department of Public Safety.

The students should be informed that the instructor is a driver education teacher, has no connection with the law as an enforcement individual, and that the conduct of the class will be such that at any time if anyone has a question concerning any phase of the school or the lectures, they may feel free to raise the question. It's important they know that the instructor will of necessity have to control the discussion for the greatest benefit of the entire group.

LECTURES

Following are rather complete outlines of the lectures. It is not supposed that these outlines will take the place of the actual lectures, but serve as a guide, and also as a means of keeping all schools uniform as to subject matter. All instructors are to be sent to Iowa State Teachers College before the start of the schools, where they will hear each lecture just as it is recommended that they be given. If rather copious notes are taken and the outline followed, the driver education teacher should be well prepared to meet his classes.

FIRST SESSION

Orientation: This normally will take about 20 minutes.

On form "A" have each student place the required information. (This is an indication to the student that you haven't all the records, which is good psychology. Also, there may be some changes from the original—such as change in occupation, education, etc. This is an excellent way to check the role and each one is always sure to get a slip and fill it out because they desire credit for their attendance.

Lecture: Psychology of Safe Driving.

I. Careful analysis of driving characteristics, accidents and human qualities leads us inescapably to the conclusion that the bulk of the psychological problem lies in the emotional and broader personality side of the individual. Unfortunately this is the most difficult of all to investigate and understand.
   A. Wrapped up here are all the personal motives, the individual conflicts, frustrations, reactions, wishes and desires. When considered in the light of the constant change the human being is undergoing we see why it is difficult to predict driving performance.
      1. What reaction does the teenager have after his girl "throws him over" and he drives away in a torment?
      2. How about the reactions of the youth being inducted, with the many fears, feelings of hopelessness, etc.?
      3. How about the impatient, the careless, the thoughtless?
      4. Why does the personality change so greatly when some individuals get behind the wheel?
   B. Driving is a special form of behavior and carries with it a tremendous egotistic weight. Apparently some of the self-satisfactions are as follows:
      1. Mastery over inanimate objects (using the automobile as an extension of oneself).
      2. Mastery over other people (making pedestrians and other motorists conform to one's wishes).
      3. Imitation (identification) response; copied from parents, or other admired persons.
      4. Thrill responses (using autos for roller-coaster type of thrills).

II. Other aspects of driving include: illusions, drugs and fatigue and boredom.

III. The driver's "sensory" and muscle response features.
   A. Vision, the most important single physical factor including: acuity, distance judgment, color perception, dominance, glare resistance, field of vision and moving eye has blind spots.
   B. Reaction time—simple, complex, anticipation and interpretation, methods of measurement.
   C. Hearing.
   D. Steadiness and extreme nervousness.
   E. It would be so easy if the answer to highway safety or even the major portion of the answer was found here. We could test and eliminate and permit only those physically fit to drive, to be licensed.
      1. Actually many of these defects can be compensated for quite adequately. Outside mirrors for hard of hearing individuals and one eyed persons; turning the head to compensate for narrow peripheral vision; placement of lights on traffic heads for those who have color deficiency.
      2. Reaction time may be dangerous if it is either too slow or too fast. The knowledge of the result of either is the important thing.

IV. Film showing "A DAY IN COURT."
   A. *Film is approximately 30 minutes in length.*
   B. Film points out many types of attitudes among drivers and leaves the audience with mixed emotions.

V. Use of testing devices.
   A. Every student should be tested on the reaction timer, the peripheral devices, the distance judgment device, and have their vision checked on the tele-binocular.
   B. This may take two nights since it takes about 15 minutes for each student.
   C. A careful analysis of each one's record is most important.

SECOND SESSION

Use an attendance form for each one to fill out just his name and date.

Lecture: Man Made Laws and Nature's Laws.

I. Discussion on how violations contribute to automobile accidents.
   A. 94 per cent of all fatal accidents show a violation of a traffic law by someone.
   B. Relation of improper speed to accidents.
      1. Excessive speed.
      2. Speed in excess of weather and road conditions.
      3. Car under control.
         a. What it actually means.
         b. When is a car out of control?

II. Failure to yield right of way—at stop signs, traffic lights, crossroads and uncontrolled intersections.

III. Passing on hills and curves.
   A. Dangers of so doing.
   B. Distance one must be in his own lane before meeting another vehicle.
   C. Discourtesy of straddling lanes.
   D. Not passing at all places where the law indicates there shall be no passing.

IV. Driving while intoxicated.
   A. Amount of alcohol that affects one's sensory controls.
   B. Effects of alcohol on the driver.
   C. Effects of drugs and other stimulants as well as alcohol.
   D. Potentials of driving while intoxicated.

V. Courtesy, co-operation, consideration for the other driver.

VI. Obedience to laws for the sake of the law's true meaning.
   A. Definite physical reasons for obeying all laws.
      1. The reasons for obeying some of the man made laws may be just as important as those reasons for obeying nature's laws.
   B. Why drivers violate traffic laws.
      1. Egotistical behavior.
      2. Laws are made for everyone else.
      3. Superior attitude of some drivers.
      4. Honest lack of knowledge on the part of some.
      5. Habit formation—definite contributor to accidents.
         a. Learning to drive from dad or other relatives who have always violated the traffic laws.

VII. Nature's Laws.
   A. Centrifugal force.
      1. Skidding accidents.
      2. How to prevent skidding accidents.
   B. Force of gravity and momentum going down hill.
      1. Law requires driver to slow as he goes over a hill and always on a down grade.
   C. Force of impact.
      1. Tendancy of all loose objects in the car to continue when car stops suddenly.
      2. Force of impact varies as the ratio of the square of speed increases.
      3. Kinetic energy (stored up energy in motion).
   D. Ability of brakes to stop a vehicle.
      1. Difference at high speeds.

2. Fading of brakes.
3. Varying quality of braking on different types of road surfaces.

E. Friction and (coefficient of friction).
F. Reasons for many skidding accidents other than centrifugal force.
G. Methods of compensating for problems that seem to be unavoidable.
H. Self-enforcement of rules of the road.
J. Review the Psycho-physical lecture enough to compare the logic of speed control and braking etc., to Nature and Man Made Laws.

VIII. Film showing "LOOK WHO'S DRIVING."
A. Film is approximately 13 and one half minutes long.
B. Film points out the falacy of allowing one's childish impulses to get away from him. Also in the end the failure to stop results in an accident, and ties in with the topic of the lecture.

IX. Use of testing devices.
A. Test the remainder of the students or at least as many as can be taken care of. Care should be taken that each person knows exactly what he has been tested for, and the results. Warnings should be given if the person's score is not above the danger point.

THIRD SESSION

Lecture: Defensive Driving.

I. The part each driver must play while behind the wheel of his vehicle.
A. Definition of defensive driving. (thinking and planning ahead).
1. Drive on the theory that all drivers are careless.
2. Realizing that as a driver you actually are driving six vehicles—your own, the one behind, the one in front, one from the right, one from the left, and the one you don't or can't see.

II. Most important factors of defensive driving are attitudes and control.
A. Control (what is it—what it means to safe driving).
1. Driver.
2. Car.
3. Traffic conditions.
4. Weather condition.
5. Surface and width of roads.
6. Reasonable speeds.
7. Ability to stop within the assured distance ahead.

III. Actions that cause most traffic accidents and deaths.
A. Excessive speeds.
1. Above legal speed limits.
2. Too fast for conditions.
3. Too fast for the driver.
B. Failure to yield.
1. High percentage of stop sign violations, most of which occur in area nearest home.
2. Yielding to trains.
C. Pedestrian violations.

IV. Last clear chance to avoid an accident. (define)
A. Pulling away from the curb.
B. Intersections (guarded and unguarded)
C. Respect for signals, flashing and actuated.
D. Slowing at all intersections.
E. Turning at intersections.
F. Meaning of shape of signs.

V. Some symbols of safety.
A. The three E's of safety.
1. Education.
2. Engineering.
3. Enforcement.
B. The three C's of safety.
1. Concentration.
2. Courtesy.
3. Control.
C. Anticipation — Perception — Interpretation—Manipulation.
D. Drive for the other driver.
E. Good Driving (IS) DEFENSIVE DRIVING.

VI. The "mental" side of driving.
A. Does it take brains to drive?
1. To some degree, yes. The I.Q. factor is quite argumentative.
2. Driver should have sufficient intelligence to:
a. Look ahead and anticipate consequences of his actions.
b. Profit from past experiences.
c. Retain knowledge of the road.
d. Have mental ability to apply the rules of the road.
e. Have sufficient earning power to maintain vehicle in safe condition.

VII. It must be remembered that ultimately the degree to which our highways are safe or hazardous depends upon drivers at the wheels of their vehicles.
A. Roads alone cannot cause accidents.
1. Wide roads in themselves are no safer than narrow roads.
2. Value of divided highways.
B. High Powered Vehicles.
1. Safety features of an automobile.
2. The proper use of the horse power.
3. The fallacy that safety features can keep you out of accidents must be dispelled.
4. No vehicle is safe because it has has seat belts, dashes and other paddings.
5. A vehicle is only as safe as the driver.

VIII. Film showing "INCREDIBLE JOURNEY."
A. Film is approximately 30 minutes long.
B. Film points out how a driver may be very careful and drive as nearly perfect as he knows how, but if he doesn't allow for the other fellow's mistakes he will still become involved in an accident that may cost lives. An excellent film to end the sessions on.

IX. Testing Devices.

If there are any more, this would be the last time, of course, that they could be tested. Be sure and test everyone.▲

PROMOTIONAL IDEA EXCHANGE

(Panel Discussion)

RICHARD O. BENNETT—PANEL CHAIRMAN

director, automotive div., accident & fire prevention dept., National Assn. of Automobile Mutual Insurance Cos., Chicago

Panel: Dorothy E. Wills, Better Traffic Committee, Pittsburgh, Pa.; Mrs. Robert (Linda) Shuler, Linda Shuler Productions, Dallas, Tex.; Jerry Marx, Oklahoma Dept. of Public Safety, Oklahoma City, Okla.; Dan Hollingsworth, Oklahoma City Safety Council, Oklahoma City, Okla.; Ty Cobb, Dept. of Public Safety, Oklahoma City, Okla.

Dorothy Wills discussed the Annual Mayor's Highway Conference in Pittsburgh. This has been a continuing project since 1946. The one-day conference has become a springboard for most traffic safety activities in Pittsburgh.

Various agencies, public support groups, business firms and media are given specific jobs throughout the year. They report back to the next year's conference and are given another specific assignment.

From the conference have come a weekly audience-participation radio show, a puppet show for children, and a number of other continuing traffic safety programs.

R. B. King, safety officer, Virginia State Police, described a television program in which a hospital emergency room was set up as a background while a state trooper spoke to the audience. He also told about a sticker for bathroom mirrors which was distributed to hotels, motels, restaurants and private homes throughout the state. The sticker reads "Are You Looking at Virginia's Next Traffic Victim?"

THE BELL'S TOLL

An arrangement was also made with a Richmond (Va.) radio station to sound a bell tone for every traffic victim during the past 24 hour period on a morning news broadcast. This idea was picked up by many radio stations in the state.

Jerry Marx told about a Chaplain's Corps established by the Oklahoma Highway Pa-

trol. Once a year on the last Sunday before July 4, a "Safety Sunday" is held in the state. In cooperation with the Oklahoma City Ministerial Alliance, the Highway Patrol prepares a kit of sermons, talks, messages and other material which is distributed to clergymen and others who take part in "Safety Sunday." This effort is non-secretarian and highway patrol officers give sermons on traffic safety on this day.

Clayton Hess of the California Highway Patrol described the California program to combat drinking and driving. A special program each December is aimed at curbing the dangers resulting from Christmas office parties. A variety of material is prepared including posters, leaflets, and special attention-getters such as a reaction timer.

Warren Taylor, health and safety dept. manager for the U. S. Junior Chamber of Commerce, discussed a project conducted by a Jaycee chapter in which a newspaper offered a prize to any driver who could stop his car within 50 feet traveling at 35 m.p.h. The challenge was printed in the paper under a picture of burned tire marks on a pavement. Taylor reported that no one claimed the prize.

Thomas C. Hempfield of the Mansfield (Ohio) Police Department described a police-sponsored, city-financed "Safety Town" for pre-school children. Children are taught traffic safety both in classrooms and in a miniature "town" with streets, sidewalks, traffic signals and markings.

P. W. Graves, safety inspector for Continental Motors Corp., Muskegon, Mich., described his company's traffic safety program which includes bulletin board cards, carton cards, outdoor posters for parking lots, place mats in the company restaurant and full-page ads in the local newspapers.

Dan Hollingsworth, director of the Oklahoma City Safety Council, told of the publishing and distributing of a traffic code manual in Oklahoma City.

Linda Shuler described a television program called "Aftermath" which has aroused a great deal of interest in Dallas. The program takes an actual traffic case and dramatizes it using real people, real judges and police, rather than actors.

W. J. Sturm of Hardware Mutuals in Stevens Point, Wis., described a traffic safety project held in Stevens Point with the cooperation of the local taxi cab company. The cabs carry white flags with the Green Cross for Safety. If an accident occurs anywhere in the city, all the cabs carry a red flag for 48 hours. If a fatal accident occurs, the cabs fly a black flag for one week as a constant reminder to the community.

Mark Markson, Minnesota Highway Dept., told of a summer camp maintained by the American Legion for the training of school patrol guards. Both boys and girls can attend a one week course at the camp which is fully equipped with camping facilities.

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NATIONAL SAFETY COUNCIL

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE TRANSIT SECTION

This volume is a record of the sessions held at the 1958 National Safety Congress by the Transit Section. The conduct of these Congress sessions each year is only one of the many cooperative activities which the Transit Section carries on in behalf of its members, and for the benefit of accident prevention work in the transit industry generally. The section gives guidance in the preparation of a great variety of technical and educational material useful in the day-to-day safety programs of transit companies.

The activities of the section are under the direction if its executive committee, the members of which are listed at the close of this volume.

IT ISN'T THE COACH, IT'S THE TEAM

by PAUL O. DITTMAR
president, South Suburban Safeway Lines, Inc., Harvey, Ill.

To tell safety-directors that they don't count for much, that it's the team that counts and not the coach, would make me unpopular, and they wouldn't believe it.

To say, it isn't the coach, it's the team, is to say it's not Casey Stengel, it's the Yankees; and no one can say that and be believed. And one couldn't be right and say, it wasn't Toscanini, it was the orchestra. Neither could you turn those statements around and say: it isn't the Yankees, it's Casey Stengel; or say, it wasn't the orchestra, it was Toscanini. To be right you have to say: it's Stengel *and* the team; or, it was Toscanini *and* the orchestra.

It's a very rare manager or coach that can produce a winner without a good team; and it's a very rare team that is a good team that hasn't a good manager. My point is, both must be good, or neither will be good.

So, I should change this title to read *It's the Coach and the Team.*

THE MEANING OF SAFETY

Safety means many things to different people. To a child, it means a lighted room. To some motorists, it means straddling the line between two lanes, or taking both halves in the middle, in order to have plenty of room on each side of the car. To other motorists it means driving at 15 mph on a 50 mph highway.

To a western cowboy it means a brace of six-shooters. To a woman safety might mean putting her head under the covers, getting under the bed, or locking all the doors of her car. To many people there is safety in numbers.

Exactly what should the word "safety" mean to us? In its application to us and our industry, it should mean eliminating hazards and avoiding danger.

Would your safety-coach and his team approve of the action of a city council in a certain city that was proud of its citizens, its prosperity, and its record of accomplishment for the good of all?

In this otherwise excellent city, accidents were happening frequently on a certain corner. After each accident an investigation was called for and action demanded. The actions had been the installation of traffic signals, painting and repainting traffic control lines, the erection of traffic signs and special illuminated warning signs. But, on a certain night, the family of a very prominent citizen was killed.

This time, the newspapers said action must be prompt and effective. Days went by. The newspapers increased their pressure on the mayor and the council, but no action came. Finally, in desperation, the mayor announced the council would meet in continuous session until it could come up with recommendations to make that dangerous corner safe.

After three days a decision was reached. The headlines read, "City Council Orders New Ambulance!"

To that city council, saving lives with an ambulance was more important than eliminating the hazard and avoiding the danger. However, it is certainly more effective to eliminate the hazard, beforehand, than it is to save the life, afterward.

The purpose of a safety team and its coach is definitely to save limb and life by the elimination of hazard and the avoidance of danger. And, since safety is everybody's business, it's *your* business no matter what your job and title may be.

SAFETY IS MANAGEMENT'S RESPONSIBILITY

What is your title? Is it president, or general manager? If so, you should be interested in safety. It should be a big and important part of your job, one of your top responsibilities!

A transit company with a poor *safety* record has a poor manager, executive vice president, or president, and, most likely, it operates with the profuse use of red ink!

You can't separate management effectiveness into good and bad. If the top man is good at marketing bonds, and loses money through a poor accident record, he is still a

poor manager. A good manager is good all the way around, including safety as one of his top responsibilities.

Any good manager will demonstrate by his personal actions that he is 100 per cent behind safety as a continuous, never ending program. His interest must be deep and real. He must demonstrate his genuine interest by his actions, his personal appearances, his knowledge of safety and accidents, and by expecting and demanding good accident prevention action on the part of all his management and administrative personnel.

The most honorable purpose in life is devoting one's self to saving people to live, move and enjoy life. If you are dedicated to this purpose you eliminate the doctor and the undertaker!

The doctor who saves a life is acclaimed, and he may rightfully be proud. The hero who saves a life is rewarded with a Carnegie Medal, and he may rightfully be proud. But you, you may save a dozen or a hundred lives—no one will ever know how many—but you will not be acclaimed or receive a Carnegie Medal.

COUNTING THE COST

There is much controversy in our industry over how much accidents cost. There is unanimous agreement they cost too much! The controversy is whether or not all the indirect charges are included in any set of figures. You want to see the picture of the company as a whole with the basic factors of costs of personnel, goods and services purchased, depreciation, accidents, and taxes.

I advocate knowing what departments and factors cost. Therefore, for companies large enough to departmentalize, they should know the dollar costs of accidents and claims, including both direct and indirect costs. This would be nothing more than letting the managers and coaches know the score!

The operations manager, the safety director, and the claims manager, along with the top brass, should each receive copies of a statement of costs of accidents, to show the dollar costs of all the relevant accident and claim factors, as follows:

Cost of Accidents—direct payments
Cost of Personnel
Cost of Goods and Services Purchased
Cost of Depreciation
Cost of Government
Total Cost of Accidents and Claims

Transit Pars is nothing more than a comparison of the actual operating score with the predetermined perfect operating score, or par. Ross Young said in his book, *Personnel Manual for Executives*, "It is well known that measurement of any activity improves that activity, particularly if there is a connection in people's mind between that measurement and actual or implied consequences. . . . The knowledge that production is measured improves production, and the knowledge that quality is measured improves quality."

MORE ON ACCIDENT COSTS

You must have figures to know the score or to measure your safety program's progress or regress.

After you get the costs of your department added to a total, you'll have to deduct about 50 per cent from the total because the costs of your department act as a credit to reduce the company's income tax. Can a credit be called a cost? A private enterprise company that is earning profits reduces its costs of accidents by about 50 per cent, but a company losing money or a municipally owned operation can't do it.

The development of costs should be according to the viewpoint and purpose. No *one* column of figures can serve all purposes or satisfy differing viewpoints.

Certainly, accidents cost money—and much more than you think! But why think of their cost in the terms of money? No person, really injured, is ever made whole by the payment of money; and the dead person is beyond all possibility of recompense! Think of your job as one to promote safety rather than one to reduce costs. You'll do the latter if you do the former!

THE REAL COSTS OF ACCIDENTS

You can't measure the total cost of accidents with numbers following a dollar sign. The first and most important cost of accidents must be in terms of life and limb, pain and suffering, scars and disfigurement, cripples and corpses! In those terms you have the real costs of accidents—the most important costs—the costs that should be *first* in the minds of all people dealing with the elimination of hazards and the avoidance of danger.

The safety-director-coach whose first thought is for the pain, suffering and sorrow caused by accidents is doing the best possible job in keeping dollar costs down. He will have a team that is eliminating hazards and avoiding dangers.

For the accident you do *not* have, there is *no* accident cost. In other words, "without the seed, you won't have the weed." The worst "weeds" in our transit industry grow from accident "seeds" in the "soil" of hazard and danger!

ACCIDENTS IN THE TRANSIT INDUSTRY

In the transit industry, the chief concern regarding accidents is with those involving vehicles and the public. Those are most important because they represent the most accident troubles.

Our safety team is comprised mostly of vehicle operators. With these people our safety-director-coach can accomplish most in the prevention of accidents and the reduction of their dreadful costs.

A number of people working together as a team are working cooperatively in an effective manner, to accomplish their objective. If their objective is to prevent accidents, we can call it a safety team.

To develop vehicle operators into an effective safety team, we must use good management methods. Management is the development of people, and the art of getting things done through people. If our objective is the prevention of accidents, we can accomplish that objective only through people cooperating.

GOOD TEAM—GOOD MANAGER

A good safety team will have a good manager—and to be good, he must use the true and tried, good management methods.

Call the man anything you like, but if he gets things done through people, he is a manager.

You may not be another Stengel, Rockne, or Toscanini, but you can save more lives, and save more people from injury than they did! You can become a good safety-manager, if you will use good management methods to develop a good safety team.

Gimmicks and gadgets are useful to attract attention and create interest—advertising methods—but they are not necessarily good management methods. Certainly, they do not represent the whole of good management methods.

Isn't it about time we put some down-to-earth, fundamental, basic thinking into this matter of safety, this serious business of saving limb and life?

Safety *is* a serious business—the *most* serious business? And we don't dignify it as a *serious* business with gimmicks and gadgets.

If safety is your job, make it your job. Think of it as the most important job in the world—it is! And, it's the most difficult job in the world just because it is the most important: A little error can cause such a dreadful and terrible result; and the correction of a little error can save bodies from being mangled, twisted, deformed, and from becoming corpses!

Think of your job as an educational one—to teach your team the methods of safety, how to recognize and eliminate hazards and how to recognize and avoid danger when it arises.

Your job is not to instill a picnic, party, or carnival spirit in your people. I doubt that balloons, beer, gimmicks or gadgets ever instilled safety in the mind of people or promoted safety in general.

BE A GOOD SAFETY-DIRECTOR

Remember, your job is a serious one, and you should be serious about it. Your job is to reduce the need for hospitals, and to postpone the work of undertakers!

Learn to be a good manager and you'll be a good safety-director. You could read Drucker's *The Practice of Management* to learn what constitutes good management, and what are good management methods.

But if you want to be a good safety-director, a good manager of any kind, you'll find out for yourself. If you don't, you'll never be a good safety-director. If you're *not* a *good* safety-director, there will be more cripples and younger corpses—and, maybe, another bankrupt transit company!

Do you want a good safety-team? Then, be a good safety-director!

It is the coach *and* the team! They both must be good to win; and *you* are the only one who can make *both* of them *good!*

CAN SAFETY BE NEWS?

by BRUCE B. HOWAT
editor, Mass Transportation Magazine, Wheaton, Ill.

My obvious answer to the question, "Can Safety Be News?" is, yes, safety can be news—and the best part of it is that safety is good news.

Our world is full of bad news. And our news media feed on it. Crime and crises, rape and racketeering, misery and murder—all fill up our front pages and claim the lead on newscasts. Accidents, of course, make news—usually front page. But that, too, is bad news. But safety is good news—and you can plan safety activities which are both effective and newsworthy.

My purpose in this paper is to show how publicizing your safety work can pay off and to suggest some safety activities which can be made newsworthy. Is publicizing your safety activities worth the time and effort you put into it? Yes indeed—in many ways.

For far too many years too many people in industry in general and in the transit industry especially have paid too little attention to public relations. They either did not care what the public thought about their business, or did not feel that public opinion mattered, or were simply too lazy to put forth the effort necessary to help the public form good opinions about their business.

SAFETY—GOOD P. R. WORK

That, basically, is the aim of all public relations work—publicity included— helping the public to form good opinions about your company. Where else can public opinion be better formed than through safety? There are two areas in which you can publicize your safety activities—and the payoff is different in each. From what I have seen no transit company is doing half of what it should in either field.

You should first of all, publicize your safety activities locally—among all channels of communication—newspapers, both daily and weekly; radio stations; TV stations; local company house organs (including your own—if you have one—and you should!) and bulletin boards; school and college publications; and chamber of commerce and service club publications.

You should have a list of every communication channel in your community and keep a record of safety stories you send to them. You should know the different types of material each wants—and tailor your stories to their specific needs.

How long has it been, for example, since you have visited each high school newspaper editor and helped him (or her) plan a feature story with pictures of students on "How to Ride the Bus" stressing safety practices, courtesy and so on?

PUBLICIZE SAFETY LOCALLY

Here are some of the things you can accomplish with local publicity:

- It will help you sell bus rides—by convincing people in your community that they are safe on one of your buses—safer than they are when walking or riding in their own automobiles. Good publicity can build your reputation for safety. And a reputation for safe operation will become increasingly important in the years immediately ahead of us.

  The two fastest growing age brackets in our rapidly expanding population are in the "can't-drive-own-automobile" categories of "children under 15" and "oldsters over 65." There are millions of potential transit customers in both of these categories—and if Mr. and Mrs. Public are thoroughly sold on the safety of your vehicles, they will encourage their "Johnnys" and "grandmas" to ride the bus downtown.
- It will win friends for your company. Safety news is good news—and everyone who reads or hears of your safety activities gets a good impression of your company. Continued good publicity of safety achievements and safety work convinces reporters and editors that your company is interested in safety and does have a good record.

  If an accident does occur, they tend to be more fair in treatment of it. Good safety publicity helps put your company in a favorable light before your community. People who may someday be on a jury deciding one of your accident cases will be more favorable to your company if they have read from time to time of your safety efforts.
- It will nurture the morale and self-esteem of all of your employees—especially your drivers. And in so doing this good safety publicity is likely to lead to even better safety records. By creating a reputation for safe operation you give each driver a high standard to live up to.

TRY NATIONAL RELEASES

You should, second, publicize your more outstanding safety activities nationally—both by attempting to get stories on AP, UP, or INS wires and by sending stories to national magazines and to your trade press. The pay off from national publicity comes to you in three ways:

(1) It will win prestige for your company—and this prestige can usually be "merchandized" locally—among your own employees and, often, in your local news media.

(2) It will help others in the industry. Our industry is unique—the companies within it are not competitive—and thus you can help the other fellow without in any way hurting yourself.

(3) By supporting your trade press, you keep it alive to help you—not only in safety work but in all phases of transit operation.

"ZERO" SIGNALS SAFETY

For example, look at what my good friends "Happy" Hall and Randy Tucker did down at Nashville. Back in 1948 "Happy" started what has turned out to be a truly fabulous "zero" campaign. Zero may mean nothing to most people, but to folks in Nashville it is the magic word for safety. Down there the word "zero" simply means "no accidents today"—and the right hand raised in a zero salute made by thumb and forefinger is a pledge to work for a "zero" day.

The sound basis for Nashville's safety campaign was, of course, careful selection, good training and a lot of personal attention for each operator. But the real rallying point for the entire safety program was the "zero" theme. Interoffice phones were answered with "zero" instead of "Hello."

Employees greeted each other with "zero" instead of "Hi." A large "zero" flag was suspended from a staff in front of the main office—and lowered to half mast when an accident marred a zero day. The zero theme was seen everywhere—on placards, on old tires, on company calendars and business cards, on utility poles along new routes—everywhere!

Locally, Hall's "zero" campaign was extremely successful. Accident rates dropped year after year. Before the campaign started Nashville buses were travelling only 10,000 miles per accident. After a few years of zeroes, NTC buses were covering 22,000 miles per accident. Newspaper coverage was excellent and the zero symbol so caught the public fancy that traffic policeman and even citizens were saluting NTC bus drivers with the zero symbol.

ZERO CAMPAIGN SCORED

Happy and Randy could have let the thing ride—on its local success. But they didn't. They invited me to come down to visit them, made local "hay" out of the visit with a "safety luncheon," and gave me the material for a darn good story for Mass Transportation.

What did this story do for Nashville Transit? Well, they bought 50 or 100 extra copies of the issue in which it appeared—circulating them among civic leaders, pasting tearsheets on employee bulletin boards and getting local newspapers to write stories headlined: "National Magazine Praises Nashville Transit Safety Record." What did it do for Mass Transportation? It gave me a good feature story—of great interest to our readers.

What did it do for the industry? St. Louis Public Service Company and other companies read about it and launched similar campaigns of their own. As is the case in most phases of our life, when you help others you just can't help but you help yourself.

It might be helpful to prepare some sort of chart to keep track of your safety publicity efforts. You could list each media, possibly indicate types of material each is

interested in and then indicate stories sent to each.

Some such record will immediately flag for your attention any media who haven't had a story sent to them for a long time, prevent embarassing repeats and give you a visible record of your safety publicity accomplishments.

There is a pay-off for good safety publicity. How do you get it? First, of course, if you have a public relations man, you should work closely with him. Because safety work is so loaded with public relations possibilities, the safety director and public relations man should be as close as ham and eggs (and you know which one is the ham!). But whether you work with your PR man or go it alone, the mechanics of getting good safety publicity are the same.

There are many types of safety activities which can be publicized to advantage. Here is a brief check list of some of the things you can be (and I hope "are") doing to publicize your company's desire for safety:

- Your "routine" work can be news:
  - —Driver selection and hiring—rates a short news release, stressing the "high standards" you set.
  - —Driver training is good for an occasional feature article. And, incidentally—and trite but true, every safe driver you have is a public relations man for your company.
  - —New safety devices used in training or placed on vehicles should always have a release written about them. When new buses are added to your fleet, a story should go out telling about all of the new safety devices on them.
- Routine "announcements" of safety activities are news:
  - —When any driver, division or the company as a whole achieves any kind of a safety record, send out a news release. You may have to develop some new statistics or "create" the record but some time spent going over operation division records or the personnel files can prove valuable.
  - —When any individual employee, division or the company receives a safety award, send out a news release. Such releases can be made more newsworthy by having some big name entertainer, athlete or celebrity make the award—such as Dallas Transit has done with its "BUSTER" awards which have been made by Jane Russell, Danny Kaye and a host of other stars.
- Life-saving actions by your drivers are news. If one of your drivers pulls a motorist from a burning car, rescues some children in a flash flood or performs some other heroic act in the line of duty, that's news—and it's your job to ferret out those stories and get them to the news media.
- Special safety activities offer you your greatest opportunity—and call for the greatest imagination on your part. Here, for example, are a few special activities various transit companies have used to promote transit safety—all of which lend themselves to publicity:
  - —A bus drivers' "roadeo"—such as has been successfully staged by British Columbia Electric Railway Company in Vancouver, Indianapolis Transit and others. Indianapolis, for example, coupled their "Driverama" with an open house—and not only drew a good crowd but also got lots of valuable newspaper, radio and TV publicity. Bus drivers competed over three courses— a 200 inch straight line with four inches on each side and reverse; a simulated mid-block stop in a 75 foot loading zone with parked vehicles at each end; and a tricky serpentine. Each finalist received a cash award—up to $100 for the winner. An annual "bus drivers roadeo" could be not only a fine training gimmick but also a wonderful safety publicity hook for you.
  - —A bus "float" to appear in any and all parades—Memorial Day, Fourth of July, Christmas or what have you —with a special paint job to sell transit as the safest form of city travel.
  - —A Saf-T-Coach such as Transit Casualty has developed. Many transit companies have achieved wonderful public relations results with such a coach. Al Moore's Topeka Transportation Company, for example, recently put a specially painted "Safety Bus" at a downtown curb for 10 days. Thousands of Topekans went thorough the bus, 1,500 taking the reaction test and 500 sitting down before Keystone eye test machine.
  - —Booklets on safe driving (showing stopping distances, proper signals, facts on tire care and so on) or booklets on "How to Ride a Bus" (possibly using cartoons to show careless habits that lead to on-board, boarding and alighting accidents) can be distributed as a public service thru "take-one" racks and other means.
  - —A downtown department store window display of safety devices used on your equipment, safety posters and other attractive, interesting material.
  - —Shop tours, participation in B-I-E days and "open house" programs which induce the public to visit your shops and see for themselves the good maintenance and driver training which makes your buses safe.
  - —Bus company awards or citations to safe drivers in the community—based on reports turned in by bus drivers.

These news-making safety events all started as an idea in some safety director's noggin. Similar ideas can—and should—be hatching in yours! A couple of weeks ago Dr. Herb True of Notre Dame came out to Wheaton to talk to our sales force and editorial staff on "Creativity." Being creative—and that includes developing new ways to publicize your safety activities—does not depend, according to Dr. True, on your heredity, your I.Q., your health, your education or your years of "experience."

CREATE SAFETY NEWS

Your creativity depends on what True labels "tremendous trifles"—your personal commitment to your job, your open-mindedness to new ideas and your experimental nature. The real key to making safety news lies within you—and depends on your ability to see news in the routine things you are doing and to create newsworthy things.

In addition to newsworthy transit safety activities which you might plan, here are some "non transit" safety activities in which a transit company can be of real service and reap deserved public relations rewards:

- —Using car cards and bumper stickers to back local safety campaigns.
- —Conducting community driver testing.
- —Lending equipment and personnel to high schools for driver training.
- —Sponsoring school safety patrols.
- —Giving free "Scotchlite" to all bicyclists.
- —Donating special school zone "stop" and "slow" signs.
- —Promoting Red Cross and other community safety efforts.
- —Maintaining safe driving billboards throughout your city.
- —Furnishing safety posters to schools and industrial plants.

BEING A NEWSMAN

Finding or developing newsworthy safety activities is the first step in "making safety news." The second step is getting the story to news media in such form as to assure its getting into print or on the air. Newspapers (and other news media), contrary to what you might think, actually welcome a story showing the ability and skill of your drivers. I have never known an editor who was not hungry for material for his next edition. It is, therefore, the easiest thing in the world to get a newsworthy item into your newspaper.

Actually, today's editors are more interested in business news than ever before. A study by George Gallup, based on interviews with 7,000 readers, will be published this fall—"the most comprehensive study ever undertaken of the American press." Pollster Gallup has already indicated that the study shows that news of business not only deserves more space and prominence than it gets in most dailies, but has a far bigger potential audience than most papers have been exploiting.

The twin keys are ***newsworthiness*** and ***proper presentation.*** The first thing an editor wants to know is where the story is coming from—so tell him. Up in the right hand corner of the page single-spaced, put your name, title, company address and telephone number—so that he can check facts or ask for additional information if he wants to. Then skip a line or two and give the date.

Then drop down four or five lines and start your story—leaving at least an inch and a half margin at the left and an ample margin at the right. Editors use this space to designate type sizes and to make changes. The story itself should be double spaced.

Your editor wants his stories short and factual. Pack your five W's (who, what, when, where and why—or how) into the first paragraph. Put additional facts in succeeding paragraphs. Omit the superlatives, flowers and excessive use of your company name. Just tell your story—in a short, interesting and factual way.

Your editor likes pictures — dramatic, eight inch by 10 inch glossies. In fact, a good picture or set of pictures is your best guarantee of getting a story published. If possible, try to get a celebrity into your pictures—a movie star, a visiting dignitary, a famous athlete or some local big-wig. Children, too, are sure fire subjects in pictures. It helps, too, to get to know the reporters, editors and broadcasters in your town. But, really, this is the least of your worries. A good, well-written story sells itself.

If you have a public relations or publicity department, you'll undoubtedly want to channel your releases through them. If not, you may be sending them direct to newspapers, broadcasters and magazines. In either case you, as safety men, should master these fundamentals of journalism—the who-what-when-where-why lead; the short, factual story; and the dramatic, interesting picture.

SELLING SAFETY TO THE PASSENGER

by JOHN A. BAKER

director, Training & Accident Prevention, Chicago Transit Authority, Chicago

It's time we recognize that if we want to make a substantial reduction in passenger accidents, we must sell safety to the passenger.

Training our drivers to recognize potentially dangerous situations and to apply defensive driving principles has contributed greatly toward a substantial reduction in traffic accidents over the past several years.

A substantial reduction in passenger accidents can be effected if we follow the same logical approach with our passengers. We must get them to recognize that they have some responsibility for their own safety. We must make them aware of potentially dangerous situations. We must help them learn to apply defensive riding principles.

In developing these remarks on selling safety to the passenger, I have relied heavily upon information and materials from several sources. This does not mean that the opinions or the ideas put forth are necessarily endorsed by those of you who contributed materials.

We will discuss these three:

1. Surveying the transit industry
2. The need for passenger safety education
3. Carrying out effective passenger safety education

Because the purpose of my presentation is to relate what CTA and other transit properties are doing to sell safety to the passenger, a brief questionnaire was developed and sent to several transit properties. This questionnaire was designed to be answered quickly and the questions were phrased in the hope that we could add together the experience of several properties to form some general statements about the subject. These were the questions asked:

1. Does your management feel it is a good policy to conduct passenger safety activity for passengers themselves?
2. What has your property done to educate your passengers on how to ride a transit vehicle safely?
3. How have you evaluated the results of your efforts to sell safety to the passengers?

In addition to these questions, properties were requested to send samples of materials used in passenger safety activities.

The questionnaire was sent to the members of the executive committee of this Transit Section of the National Safety Council. These persons provided a good, though small, sample because they represented properties of all sizes, they represented several geographical regions, and they quite obviously had a great interest in the subject of passenger safety.

SHOWED INTEREST

The fact that 25 of the 30 companies surveyed replied and a good portion of them sent materials is proof of their interest in this subject of passenger safety. Those of you who were not included in the survey are urged to contribute your ideas and describe your property's activities in this area during the discussion immediately following these remarks.

Here are the general responses to these three questions:

In response to Question I, "Does your management feel it is a good policy to conduct passenger safety activity for passengers themselves?", 20 of the 25 properties replying answered "Yes," three properties answered "No," and two properties had divided opinion or questionable answers.

The response to Question II, "What has your property done to educate your passengers on how to ride a transit vehicle safely?", was even more one-sided. Of the 25 companies replying, 23 are carrying on some kind of passenger safety activity. The type of activity varies widely, but by far the most popular types of activity are car cards, "take ones," driver cautioning, and other on-vehicle techniques.

The response to Question III, "How have you evaluated the results of your efforts to sell safety to the passenger?" indicates that none of the 25 companies has been able to measure the effects of passenger safety activity in specific terms. However, several persons commented enthusiastically about the benefits of passenger safety education in general terms.

Responses to the questionnaire indicate that transit properties recognize the importance of educating the passenger and are carrying on some form of passenger safety education as a necessary means of reducing passenger accidents and claims. In fact, there seems to be a feeling that we are doing too little to sell safety to the passenger. Such comments as "We are not doing enough in this area," and "We hope to increase our efforts to educate passengers" indicate this disturbed feeling about passenger safety education.

So an apparent dilemma exists. We feel we must educate the passenger to ride safely; yet, something seems to be preventing us from doing a more effective job. Several problems are brought out as reasons why we haven't done more to sell safety to our passengers. Let's look briefly at some of these problems that are connected with passenger safety education.

First, we recognize the difficulty of selling safety to the passenger and feel unsure that we can do an adequate job in this area. It is extremely difficult to write a message to our customers that is direct and yet will not be taken as a criticism of them. We all tend to do things we are familiar with and things we feel we can do well, rather than attempt to do the things we are unsure of even if they are things that need to be done.

SUGGEST FALSE CLAIMS

Another problem brought up frequently is the feeling that stressing hazards might tip off unscrupulous passengers as to where and how they might claim injury. This feeling may or may not be justified. Has anyone proved that talking to passengers about their safety results in more claims? It seems logical that unscrupulous passengers will attempt to frame false claims regardless of our attempts to warn our passengers of hazards that do exist.

A third problem brought out by the questionnaire is our inability to measure the effects of passenger safety education in concrete terms. We are unable to hold many changing factors constant while we measure the results of our passenger safety activity. This same problem exists in other necessary fields of endeavor.

Safety training of our operators and installation of safety devices in our equipment are examples of activities whose worth we cannot measure in exact dollars and cents. But we have learned that it is terribly expensive not to carry on such activities, so

we carry them on, even though we cannot determine their exact worth.

Not the least of the problems is the feeling that it is inconsistent to talk about our good safety record and then stress the hazards of transit travel. This is not a problem unique to us as bus operators. The air lines have faced a similar problem and have done an effective job of resolving this "inconsistency."

WRONG TO STRESS HAZARDS?

Each air line passenger is required to fasten his seat belt when taking off or landing, and this requirement has not caused a loss of confidence in the safety of air travel. Quite the contrary, this firm policy gives us assurance that hazards are recognized and our safety is put first—sometimes even ahead of our convenience.

I am not trying to ridicule or to minimize any of these problems. They are real and the solutions to them are not obvious. What I am saying is that they should not be used as excuses for failing to attempt to sell safety to our passengers.

The real issue is: Is it necessary to inform our passengers about the hazards connected with transit travel? Must we persuade passengers to take necessary precautions for their own safety? This issue must be resolved in terms of the consequences of selling, or not selling, safety to our passengers. Only after we resolve this issue should we consider these problems connected with passenger safety activity.

The consequences of not informing the passenger are great. Today, the public demands fast transit travel. Traffic conditions require fast starts, stops, and swerves. Passengers must recognize these inevitable hazards of transit travel and develop good riding habits.

PASSENGER CONTROLS SAFETY

In many instances, the passenger has more control over his safety than we do. How many passenger accidents did you have last year that were due wholly to the actions of your bus operator? Or, put it another way, how many of your passenger accidents could have been prevented by the passenger? How many could have been prevented only by the passenger?

We must sell safety to the passenger. If we don't, we miss our best means of reducing passenger accidents, and we lose some of our investment in driver training and good equipment design because our passengers will not take full advantage of the safety helps we provide.

We are responsible for the safety of our passenger—and we are fully aware of the responsibility. But this does not mean we cannot ask our passenger to help us keep him safe. It is as much his objective to ride safely as it is ours to provide a safe ride for him. We cannot fully accomplish this joint objective without his help. We must sell safety to the passenger.

Once we have recognized the necessity of *selling safety to the passenger, we must* turn our attention to developing and carrying out activities that will accomplish our goal. There are certain principles we must keep in mind if we are to develop activities that will be successful.

PASSENGER SAFETY EDUCATION

First, our program must be audience oriented. Who are we trying to sell? What do we know about our passengers? What characteristics do they have? What *interests*? We must tailor our activities to the interests and desires of our passengers. We can give special attention to certain types of passengers who have demonstrated they are in need of safety education.

Women passengers, elderly passengers, handicapped persons, and children, for example, can be singled out for special attention in our program. We should also attempt to involve our passengers in our passenger safety educational activity. When people participate in a program, they accept the contents more *readily and remember* the facts longer than when they are completely passive and have no part in the program.

You are probably familiar with this claims questionnaire used by Transit Casualty company. Through this questionnaire, Transit Casualty is attempting to find out more about causes, contributing factors, and the characteristics of the people who are involved in accidents. With this type of information, activity can be designed and slanted towards those passengers who need the help most.

The Sunday riding pass from Cincinnati Street Railway company shows how we can utilize a medium that takes notice of a special part of our audience. In Cincinnati, Sunday passes are used a great deal by elderly persons. Elderly people have more than their share of passenger accidents. Therefore, the Sunday pass was selected as a good medium for this type of passenger safety message.

The next two examples show a means of getting passengers involved in passenger safety activity. One from Capitol Transit in Washington, D. C., shows a "take one" with a safety slogan blank. Passengers are encouraged to send in safety slogans and are awarded cash for slogans that are accepted. Twin Cities Rapid Transit in Minneapolis has a similar program using a "take one" to invite passengers to send in safety suggestions.

These examples show that activity can be tailored to the audience we are trying to reach. In addition to tailoring our materials to our audience, perhaps we could tailor our method of approach by working with groups that represent riders who require special attention.

We might effectively reach our women riders through women's groups; our handicapped riders through organizations that train and help them; children through schools. Before choosing techniques and developing activities, we should stop to remember whom we are trying to sell. Our program should be audience oriented.

NEED CONTINUOUS EFFORT

Another principle to keep in mind is that our program must be a continuous effort. It isn't reasonable to expect a one-shot approach to accomplish our objective. Reducing passenger accidents is a long-range problem. We must recognize that hazards will not be eliminated by this activity and that we must combat these ever-existent hazards with continuous passenger safety education. Perhaps it's more realistic to think of passenger safety education as waging a continuous delaying action rather than expect such activity to solve the problem.

Our program should be teamed-up with accepted plans, activities, campaigns, and organizations. Transit companies are not fighting the battle of reducing passenger accidents all by themselves. Many organizations are effectively working on passenger safety as well as other areas of public safety.

More effective results for our programs can be obtained if we will coordinate our efforts with the civic and citizens groups. People will accept criticism and suggestions much more readily from "accepted" agencies such as the National Safety Council, churches, schools, or citizens' safety groups than they will from a transit company.

Here are some examples of activities being carried out by various transit properties in conjunction with accepted organizations and campaigns.

This first example is a decal CTA has installed in our buses in cooperation with the Citizens' Traffic Safety Board of Chicago.

These next two examples are a series of posters designed by CTA and displayed in Chicago public and parochial schools.

Milwaukee Transit sent in two car cards and a booklet for school children on "How to Ride a Bus." Here again, one of the posters is sponsored by an accepted safety commission, and the booklet is distributed through the school system.

S-D DAY CAMPAIGN

Here's a campaign that should be familiar to all of you: the S-D Day campaign. Car cards and backs of transfers are used by CTA as part of our public safety activity. We coordinated our program with this nationally-observed Safe Driving Day Program.

When we design passenger safety activity, we should stop to ask ourselves, "Are we trying to go it alone, or are we taking full advantages of relationships with accepted groups?" Close working relationships with safety and civic organizations can extend and increase the effectiveness of our efforts to sell safety to our passengers.

Whenever possible, our programs should be integrated with related company activities that are wholly or in part designed to accomplish the same results. Passenger safety education is not a substitute for driver training or good equipment design. Actually, passenger safety education is a necessary supplement to these activities.

Unless passengers are informed, they do not take full advantage of good equipment design. As Mel Bullock's study points out, many of the claimants interviewed admitted stanchions were available, and their use

would have prevented passenger accidents, but for some reason they did not see fit to take advantage of the safety devices provided.

CTA has a specially designed training bus to take the passenger safety program to bus drivers. At the same time, we used several on-vehicle techniques such as car cards, "take ones," and backs of transfers to appeal to our passengers. We integrated our driver training and passenger safety activities into one program.

Indianapolis included a Driverama with an open house to demonstrate the skill of their bus drivers to the public.

USE HOUSE ORGANS

"Transit News," CTA's house organ, is put out monthly by the Public Information department. An employee publication, which usually has a wide circulation outside the company as well as to families of employees, provides an excellent medium for continuously emphasizing passenger safety.

Our Public Information department uses a character known as "Bill Saver" in much of our literature to the public, so we "latched on" to Bill Saver to talk about safety in this one.

Existing company activities provide many opportunities to sell safety to the passenger, and often effective results can be obtained through combinations like those we have just seen.

In presenting information to our passengers, we should concentrate on specific subjects whenever possible. Our message should be easy to understand. If the message is too long, too general, or too hard to understand, we will not get our point across. So let's figure out what we want to say and punch it across in an interesting, brief, easy-to-understand manner.

Most of you are probably familiar with the National Safety Council's Data Sheet No. 13. This is a good source of specific information on how passengers should ride transit vehicles.

There are several good techniques available that can be used right on the vehicle so that the message goes to the right people, our passengers, at the time they are exposed to the hazards.

Several properties sent in samples of "take ones," car cards, and other on-vehicle techniques that illustrate how they are getting a brief, specific, understandable message across—right on the vehicle.

Another technique that many of us use is a permanent safety message in the form of a decal which can be effective because it can be used to point out a specific hazard in the place and at the time when the hazard exists for the passenger.

"Gus, the Bus" is an Atlanta Transit System's personalized safety coach. These buses are used in regular service and contain a recorded safety message mounted near the center exit door. Atlanta has developed an intensive passenger safety program around this personalized bus.

The final principle to remember in selling safety to the passenger is never miss the chance to sell the present safety of our transit ride. This may seem quite obvious, and yet, I wonder how often we remember to stress our safe ride. Stressing present safety and asking for the passenger's help to keep him safe are not at all contradictory. Here are some of the ways that properties have included emphasis on present safety in their message to the passenger.

In Atlanta Transit System's "Gus, the Bus" program, the safeness of the transit ride and the automobile ride are compared.

Miami Transit stresses the same comparison in a "take one."

A CTA car card telling passengers that their driver has been trained in passenger protection is another way to stress the safety of their bus ride.

Toronto Transit, TTC points out that their men are winners of the ATA Safety Award. They are stressing the safe driving ability of their drivers in still another way.

ALWAYS SELL SAFETY

If we can gain our passengers' confidence, if we can make them feel that their safety is put first, they will be more receptive when we ask them to help us keep them safe. So we must never miss a chance to sell the present safety of our transit ride.

We must decide to sell safety to the passenger because passengers have more control over their safety than any other factor. Unless they recognize the hazards and apply defensive riding habits, we cannot fully accomplish our goal of cutting passenger accidents to the minimum.

Our passenger safety education program must be built around sound principles. We must: 1. remember the audience, 2. make our program a continuous effort, 3. team up with accepted organizations, 4. integrate our passenger safety activity with related company activities, 5. emphasize specific subjects to our passengers, and 6. never miss a chance to sell the present safety of our transit ride.

Recognizing the need for effective passenger safety education and developing a sound passenger safety program will accomplish our objective if we put these principles into action:

A—Audience oriented
C—Continuous effort
T—Teamed up with accepted organizations
I—Integrated with related company activities
O—On specific subjects
N—Never miss a chance to sell the present safety of our transit ride.

To make the principles easier to remember, we have figuratively put these principles for effective passenger safety education into *action*. I hope this will remind us that we must literally put these same principles into *action* if we are to accomplish our objective—the fewest possible passenger accidents.▲

SELLING PASSENGER SAFETY TO THE OPERATOR

by THOMAS L. WARD

supervisor of training, Milwaukee & Suburban Transport Corp., Milwaukee

"How can we reduce passenger accidents, particularly the on-board accident," appears to be the $64,000 question in accident prevention in our business. Our claim department cost figures show that more money is being spent to settle on-board accidents than our collision cases.

Until a few years ago, our safety concern was the rise in traffic accidents as the number of motor vehicles on the streets increased. Now the traffic accident rate for our company has been reduced more than 55 per cent from 15.37 accidents per 100,000 miles in 1951 to 6.40 traffic accidents per 100,000 miles in 1956.

It is true that many passenger accidents are minor, but many result in serious injuries and are costly to the company. Currently settlements for passenger accidents on our property total about 50 per cent of claims cost.

Most chargeable traffic accidents can be attributed to operator-failure. Our success in reducing traffic accidents is from working with the faults and attitudes of the individual operators.

A large majority of the passenger accidents are from man-failure, and we feel the answer is proper training and retraining of operators and encouraging them to follow the best operating procedures.

Over the years, the company has provided aids for the passenger to board, walk through the vehicle, support himself when standing and in alighting, such as grab handles, stanchions and grab rails.

SELLING PASSENGER SAFETY

This is currently being done at every opportunity, such as:

1. During the orientation and training of beginners.
2. During periodic regular follow-up of all operators.
3. During the refresher training for 90 day men.
4. During remedial training of accident repeaters.
5. At all contacts of transportation department supervisory personnel with operators.

In the orientation talk, we prepare the trainee's mind for the training course and the job.

Besides stressing the importance of driving as an occupation, we instill in him the desire to do the job safely and efficiently.

We point out that the good driver, besides knowing the written rules of the road also knows and follows the unwritten laws, such as:

—When behind the wheel, he must be attentive at all times;

—He must be alert for the unexpected;

—Through repetition of correct driving patterns, he established good driving habits which become a permanent part of his driving.

Skill in connection with driving is more than just the manipulation of the controls. We develop skill through well guided practice. Using proper methods of instruction and a competent instructor is the first step in teaching good driving habits.

True skill is the result of repeated practice. The good driver is one who practices correct driving procedures until they become a habit.

TRAINED IN TRAFFFIC

After the trainee learns the mechanical operation of the bus, masters the basic maneuvers and is thoroughly familiar with traffic rules and regulations, the next step is driving in traffic.

Before and during these road exercises, the trainee is indoctrinated with the principles of defensive driving.

One leading cause of accidents (passenger or traffic) is the driver's failure to cope with the unusual traffic situations. We train the new driver so that when he encounters these unusual traffic situations, he will react to avoid an accident.

The important factor to combat these situations successfully is to anticipate the occurrence of an unusual traffic situation. Trainees are taught to "think ahead" to anticipate the unexpected. If prepared for the unusual—they will have no unusual.

Of equal importance in avoiding accidents when the unusual situation develops is knowing the correct mechanical action and then performing it properly.

A driver is taught and practices the correct responses to unusual situations. Frequently when the unusual situation develops, the driver does not have time to analyze the situation. He must depend on prior training for the correct response.

We use various visual aids and distribute N.S.C. pamphlets:

1. Defensive driving.
2. How to be a smooth operator.
3. Passenger safety.

We teach that "courtesy and safety" go together. Emphasis is placed on the need to be alert for crippled people, old people, children, bus stop hazards. The operator is instructed to assist the blind, the aged, the crippled and the overloaded passengers and others who have difficulty boarding, standing on board or alighting from the bus. A word of caution "watch your step" may save an accident. Operators are taught to practice courtesy continually. The courteous driver is also a careful driver.

Selling by Follow-up Instructors

When the trainee has demonstrated a satisfactory degree of driving skill, he is assigned to a bus and a run. His training does not end at this point however. A follow-up instructor rides with the new driver during the first few days and periodically thereafter to observe driving habits and reinforce the initial training. Habits relating to passenger safety are watched and emphasized on all of these contacts. If bad habits are developing, the follow-up instructor retrains as necessary.

REFRESHER TRAINING FOR 90-DAY MEN

The purpose of this one day refresher course is to review the operators' original training and instructions after they have had experience on the job. The program is a six-hour conference session with subjects reviewed by slide illustrations of typical traffic and passenger situations.

Since passenger safety is a great concern, the conference reviews the original instructions on how to avoid situations that may require emergency brakes and the possibility of throwing passengers. The settlement costs of on-board accidents and typical cases of preventable accident situations are discussed.

Selling During Training for Repeaters

We have a good record on each operator's performance on the job, and use it for close follow-up and early indication of increased frequency or the specific nature of accidents experienced by individual men.

For operators who are accident repeaters or observed in faulty driving practice, our first problem is to discover the driving faults and then look for the reason for faulty driving. If it is primarily bad habits, additional training to instill good habits and proper attitude toward the job may be all that is necessary.

However, careful examination of the driver's accident record and attitudes on and off the job and during a personal consultation may reveal family trouble or mental instability as the root cause. Sympathetic treatment can relieve the operators of on-the-job tensions. We may be able to solve his basic problem, because often the driver does not recognize his difficulty.

If counseling and retraining fail to improve the employee's accident record, he is reassigned to non-driving duties or released.

SELLING SAFETY AT ALL LEVELS

Flyers, posters, bulletins, and honor rolls, have been tried to sell safety and keep accident prevention and defensive driving uppermost in a driver's mind.

Operators are frequently contacted by division superintendents, follow-up instructors, route supervisors and other management representatives. Some months ago we inaugurated the practice that each contact . . . discussing a complaint, miss, accident, or merely chatting . . . should conclude with a brief safety discussion and the need for continuous defensive driving. The objective was to keep the story and importance of proper driving behavior foremost. Short five-minute reconsideration on being alert and using good judgment to avoid accident situations will serve as an effective reminder and supplement other efforts to make our operators real defensive drivers.

We intend to contact every man on the system through this particular means. These short talks are well received by operators and are a satisfactory means of keeping men aware of accident problems.

Quarterbacking the safety program is the committee on personnel and accident prevention. Committee members are the operating vice president, who serves as chairman, the superintendent of transportation, the two assistant superintendents of transportation, the training supervisor, the personnel director, the claim agent, the engineer of way and structures, and the superintendent of equipment. This committee meets monthly to initiate plans for further improvement of safety. Goals are set. Facts relating to past accidents are reviewed. Where corrective steps are possible, orders are issued and action started. Safety is the first order of business at all departmental staff and supervisory meetings.

We continue practices which in the past have been effective accident prevention and keep a watchful eye on operating procedures. We correct and reinstruct as necessary and are continually searching for new ideas to improve our safety performance. We must do an increasingly effective job of instilling proper skills and attitudes in those behind the steering wheel—emphasizing the positive force of driver education and the deterrent influence of a soundly administered enforcement.

To beat a better record each year becomes increasingly more difficult. Our passenger accident rate in 1956 of 5.92 per 1,000,000 passengers was bettered by very few American cities. However, we do not rest on our laurels, but exert every effort to improve our operations and eliminate needless accidents.▲

A CLINICAL APPROACH TO RETRAINING

by CARL F. RAMSEY

chief station supervisor, Cleveland Transit System, Cleveland, Ohio

"Retraining" perhaps means different things to different people. But here "retraining" is any safety education or instruction given operators after their initial training period.

Although conditions may vary from property to property basically safety problems are the same. A clinical approach to retraining has five divisions:

Preparation of Supervisory Personnel

a. They should be specially selected.

b. They should be specially trained.

A definite relationship exists between supervision, operator's attitudes, and accident frequency. The supervisor is a key man in any safety program because his job deals with people. "The common denominator of all supervision is the direction of human actions." The transportation supervisor directs operators and it is his responsibility to motivate and teach them to operate safely. He must inspire them to cooperate, develop incentive and be interested in doing their best.

The transportation supervisor has a more difficult job of producing safe operation than the plant supervisor, because transit operators have physical supervision only brief periods of their work day.

This means the supervisor's instructions must extend beyond checking or correcting any deviation. Operators must be trained to make split-second decisions based on sufficient background training to insure a high degree of accuracy. Obviously, the key to a successful retraining program is the mental attitude the supervisor develops. This insures retention and recall of experiences to fit the problem at hand. For this the supervisor must have a high degree of leadership—the kind which inspires performing the job at peak level.

Supervisors selected to administer a retraining program should have the ability and desire to teach. They should know the principles of human relation problems, safe operating principles and practices, and all details of the retraining program. Safety should not compete with anything for their time, attention, and enthusiasm. The operators must feel that the supervisor wants to help them, is interested in their growth and improvement, and will be pleased by their success. The supervisor must recognize that our biggest problem is not "defective equipment"—is not "accident hazards"—is not "the other vehicles." Our biggest safety problem is people—our operators.

STANDARDS FOR OPERATORS

a. Determine average number of accidents per operator for the system.

b. Determine average number of accidents per operator for station or division.

c. Compare individual accident records against these averages.

A good safety record depends on the performance of operators. We must tell them what is expected of them as individuals. We can get safer operation by asking for it, by insisting on it, and by setting standards for it. Our operators are obligated to themselves to give their best. They should know how they are doing, and the standards by which they are judged. We should set individual goals—goals that are understandable and fair. In doing this we should appeal to operators' mind, not emotions, and bear in mind that while safe performance might be obtained by pressure tactics, it is much more desirable to secure willing, voluntary cooperation.

ESTABLISH PROCEDURE FOR RETRAINING

a. Establish pars for comparative purposes.

b. Separate individual records that vary from par.

c. Group individual records according to variance from par.

Retraining should not be a hit and miss basis. An orderly procedure (based on facts) should be set up to eliminate guess work. The operator's individual accident record is the key to this procedure.

First, an average par should be established for the station or the division. The number and the severity of the operator's accidents are considered. The individual can then be compared to the par established by fellow operators working under the same conditions, operating the same equipment, same lines and subjected to the same degree of accident exposure.

Once par is established, the next step is to separate the individual accident records that vary from par. They should be separated into groups according to their variance from par, such as:

1. No accidents—Commend
2. Above par—Encourage
3. At or near par—Accident clinic
4. Below par—High accident review
5. Unsatisfactory — Remedial training or suspension or discharge.

INITIATE RETRAINING ACTION

a. Prepare retraining programs for each group.

b. Administer program on an individual basis.

c. Start all programs with a personal interview.

Initiating the proper retraining action could very well determine the success or failure of the programs. Programs prepared in advance fit the needs of the five groups. The program is prepared for the entire group, but should be administered individually because retraining is not a group activity. Each operator must be handled on a personal basis as indicated by his record, length of service, past experience and personality.

Operators in Group 1 should be given a commendatory interview. The interview should be private befitting the achievements, because operators without accidents are prize possessions and should be considered as such.

Operators in Group 2 should be handled similarly. The commendatory interview should take approximately 15 minutes.

Skipping group 3, temporarily, group 4 are operators below the established par and should be given the high accident review course. This 8-hour course deals in detail with the six basic traffic hazards producing accidents and also gives techniques of professional defensive driving with demonstrations by the training instructor. It is suggested the operator be paid for this time.

Group 5 is operators with unsatisfactory accident records with whom more drastic action must be taken. They are given remedial training, a 3-day retraining course, and are not paid for the time. This course details safe operation with emphasis on defensive driving. In addition, everything bearing on the operator's accident record is explored, such as financial circumstances, or domestic difficulties which may lead to an interview with his family.

He may be given a complete physical examination, especially eye tests, and possibly psychological and psycho-physical tests. He then practices in actual operation the things he has been taught. If his actions indicate he can't do the job safely, he is discharged. If he can do the job, he is returned to service ON PROBATION.

Group 3 are operators whose accident records classify them as average. The objective is to move them into Group 1 or 2, but the approach must be carefully planned and executed. As long as an operator's accident record is average, he can't be told that it is bad. The very fact he is in Group 3 indicates he has the potential for Groups 1 or 2. These operators should be referred to the accident clinic review, a 2-hour course and they are paid for the time.

The accident clinic should prove to the operator that accidents can be avoided, instill in him the desire to avoid accidents and teach him defensive driving.

We prove that accidents can be avoided by showing and discussing the safety records of Groups 1 and 2. We point out that those operators drive the same equipment, over the same routes, carrying the same passengers. The operator's accident record is analyzed and he is shown his extended periods of time without an accident. We stress using defensive driving techniques all the time, so those accident-free periods will be extended and appear more frequently.

We tell the operator he has the potential for Group 1, and he is unjust to himself and the company if he fails to use this ability. A cost breakdown shows him the tremendous saving possible if he and others in Group 3 used their potential abilities. Slides are used to show the causative and preventive factors in the six basic traffic problems. Slides on passenger accidents are also used at this time.

The traffic magnetic board is next used to recreate accidents in which the operator was involved. The operator helps recreate his accidents on the traffic magnetic board and explains the defensive driving practices he will use to prevent those accidents in the future.

We are a sales business. We must sell our service to the public, and safety to our operators. Can safety be sold? Safety rules will not sell it, because rules do not control human behavior. Safety is an attitude and can only be sold through proper promotion and continuous, effective educational programs. It has been said that "safety is a problem of human behavior which requires education rather than legislation and crusade rather than tirade." If the operator is sold on the accident clinic program, and he will be receptive to the program, to safety education and instruction in the future. In addition, he will become a safety salesman among his fellow operators.

WAYS TO EVALUATE RESULTS

a. Follow up to see results of your action.
b. Keep an eye on attitudes, relationships and service to see if they have been affected.
   1. If record improves, call in for interview at six months intervals (commendatory).
   2. If no improvement, take further corrective action.

Once you invest time, money and effort retraining an operator, you can't afford to leave him to his own devices. You must protect that investment by periodical check-ups to see if the retraining is bringing the desired result or to take additional remedial measures as is indicated.

Safety educational programs for our operators cost money. There are those who feel they can't afford to combat accidents in this manner. However, the transit industry can not afford to spend approximately $60,000,000 annually for injuries and damages. Safety education is much less expensive and certainly a more worthwhile expenditure.

WE'RE KEEPING TOO MANY ACCIDENT RECORDS

by J. G. BUTLER
director, Personnel & Labor Relations, D. C. Transit System Inc., Washington, D. C.

The whole country has gone haywire over figures! We are nuts about statistics! We are slap-happy about records, surveys, polls, analyses, ratings and, in general, any kind of accumulated data!

Now, before I discuss the wanton waste involved in the superfluity of accident records most transit companies maintain, I want to make it clear that I recognize the stern necessity of compiling statistical information and informative records relating to accidents. However, if everyone would carefully and honestly examine every report form, summary sheet and analysis record used in safety, claim and personnel departments, we could dispense with 25 per cent to 75 per cent of the material. This pruning is practically guaranteed to improve safety programs.

Anyone concerned with safety work in the transit industry should insist on certain indispensable data to direct or execute the attack on accidents. Without keeping basic records you cannot know where your activities should be concentrated nor measure the results of your efforts.

It has been the universal practice to establish and maintain vast systems of record keeping, involving all activities of the various transportation departments. Also, a misunderstanding existed on the type of information necessary to prepare reports. A better understanding of laws and regulations governing our operation has afforded relief in that direction.

MUCH DUPLICATION OF RECORDS

Due to jealousy, distrust, and lack of proper communications between individuals and departments, record keeping was often established by more than one department within the same company. As an example we had established a record keeping system for individual operators in each operating division, the training division, the transportation personnel office, the transportation department office, the dispatcher's office and a general statistical record maintained by the claims department. In addition to this, each operating unit published reports. Daily, weekly, monthly and annual reports provided excellent dust-catchers, but seldom helped reduce accidents.

Even worse, the reasons why certain records were religiously maintained were forgotten. A large number of personnel were devoting so much time to gathering information, preparing reports, tabulations, analyses and filing that no time remained to present the material to the operating personnel, at least not effectively. As a result offices are actually overstaffed, and the safety supervisor, submerged in a sea of statistics, becomes prone to adopt negative attitudes, whereas positive thinking is needed.

Even when we provided a sufficient complement of personnel to present analyses of statistical information, orally or in graphs, charts or written reports, the operators soon became bored and immune to such dry media. One of the quickest ways to sabotage a safety program is to bombard employees with too many statistics and records.

The actual cost of record keeping was not established nor was the excess of personnel evaluated; consequently, an appraisal of the eventual savings is not available. This is because departmental reorganization was the paramount objective and persons displaced were reassigned to other duties in other departments. Also, a 52-day work stoppage in 1955 caused a substantial reduction in personnel in all departments of our company.

The work stoppage gave us another opportunity to determine what records were actually necessary. We reassigned work so that no person was specifically allocated the exclusive task of record keeping. It was distributed as a routine detail of a clerk's activities.

A change in personnel made it possible to re-evaluate our needs and to establish a centralized location to maintain the records of the individual operators. We eliminated record-keeping at our operating divisions and training division, thus relieving superintendents, supervisors, and clerks to perform a more desirable function.

The claims department still prepares the basic statistical information relative to number, date, location and classification of accidents under the system adopted by the American Transit Association. Each accident report shows the time, weather conditions, identification of operator and vehicle and, ultimately, the cost of settlement. From this reservoir of information, any form of analysis can be prepared.

The route and location analysis formerly prepared by the claims department was eliminated after a poll showed that the departments didn't use it. This not only released the person preparing it for other duties but eliminated files where useless material was accumulating. Any route or location accident information necessary can be secured from the reports maintained in our claim department or dispatcher's office.

RECORD NEEDS EVALUATED

A day by day comparison record is maintained of the number of current accidents with the number that occurred during the same period last year. This gives us a general view of our accident situation at any particular time. The time to analyze basic records to determine which lines, areas, types of vehicles, times of the day, individuals or groups of operators or kinds of accidents require special attention, is not daily, weekly, monthly or annually. Instinct or inspiration will not prompt you to select the particular problem in most need of corrective measures. On the other hand, an elaborate record system will not tell at a glance just where tomorrow's efforts should be aimed.

We can justify undue emphasis on records covering every detail of our accident picture

by saying it is impossible to determine what phase of the operations is costing claim dollars unless we have at our fingertips a day-by-day picture of each minute component of each accident. Cluttering up your files with non-essential accident records which require daily or weekly attention certainly is not going to reduce accidents.

Top management is not impressed by formidable reams of records. Don't wait for an order to reduce paper-work! Self-imposed restraint in documenting details will not only lighten the clerical, administrative and supervisory load of the safety department, leaving time and thought for action, but will also produce the results that management is entitled to and demands from the safety program.

HAVE ACTION—NOT RECORDS

There is a happy medium between processing too much accident information on the one hand, and not compiling or periodically analyzing basic records on the other hand. The safety man who thinks he can get along without records is a fool, but the safety man who overdoes the record-keeping will be so confused and have so little time for constructive work that he will actually find an ever-increasing number of accidents to add to his records.

To specify precisely what records are necessary is virtually impossible. The size of the operation, the effectiveness of the present safety program and other individual considerations all have a bearing on the answer. Two transit properties of identical size and operating characteristics may well require entirely different amounts of record-keeping to aid in their respective accident-prevention efforts.

A little study will reveal that we seldom refer to a great portion of our records. If we desire to use them, it would not be difficult to obtain special statistics promptly, provided we plan the basic record-keeping in such a manner that you won't need an electronic brain to produce the information.

The real secret to a successful, economical and effective accident record system lies in intelligent planning of the raw material. If you secure adequate primary information, it is easy to extract almost any specific data, including helpful comparisons, trends and examples. Just see to it that your thinking and planning and doing are not hampered by the vicious habit of piling up records that smother rather than serve a progressive program of safety promotion.▲

WE CAN DO MORE WITH ACCIDENT STATISTICS

by PATRICK S. SIROIS
safety director, Miami Transit Co., Miami, Fla.

As far back as 1945, M. A. Kraft, then director of personnel and accident prevention of the American Transit Association, said transit companies need a progressive program of accident analysis. To accomplish this, he stated, they must improve individual accident reporting by employees, expand present classifications of accidents into logical detailed groups, and establish a system of adequate files for quick, convenient, analysis of accidents along many different lines.

This need is as definite now as in 1945. Accident statistics are the compilation of fact and data of our fleets' accidents. We can do more with accident statistics, because they reveal answers to many of our problems. You can't lick a problem you don't know you have.

Suppose you were starting with a new company or with an old company which never had a safety program. How would you get started? You would find out what specific problems the fleet was having and then apply specific corrective measures at the specific problem. This would call for records, and if these were non-existent, incomplete, or difficult to evaluate, you'd do a lot of digging until you would come up with specific recommendations.

Many companies today don't keep records. Some keep many records, but don't use them.

TOO MANY OR TOO FEW?

Whether you are keeping too many accident records can be decided only after an analysis and evaluation of those records are made.

Adequate records must reveal unsafe acts, equipment, conditions, practices, or unsafe combinations of these factors. Unsafe acts can be controlled, unsafe equipment made safe, unsafe conditions improved and unsafe practices regulated by policy and supervision. But the control is not strict discipline. The control is driver education and driver improvement programs which bring about voluntary correction.

Adequate records must indicate trends to compare with other fleets in the area and the overall police experience in accidents. Most local law enforcement agencies keep detailed accident map studies and are glad to compare notes. Adequate records show the frequency and severity of the accidents, the most frequent type or classification of accidents and the cost of the accidents.

Effective records provide information for management. Management must see the need and necessity for specific problems you are attempting to solve and then will support and lead those programs.

Records also provide the safety man with information to see the problem of accident prevention. When he can see the problem, isolate it, and plan specific action, he is on his way toward reducing operating accidents.

Records educate the bus operators and passengers, to indicate areas of need. They also help persuade public officials to get bus loading zones, correct hazards unsafe for other drivers, establish adequate, safe routing, or rerouting. Again you have to show a need and a necessity based on records of your accident experience.

Records have legal value, and are strong deterents against fraudulent claims. Fair settlement depends on sound analysis of causes and circumstances.

Our records consist of operator's report of an accident, investigator or supervisor's report, and the claims file. If the operator's report is complete, we can do a good job with the other records. However, we usually don't rely completely on the operator's report, because some of us often require more detail from the investigator's or supervisor's report. If you have access to the entire claims file you should have an adequate source of information.

Most of the basic records in the safety department, consist of a daily log or accident register, a location file, a summary, and an operator's card or file, in addition to forms for either the ATA or National Safety Council.

The daily log or accident register is the first step in compiling information. We keep a more detailed log than the Accident Register prepared by NSC, covering number of passengers, passengers' or observer's names secured by the operator, the accident point rating for incentives and a brief description of the accident.

From this register, we have details such as, time of day, day of the week most accidents happen, and location of accidents. Also included are vehicle and operator most often involved, other person, vehicle or subject most often involved and the type of accident most often experienced. This breakdown provides the source for proper analysis.

The operator's individual card or record will reveal the number of accidents in a particular period of time, the type most often experienced, or pattern of accidents, and how the individual operator compares to the average of all operators.

Location files, vehicle and route information pinpoint areas to explore, analyze and correct.

Accident loss control must be the end result of sound accident prevention programs. Cost data will show which accidents are the most expensive and why.

A SAFETY MAN MUST BE CURIOUS

Besides interest and ability, the safety man's greatest assets are curiosity and imagination. Even after he has developed adequate source records, established basic records and made primary breakdowns—he still has not done all he can do with accident statistics. He knows he must analyze the information on when, where, what, who, why and how.

Asking questions reveals the primary causes of accidents. But you also have to see the underlying causes to see your problem completely, and these are multiple and complex.

The problem of accident prevention will be solved when we forget who was primarily at fault, uncover underlying causes and make these as obvious to drivers as the acts of following too closely, or failing to yield the right of way. To name a few, illness, inattention, emotional mal-adjustment, lack of adequate training, lack of supervision, or poor attitude, may be the underlying causes.

When the safety man sees primary underlying causes, he can take corrective action along productive, rather than general lines. The action he takes may be developing, improving or recommending the selection and training phases of the program. He may recommend proper maintenance of equipment, passenger education, hazard studies, bus stop surveys—programs aimed at more efficient supervision or driver retraining.

The safety man's records and analysis are to him what charts are to the navigator—they reveal the problem and steer him in the most beneficial direction.

WHAT CAN WE DO COLLECTIVELY?

We are not alone in this fight against loss due to accidents. Although we work as individuals, we have the National Safety Council's services. Not all of use are using these services. We haven't as yet started to compare on a uniform level, or relate information about our successful procedures. When we have a problem, we write another partner for a rundown of his experience. This takes time, and sometimes the person we write doesn't have the answer. We are missing a bet if we don't develop a single, convenient method of getting the information we need to do a better job.

Collectively, we can do more with accident statistics! We can agree on a uniform classification and analysis of accidents in the transit industry. We can report our experience periodically to a central agency for compilation and comparison with other companies. A better overall picture is shown with thousands of accidents and millions of operation miles than with local experience.

The objection is that our system is pretty good and serves our purpose. However, it isn't working half as well as it might if we still have problems to ask individuals. We have an excellent medium of exchange in "Transit Topics."

Since we all use something else, let's agree on something which will provide the answers. Let's use the ATA code and classification and Form Vehicle 20, Experience Analysis to poll and exchange data. A study of millions of operation miles and thousands of accidents should produce answers to many of the questions.

Our companies became members of National Safety Council for specific reasons—to get ideas, suggestions, help and knowledge which will effect accident loss control. Most managements have learned from hard, bitter, expensive, experience that general programs, will not produce the results desired in accident loss control.

Aside from reducing accidents in our fleets, safety men have further obligations to communities and fellow safety men. Accident prevention on the community level pays dividends in good public relations and greater safety in the community, which has a decided effect on accident experience. We owe each other the benefit of our experience and achievement.

I respectfully urge and recommend that we begin using the ATA code and classification and the Experience Analysis, Form Vehicle 20 and start sending periodic reports tot NSC. If you are satisfied with your present classification, fine, keep it. But in addition, take a few minutes each day to code and classify according to ATA. If your programs are secrets, omit the name of your company. With a good accident register, the ATA code and Experience Analysis, we may not have to keep too many records.

If we do this collectively, our experience can be summarized. We can determine a par or mean average, and measure ourselves either above or below standard. If below, we can direct our activities toward specifics. The best fleets can advise on solving a problem. They even may find that while their numerical experience is pretty good, some fleets with higher numerical scores have solved the problem of controlling cost. We can lose no more than a few minutes a day and have a great deal to gain.

The number of records you keep is your concern. I am not advocating that you scrap what works well for you. I am, however, advocating that you ask more questions of your records, dig deeply into underlying causes, and go after the problems through adequate records.

I recommend we start summarizing our experience in a uniform manner on the recommended ATA code and classification and Experience Analysis and that we do this on an industry-wide level. All of us will see new, unknown problems, how the experience changes from time to time, and how to solve the problems uncovered.

If we do these things, we will have done all we can with accident statistics and will reduce accidents making our transit industry the most attractive, efficient and the safest in the country.

THE MECHANICAL DEPARTMENT'S ROLE IN SAFETY

by HYMAN FELDMAN

director, surface maintenance dept., New York city Transit Authority, Brooklyn, N. Y.

A miracle occurred in New York! The Surface System of the New York City Transit Authority operates nearly 2,000 vehicles in all boroughs of the city of New York. This year 413 million passengers will be carried 76 million miles. Eleven garages and a base shop house, service, clean and maintain this fleet.

During the ten years prior to the fiscal year ended June 30th of this year, a total deficit of 77 million dollars accrued to the Surface operation. This continuing deficit reached a climactic point in fiscal 1953 when a deficit for that year alone reached a peak of 14.6 millions of dollars.

The Transit Authority, with consulting experts of the industry, researched the entire matter. The experts said fresh thinking, new experienced management officials and strong, dogmatic, skilled, experienced controls were required. Consequently they hired transit experts with known skills to devise and implement correctives.

The fiscal year ending June 30th this year saw this system in the BLACK. A miracle occurred in New York.

PROCEDURES NOT UNIFORM

What does all of this have to do with safety?—A good question. A first act in reorganization was examine the system, ascertain the problem and attempt to arrive at a solution. One basic problem became very clear—procedures were not standardized and practically everyone had his own way of doing a job. While the problem was simple, the solution was not.

In any case, since procedures required standardizing, numerous projects began to ascertain the best method for performing the work in standard operating procedures. After this "writing" phase came implementation. Obviously pitfalls arose and it was here the matter of safety was thought about.

Proper, economical and efficient maintenance is performed by using certain simple impediments. A man properly trained understood his work, and had adequate, proper tools and parts was required to accomplish the feat. The man was available, the procedures were established as mentioned before, and the simple term "safety" alone accomplished all the other requirements.

How could a man work efficiently and safely without adequate light? How could he work efficiently and safely without the proper tools and parts?

STUDIED SAFETY AND EFFICIENCY

Maintainers were seen with flashlights under their arms attempting to tune-up engines. Experts studied proper portable lighting and designed and manufactured a special fluorescent lamp. This lamp lights work and even permits a maintainer to stand in front of the light without casting a shadow and/or reducing the light intensity.

Furnishing proper tools and parts was simply handled by requiring the use of proper tools and severely disciplining those who did not use them.

While discipline may be necessary in both the safety and the maintenance fields, it alone will not breathe continuing safety practices or efficient maintenance. A safety consciousness must be present.

A special standard operating procedure was prepared, titled "Safety," which established safety committees of two hourly rated men and two annually rated men. Committee membership rotated so that each man would serve for one year with replacements each three months. One man was safety coordinator.

Once a month the safety committee at each location conducts a meeting on company time. Attending are committee members, the safety coordinator, the location chief, the division chief and the location's transportation department location chief attends.

The committee first inspects the area. Secondly, all employees are instructed to inform committee members of unsafe practices. At the meeting all items of safety —those noted on the formal inspection, those mentioned by employees and those mentioned by the transportation location chief,—are discussed. A report after each meeting makes it MANDATORY that action taken be noted as well as firm target dates for action. If these last two items are left off, the report is returned.

Also, at the safety committee meeting, every accident, notwithstanding seriousness, is reviewed by the committee and a recommendation is made.

An effort is made to enhance the importance of the committee members first, by posting their names on bulletin boards, secondly by each wearing a large attractive badge and thirdly, by giving them inspection freedom not permitted others of the same title.

In the base repair shop where there are more and more men, the same general committee set-up is established, except a representative is appointed from each activity. There is one man for floor work, body work, convertor work, unit rebuild and paint shop.

Although the committee members are from different activities in the shop, they are urged to criticize their associates' areas.

There is greater latitude in the base shop and consequently, friendly rivalries spring up between the various areas. Lots of joshing begins when results of safety matters are announced. This friendly rivalry is very helpful towards enhancing the safety record.

Four foot by eight foot signs were erected at all parts and tool room windows which read "SORRY—NO STOCK on Hands, Fingers, Toes and Legs." The shop maintenance forces consider these signs humorous and joke about them constantly, increasing safety awareness.

Moveable safety slogan rocks were installed in the shop, equipped with a different slogan. These are moved about every few days to keep them fresh at all times.

SIGNS, SLOGANS, CHARTS

Each area in the shop has a large sign which reads "Housekeeping" with a slot underneath for the words "good," "fair" or "poor." On Friday, the safety committee tours the shop and rates each area by marking the signs. This routine has generated tremendous interest as well as competitive spirit. It has been particularly good because hourly rated men act as judges.

This shop also has two charts listing the name of each section with a man-hour-exposure tabulation. Each week the number of exposure hours without a lost time accident is calculated and a red ribbon stretched to the cumulative total figure. This too generates competitive spirit and the workers become perturbed when someone harms their record. Through this, each group is aware of the American Transit award won for at least 250,000 exposure man-hours without an accident and informs them how near they are to the goal.

This year we began a competition among all locations and units in the shop. All location chiefs wrote a personal letter to their employees telling them of the importance of the contest. Large bar charts have been posted showing the positions of all entries. Each person in the winning group will receive a pin at a ceremony.

Our safety committees and supervision know that our practices are much more safe. But they are working even more diligently towards enhancing safety than they did previously.

EMPLOYEE SAFETY

by WILLIAM I. LITTLE
superintendent, Transportation division, New Orleans Public Service Inc.
New Orleans, La.

Every employer today gives much thought to his employees' safety. If this desire to make jobs safe was not brought about by man's desire to care for his fellowmen, it was encouraged by the National Safety Council and other organizations. If those two incentives were not enough, then employee compensation laws and the high cost of settling claims of employees injured have made it mandatory that we make our jobs as safe as possible.

After the industry and company take safety precautions by improving equipment and instructing the employees, the next move is to get the complete cooperation of all employees. They include top management, supervisors, foremen, clerks and the men on the job.

The New Orleans Public Service Inc. has a program to promote employee safety. This may not be the program you should use—yours may be far more effective. However, we believe the way to improve performance is to coordinate proven methods of other companies applicable to our needs with our own ideas.

At Nopsi, our safety training is broken into the following six steps.

1. The value we attach to employee and public safety is discussed with new employees.
2. Safety methods and practices are discussed and taught during an operator's training period.
3. Follow-up and close observation of an operator are made after he starts in regular service.
4. Personal safety and unsafe acts are discussed at refresher conferences. Safety training films and other visual aids and posters, are used.
5. Personal safety is stressed with public safety at safety celebrations.
6. Employee publications review good safety practices and noteworthy safety accomplishments.

The interviewer, who talks to an applicant before he is accepted by the department, discusses the importance of personal and public safety. He shows him the pride the company and employees take in safety records, and how these things are important in the way the public feels toward the company and from the humanitarian point of view.

NEW EMPLOYEES' ORIENTATION

This continues in orientation by the employment department after he is employed and before he is sent to the transportation division for his initial training. He sees an orientation film which emphasizes the company's efforts to make his job safe, and some awards received by the departments and divisions of the company. This lets him know he is a member of a team interested in his welfare, and stimulates his thinking of safety.

When new men report to the training school, their training in safety takes a more practical course. They see through motion pictures and slide films the safe way to do their job.

The types of personal injuries we experience are similar to those of other transit operators. Some of the more frequent types are:

1. Arm, hand or back injuries from handling the steering wheel.
2. Back and arm injuries in raising windows.
3. Hand, arm or back injuries from handling trolley retrievers.
4. Eye injuries in placing trolley poles on wires.
5. Falls.

On the practice track, they are shown the correct way to turn a steering wheel with the least amount of strain on their backs, shoulders and arms. They are told that one out of six personal injuries come from handling the steering wheel. We teach them to pull the steering wheel as if it were a rope. It surprises them to find how much easier it is to pull the wheel than to push it around. Strain and over-exertion, two other frequent classifications of personal injury, often come from improper handling of the steering wheel.

OBSTACLE COURSE TO DRIVE

Our practice track has a section of roadway with built-in ridges and depressions like rough street surfaces. They see here how the steering wheel can be jerked out of their hands, causing injury to themselves and possible injury to passengers if they lose control of the vehicle. With practice over these bumps, they learn to grip and control the wheel. We also set up large barrels, staggering them to force the operator to zigzag through them, and show him how to steer without straining and how to drive through tight spots safely.

The track has sample stops similar to those on our routes: a stop just after a right turn, one after a left turn, and one where you make a short turn to get up to the curb. If this lesson is learned well, the operator should perform his duties in a safe and efficient manner.

Raising and lowering windows are a frequent source of injury to operators and an inconvenience to passengers. The new operator sees it is easier to raise or lower windows before the bus leaves the garage. Without passengers, he can face the window and brace himself so the strain is on his legs rather than his back and shoulder muscles. Standing in the aisle making a quarter turn to raise a window is a good way to strain his back, especially if the window is stiff.

New operators are shown the proper method of resetting trolley coach retrievers to prevent hand, arm or back injuries when the trolley poles dewire. And they are shown where and how to stand to avoid eye injuries when placing the trolley poles back on the wires.

Many employee injuries result from falls. Getting on or off a vehicle, walking or running to the comfort station, walking or moving around the stations and bus lots. Injuries from falls are hard to control. No one wants to fall but anyone is prone to rush, which may cause him to slip. We emphasize "look where you are going" and "take your time," to minimize this type injury. Good housekeeping will help; oil slicks reported and taken care of, and objects picked up, especially from steps, reduce tripping hazards.

Close follow-up is made by instructors and supervisors after the new man begins. We stress to both new and experienced operators that safety measures are designed to help them and are essential to the welfare of the employee and his family. We sell him on the safe method being the best for him. We are not critical of an operator because he has to be shown how he is helped by safe practices.

Every year, our operators go to our training school class in groups of 30 for a one day's discussion. We discuss personal injuries of operators without giving names and ways these accidents could have been avoided. The men enter into these discussions, expressing their own views and are encouraged to make suggestions. When they can make suggestions, they are more likely to put them into practice.

FOLLOW-UP AND CLOSE OBSERVATIONS

Every year since 1948 we have had department get-togethers to celebrate winning various awards for safety achievements, both in public and employee safety. These awards have included the National Safety Council's "Award of Honor," the American Transit Association's Silver Plaque for Traffic and Passenger Safety, and a number of Bronze, Silver and Gold Awards from the American Transit Association for record man hours worked without a lost time accident.

These celebrations are attended by the employees and all the members of their families. We show them that their part in establishing records is sincerely appreciated by the company.

Officials from the president to the foremen express their appreciation. The main point we emphasize to employees and their families is that their good work is valuable to themselves and the company and that it is appreciated. A pat on the back does a lot of good and we all try to do a little better after that little pat on the back. In this way, we promote a desire in our operating people to do a safe job without making them feel they were brought there to be preached to.

"Transit Service," the monthly magazine of the transit department sent to all employees' homes discusses accident prevention work. The July 1957 issue featured the safety awards received in 1956, with the cover showing the eight awards received during the first six months. The feature article covers the awarding of the American Transit Association's Silver Plaque, and point out how the award was earned by the members of all divisions working together.

In other issues, operators' individual safety records are shown and the names of men receiving safety certificates are listed. Letters of commendation are published. Many point out how an operator handled his vehicle safely.

All these things help remind the operator he should be safe while at work and his safety record is appreciated by the company. But most of all, he and his family really benefit from his safe operation.

OFF-THE-JOB ACCIDENTS

Statistics are such boresome things
And figures rather dull.
It's hundreds, millions, billions, trillions,
Over which we mull.

But facts are facts where'er we go
Regardless of amounts,
So here's some facts on accidents,
And that's what really counts.

It isn't always big machines
With blades of sharpened steel
That rob a man of arm or leg
And make his senses reel.

Nor is it always "on the job"
Most accidents take place,
But just the opposite is true
And figures prove our case.

It's carelessness in little things
At home and on the street
Neglect in moving objects small
Away from running feet.

A makeshift ladder, sliding rugs,
Electric cords that spark
A disregard for cellar stairs
And stumbling in the dark.

Crossing where no crossings are
While looking at the sky,
Driving on a slippery road
With milestones whizzing by.

These are the things that take a toll
We all should frown upon
So watch for them when off the job,
As well as when you're on.

—Humble Pipe Line Company, Houston, Texas

DO WE DRIVE AS WE LIVE?

by DR. PRESTON BRADLEY
Pastor, The Peoples Church of Chicago, Chicago

When talking about safety you only have one theme and all you can possibly do is a variation upon that theme. The effectiveness of what you're saying will depend entirely upon your capacity to create the variation.

I'm chairman of the Library Commission of the City of Chicago and chairman of the Mayor's Commission on Human Relations and a member of the Illinois Prison Investigation Commission. I've given a great deal of my life to enterprises with a civic circumference. But, I get a little tired about the constant undignified references to Chicago. If they would only tell all the truth it wouldn't be so bad.

We are in an era where accidents, murders, immorality, corruption and sin are news. Goodness and truth and achievement are not yet news. They do not possess the dramatic quality of news and that happens in this matter called publicity. Let me tell you what I mean. I could lecture giving the best of my mind, the best of my thinking, the best of my energy.

I could project my ideas to the best of my limitations which are many and nobody would pay much attention. Every editor in the city of Chicago is my friend. But the probabilities are that no matter what I'd say while I have this opportunity, it won't make any headlines. Nobody will care much about it, nobody.

THIS MAKES NEWS

But, I can put my name in one inch letters on the front page before eight o'clock tonight of every newspaper published in the city of Chicago with no trouble at all. All I have to do is artfully get my fingers in your pocket and get your wallet and put it in mine and then go around and visit some more and get in and get another wallet and get four or five of your wallets and start out of here.

The house detective gets me going out the door on La Salle Street and says, "Doctor can you step into the office a minute." He finds your pocketbooks in my pocket. There isn't a newspaper in the city of Chicago that won't have a headline "Doctor Bradley Arrested As A Thief." That's news.

Until we can bring sufficient pressure on those who have the power of creating public opinion in your field and in mine and in every other area which affects the human personality this is going to be an uphill battle.

PUBLIC OPINION BRINGS ACTION

The greatest force and power in a democratic society are the newspaper, the lecturer, the educator, the person who has the responsibility of creating public opinion. For public opinion leads to action and action leads to destiny and destiny is where we are all involved.

You can have a technical appreciation and technological education of the whole problem of safety. You can exchange ideas at national Congresses; you can discuss the by paths; you can do all that. But you and I must find the way in which we can touch that intangible power in a democratic society in which every problem is involved in the creation of public opinion.

Just as the present cold war of the world —a war of missiles and satellites—is not a cold war in which the national boundary lines of unimportant nations are involved or little inarticulate people. It's not merely a cold war in which the representatives of the free world argue and meet and discuss in the United Nations. Fundamentally, it's deeper than that.

This cold war is a war for the human mind. When we come out into the area in which the most valuable thing in the world is involved—a human life—we've got to become more basic and more fundamental than I sometimes think we are. It isn't enough to have a technological understanding of the problem; it isn't enough to have a machine made with honesty and integrity in your control.

Have you ever thought that there never was a perfect machine yet that could not be destroyed and wrecked by an imperfect machinist?' The integrity of the machine

today is beyond question. Never were the manufacturers more honest; never was there less cheating in the actual product of transportation.

All of the great industrial equipment of the nation in the creation of the wheel, which is the symbol of the whole problem, were never more integrated with the basic honesty than they are today. I am familiar with a great many of them, a great many of the manufacturers, a great many of the techniques that are used. As an outsider who knows nothing about the technical aspect of safety I want to suggest to you something deeper; something more fundamental.

PURE ACCIDENTS DON'T OCCUR

I don't think that there has ever been a pure accident. I am not one of those who accept the philosophy of fatalism. I am not a fatalist in my theology and I am not a fatalist in my philosophy. And I have lived a long time in the heart of a population of three and a half to five million people and I'm face to face with this problem every day.

Perhaps I should tell you I never drove an automobile. I've been guilty of many things in my life but I've never been behind the wheel of an automobile. I've had an automobile every since there have been any and I have one today. But I have never driven an automobile in my life. Right now I imagine some of you are thinking, "What in thunder does he know about safety?"

Now don't be too sure. As one who doesn't drive, my opportunity to observe my chauffeur and the other fellows on the highway is pretty acute. Don't you discount the authority of that observation.

SAFETY DEPENDS ON PERSONALITY

I think that many times we've been a little wrong in our emphasis about some aspects of safety. When you resolved it all down to its final point it is a matter of personality. It's just as simple as that! It's a matter of personality! I submit this observation to your consideration for you are most deeply concerned.

Something happens to every man who gets behind the wheel of an automobile. Something happens to him, psychologically, and 99 per cent of the accidents both fatal and of *little* consequence can be traced to a personality defect, a fundamental personality defect.

I have written eight books, two of them on the human personality and I think in this field I speak with some element of authority. I'm dealing all the time with the human element—the element of personality. I have never yet seen a situation which could not be traced to some defect in the personality.

That means that over the long pull with the ever increasing opportunity of speed on the highways of America, and with the application of the scientific aspect of transportation which the experts are giving to us in the creation of the great freeways of the nation, we still have much work to do in the matter of driver's personality.

Last week I was speaking in Los Angeles and a friend of mine who was interested in this very subject took me out on the highways and freeways around Los Angeles. It was a never to be forgotten experience and in a matter of just two or three hours, I saw three tragic accidents in which the lives of eight people were involved.

. . . BECAUSE OF HUMAN FAILURE

When we followed through the investigations that came later, it was not alcohol or the like, it was human failure—lack appreciation of the rights of the other driver.

Obviously, no man should ever take the responsibility of all of his faculties. And, those faculties should not either be depressed or encouraged by an artificial condition. When a brain is befogged with alcohol, even a microscopic presence of alcohol that you could hardly detect on the breath, there is a psychological reaction in the person's will and judgment.

The idea that a person has to be so drunk that he staggers or that he weaves in traffic in order to come under the classification of intoxication is ridiculous. You can't take a spoon full of alcohol in a position of responsibility like that and not have a direct affect upon your will and your judgment. I think that there is an area of education is that field that sooner or later we've got to do something about. It isn't enough to treat it as objectively as it is being treated today.

If the job is really going to be done in the presence of the trend to create more power in an engine, *it will* take more regulation in the state legislatures and assemblies of our country. The paradoxical situation of most state legislatures talking about 65 daylight and 60 night time and putting increased limitations on speed and in the meantime the manufacturer providing more horsepower is creating serious situations.

I'm not so sure but what it's dangerous to put into the highway an instrument in the hands of a man who depends upon something called quick pick-up knowing that under him is 200 or 300 horsepower, that he can take a chance in any spot because he knows it's there.

I don't think we're beginning early enough to teach safety. This is a power age. Every kid is smitten by the power bug. I've got a nephew that's already talking about space flight. He explained to me the other day how to make a platform in the moon where they can land. He's got it all figured out.

Of course, I don't get as excited about those things as a lot of people. This little piece of tin running around the globe in an orbit doesn't bother me. I don't know why anybody bothers the poor old moon or Mars or any of the rest of it. I think we ought to be doing something about this earth first.

TRAIN PEOPLE EARLY

If we could have saved this money, half of the billions the taxpayers of America pay, to begin this problem of psychological training for the individual at the time we should be at it and not wait to do the job, we'd get the job done. We should be getting at this problem in the earliest grades of school.

We need to study the human personality; we need to develop the whole philosophy of one's reactions and reflexes and responses which are involved in any moment of emergency. What's the test of a man's character anyway? If we should have at this moment some great catastrophe; if there should be an explosion; if this roof would start falling in—we would all be experiencing some great emergency.

Let me see you in the first minute of that emergency and I'll read your character. Let some tragedy come into your life in the next 30 minutes. Let something happen and let me see how you handle that and I'll tell your character.

Most of us can be honest most of the time. Most of us can be true to one woman most of the time. Most of us can pay our debts most of the time. Most of us are pretty decent most of the time. Most of the time doesn't matter, it's what we are the rest of the time that matters, not most of the time.

EMERGENCIES REVEAL CHARACTER

A person is fundamentally what he does and how he responds and how he reacts in an emergency. If you can shape the human personality early enough to build a fortification for the emergencies of life you've done something to transform the whole area of our modern world.

This is a battle for personality and that's why I think that there are psychological tests that are now so definite in their character and so unimpeachable in their authenticity that I should think we would require a psychological analysis of each driver's personality.

There are people who have most of the major requirements but are so sufficiently defective in fundamental requirements that they go to pieces and you wonder why a sudden flare up in the highway happens, when sudden anger arises.

If my chauffeur who's been with me for many years ever told me I had the right of way, I'd fire him. There isn't any right of way, fundamentally. There is only a right way and yet there are those on these highways whose character becomes suddenly transformed and anger comes quickly. That's part of his personal character.

POWER AGE GROWING

It hasn't anything to do with his ability to drive or the principle of safety. It's a psychological factor in that person's life and I think we're wasting a whole lot of time and a great deal of our emphasis: first, by not beginning early enough. This is a power age and it's going to increase in power as the days go by; we haven't even started yet.

The automobile itself will undergo such a great transformance in the next 25 years that none of you would hardly recognize it today. Safety problems are going to increase not decrease. Let us, in the great area of *the mind and in the psychological*

aspect of it, recognize how important that phase is, too.

You let me see a person in traffic with responsibility and let me sit along side of him and analyze his reactions and I will grade that person's basic responsibility and understanding of safety to an uncanny degree of perfection. Let me see his reflexes and his responses and I will ascertain the quality of his understanding of safety. If pride and self-importance and right of way and all such factors are predominant, he's dangerous. And sooner or later he'll have trouble.

Of the awards that we have made in the city of Chicago for safety, and I've been making them to the Police Department and the Fire Department and to other institutions in our city, the recipients have been the most highly integrated characters in the departments.

A man for safety is an integrated personality. He's a man who is completely in control—first of his mind, next of his emotions, next of his body, so that he is in control of every given circumstance. That man knows and practices safety. Let us have more of those kind of men.

REPORT OF THE NATIONAL FLEET SAFETY CONTEST COMMITTEE

by E. G. COX

chief, Section of Safety, Bureau of Motor Carriers, Interstate Commerce Commission, Washington, D. C.

Each year we report the current National Fleet Safety Contest, bigger and better than the year before. To some, this might sound repetitious and uninteresting. We know, however, that the situation indicates progress both in volume of accident data and in the accident frequency rate of reporting fleets. The mileage of participating fleets increased 215 million miles in 1957 compared to the previous year, yet, accidents dropped 200. The result was a decrease in frequency rate of five per cent.

The average frequency rate of 1.51 accidents per 100,000 miles operated is the second lowest frequency rate in the history of the contest. It is only exceeded by the 1954-1955 contest rate of 1.44.

Records of winning fleets were verified by personal audit for the seventh year. The largest number of contestants were checked by audit than ever before. The 325 audits represent over 93 per cent completion despite the difficulty of obtaining representatives of the contest committee in each state, Canada and the Territorial Hawaii.

From the audit work sheets reviewed by members of the contest committee, it was found that 70 per cent of the contestants were certified exactly as they reported to the contest. Twenty-one per cent of the audits resulted in some change up or down in mileage or accidents and in nine per cent of the audits, the contestant dropped out of the running.

250 AWARDS PRESENTED

More than 250 awards are being presented to contestants in the 1956-57 National Fleet Safety contest.

These consist of first, second and third place awards, as well as perfect record certificates.

To each of the winners, we extend our heartiest congratulations and to the runners-up our hope for improvement during the coming year. To every contestant who participated in the contest, we offer our thanks.

Needless to say every contestant cannot be a winner. Yet, every fleet that improves its record in each succeeding year is a winner by virtue of savings to the company in dollars and lives.

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GREEN CROSS FOR SAFETY

WOOD PRODUCTS and TEXTILE INDUSTRIES

Transactions of the

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(October 21-25, 1957, Chicago, Ill.)

NATIONAL SAFETY COUNCIL

425 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

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LEARNING TO LIVE . . .

Learning to live—safely—was the drawing card which brought more than 13,000 men and women from the United States and 27 other countries to Chicago for the 45th National Safety Congress. These people gathered to exchange the latest ideas in safe attitudes, safe methods and safe equipment. Through speeches, panel discussions and symposiums, they acquired new ideas for helping others—and themselves—to live, work, and play safely.

This was the reason the National Safety Council was organized less than half a century ago, a time when man's thoughts barely kept pace with the industrial revolution. Since then, man has introduced an atomic age which is bringing the continents closer and has made the earth a smaller world. And now man anticipates inter-space travel!

Through science and technology, man is progressing to increasing speeds in travel and production, and increasing dangers—new dangers never before encountered. These, in addition to the everyday hazards of life, occupied the thoughts of the safety people at the Congress.

To encourage more widespread knowledge of the various fields of safety, the National Safety Council publishes the Current Safety Topics—30 volumes of condensations of Congress speeches and exchanges of ideas. Each volume is a handy reference to different phases of accident prevention. The complete set of volumes are listed on the back page of each volume.

Since the proceedings have been edited and condensed for reference purposes, the complete original manuscripts with any charts or illustrations used, are available in the National Safety Council files. Views expressed at the Congress or in any volume of Current Safety Topics are those of the Congress participants, and not necessarily those of the National Safety Council.

THE WOOD PRODUCTS SECTION
TEXTILE SECTION

This volume is a record of the sessions held at the 1957 National Safety Congress by the Wood Products and Textile Sections. The conduct of these Congress sessions each year is only one of the many cooperative activities which these Sections carry on in behalf of their members, and for the benefit of accident prevention work in the wood products and textile industries generally. The Sections give guidance in the preparation of a great variety of *technical and educational material useful in the day-to-day safety programs of* wood products and woodworking plants, and textile plants.

The activities of the Sections are under the direction of their executive committees, the members of which are listed at the close of this volume.

THE WOOD PRODUCTS SECTION

SAFETY NEEDS COMMUNICATING, TOO

by HERBERT E. IHRIG
staff consultant, Florez, Inc., Detroit, Mich.

America has become the greatest technocracy in the history of mankind. Aside from our being second best in the business of creating man-made satellites, this great country of ours can probably build anything bigger, better, faster and cheaper than any other nation on the globe.

Essentially, we have been, and to a great extent still are, "things" minded. When it comes to the "human" side of the equation, we are still pretty much in swaddling clothes.

To see how "mechanically" minded we are, let's take the subject of automation. The average person will tell you that automation means building an automatic factory where you put the raw materials in one end of the machine, press a button and a packaged product comes out the other end. Peter Drucker, in his book "The Next Twenty Years" says, and I quote, "The automatic factory is the end-product rather than the beginning of automation.

Automation properly does not start with production at all, but with an analysis of the business and its re-design on automation principles. The form the automatic production takes in the plant is determined by that analysis and re-design; and mechanization, the replacement of human labor by machines, is a detail of automation and not always an essential one."

MECHANICAL COMMUNICATION

Take "communication" as another example. Realizing the need for improved communication, what have we done? Quite naturally, we have attempted to solve the problem of increasing human understanding through mechanical means.

Today, we not only have the printing press and the telegraph, but an intricate system of telephones. We can talk to our homes and offices from our cars. We have "ship-to-shore," whether the ship is in the air or on the water. Before long we'll be able to dial to any point of the world without the benefit of an intermediary operator.

We have radio and television, and the newspapers, magazines, pamphlets and books which are produced every 24 hours total up into an unbelievable amount of tonnage.

But have these mechanical means really helped us? Or wouldn't a true appraisal indicate that they have merely made it possible for all of us to misunderstand each other faster!

FASTER MISUNDERSTANDING

Now, let's relate the problem of communication as it evidences itself within the structure of our business organizations. Here again "mechanics" have led the way —perhaps backwards. For the past 25 years, they have attempted to improve understanding within business groups through the utilization of such mechanical devices as pamphlets, flannelboards—yes, even elaborate closed-circuit TV programs.

I do not mean to imply that the "gadgetry" and "gimmickry" of communication is not useful. It is indeed. However, due to our mechanistic, intellectual heredity, we are sometimes prone to think of these mechanical widgets and gadgets as substitutes, rather than as supplements to the creation of better understanding.

Tremendous strides have been made in the field of golf, for example. We have easier courses, better greens, greatly improved golf balls and superlative playing equipment, yet the number of good golfers has not increased perceptibly. There's no doubt about the fact that good equipment will make a good golfer a better golfer.

But the finest of equipment will never make a pro out of a dub. What the majority of we hackers need is to know how to swing a golf club correctly. Until we know how to do that, any investment in superior equipment can only help us produce marginal results.

LOST RIGHT ROAD

And so it is with communication. Not only have we naturally looked for mechanical means of solving the problem, but in so doing we have been guilty of taking our eye away from the right road.

The problem has probably never been better phrased than by W. H. White, Jr. of *Fortune* magazine, when he stated, "The greatest enemy of communication is the illusion that we are communicating." And he added—"and the chief reason for the preservation of this illusion is that we continue to place undue emphasis on the format instead of the context."

To put it more briefly in another way —in trying to find short cuts to our communication problems, we have developed an expensive and elaborate system of short circuits!

Allow me to indulge in a "corney" example of what I'm trying to get across. Take some kernels of one of the finest types of seed corn developed in our part of the country. It's called K-29 and it comes from Fremont, Ohio. I'm not a farmer, but I'm told that this type of seed corn will guarantee taller and stronger stalks, a highly desirable resistance to fungus, and will result in bigger and higher quality yields.

SEED REPRESENTS AN IDEA

So let's assume, for the moment ,that this seed represents an idea, any kind of idea, some idea that you want to put across. After all, an idea is nothing more or less than a mental seed. We know that the idea is good—just like this seed corn is good. Now, if I throw some of these kernels out into a meeting room, will they grow? Of course not.

Let's put ourselves, therefore, in the shoes of the farmer who wants to get a record-breaking harvest of corn. What does he do? Doesn't he take a look at the field in which he wants to plant? If he finds rocks, boulders, or stumps, doesn't he arrange to have them blasted and removed? Before going into that expense, wouldn't he send soil samples to determine whether the soil is worth planting, and what ingredients it might lack?

Assuming that the effort is worthwhile, doesn't he then plow and prepare the soil and then fertilize it as needed? Doesn't he also have to worry about the amount of moisture the soil will need—maybe irrigate, if necessary? And what about the temperature factors? Doesn't he have to plan keeping them in mind, too?

It is only until he has given plenty of thought to each and all of these many and important inter-related factors that he is ready to do the planting. He knows, of course, that the planting operation itself is probably the simplest one of them all.

ACCEPT FALSE BELIEFS

Most of us have been unthinkingly educated into accepting the false concept that it is possible to pound ideas into people's heads. In accordance with this concept, we have been trained as the shock troops of communication to increase our vocabulary, learn about semantics, study grammar and rhetoric, develop our powers of logic to become public speakers, even to become ham actors or participants in some type of a "communicational show."

The emphasis has been on improving our ability to tell other people our ideas better. Our school systems and our business systems in following this concept have done two things. They have provided us with different kinds of hammers and have taught us how to wield them more effectively. But a hammer is still a hammer, no matter what shape or size or weight. And no matter how skillfully used, an idea is still an idea—a bit of mental seed.

Probably the greatest lesson that my company learned in the past 25 years is that it is impossible to transplant an idea as such. All we can do is to stimulate the other person in such a manner as to induce him to recreate for himself a facsimile of the idea we are trying to get across.

MUST RE-EVALUATE

This, in essence, represents a complete reversal of method—a method which requires that we make a total re-evaluation of our individual concepts of communication.

Can the gimmicks of communication help us as we look upon this problem from an inside-out point of view? Certainly. But only when they are used in the right way and at the right time. These gimmicks can perhaps be compared to the mechanical corn planter—a useful bit of farm equipment indeed when used at the right time, in the

right way, with the proper seed, and given the proper soil conditions.

Since we of Florez Incorporated are primarily specializing in sales training, our greatest opportunity to experiment has been in relation to our efforts to help our clients develop greater efficiency of marketing manpower, to assist in the marketing personnel development function of marketing.

JOB DESCRIPTION

Like many other people, we have learned the hard way. For example, the simple truth that before you can train a man to do anything, you must have a pretty good idea of exactly what you want this man to do. Out of this kind of thinking comes what is commonly known as job description.

The next truth which is equally simple is that a cabbage cannot be trained to climb a trellis—even if it is made of solid gold. Similarly, we have to define generally the kind of man who can do what the job description calls for and then go out and get this kind of a man. Now, of course, I'm talking about man specifications and the elements of recruiting and selection.

There are some close similarities between my job in the field of sales training and the work of safety personnel. My job is to help develop more effective sales manpower and this really does not differ too much from the fundamental responsibility of developing safer employees.

I have just said that in applying these principles of communication to the job of developing more effective sales manpower, we learned that the beginning point was the job description, the establishment of man specifications, and the proper recruiting and selection procedures. Is this a starting point for you in developing safe employees?

PUT SAFETY IN DESCRIPTION

It is as important for safety to be written in as an integral part of the employee's job description as it is for salesmanship to be written in as an integral part of the salesman's job description? Can the man specifications for a given job be so drawn up that the safety factor is taken into consideration?

Do the selection and recruiting processes of your company tend to eliminate the unsafe employee in the same way that a good system for recruiting and selecting salesmen will tend to screen out those men who are not readily trainable, to recognize the cabbages that cannot be trained to climb the trellis?

This, you see, is some of the important soil analysis, cultivating, and conditioning which must happen before we plant the first seed. When it comes to actually planting the seed, once again it depends upon the conditions that exist. In actually training the new man, we use all three methods—on the job training, self-study, and various types of meetings.

Within each of these situations we employ the media which seems to fit best. When you go to plant the seeds that will help make the new employee a safe employee, do you have a variety of methods and media at your disposal? When the employee is new, you have your greatest opportunity to make your broadest, deepest impression and here the devices and gadgets of communication take their proper place.

MUST RE-CHECK ALWAYS

The only way to measure the effectiveness of your communication is the constant checking and re-checking of understanding. In the development of effective salesmen we feel that the close personal supervision and an organized system for performance evaluation is the only effective way to check understanding.

Does this apply in the field of safety?, Do you find the supervisor with his evaluation of an employee's performance to be a vital link in your chain of communications?

With this approach to the communications problem, I think perhaps we can see communications now not as an isolated program or campaign, but we see communications as a concept which applies beginning with the definition of the job to be done through recruiting and selection, training, supervision, and performance evaluation.

There is only one true measure of my effectiveness as a sales trainer and that is the performance of the salesmen I have trained. We also seem to agree that your effectiveness as safety directors could be measured by the safety performance record of your employees.

In other words, how good we are is measured by how well other people perform. A few years ago we worked on a safe-

driving program for the United States Army and one of the points we made in this program was that performance was a combination of skill plus attitude.

COMMUNICATIONS GROW ATTITUDES

I think it is apparent that the development of proper employee attitudes is contingent on a broad and mature understanding of the communications concept by management. If we can understand that no matter how wide the screen is, it is still impossible to transplant an idea as such.

Remember, the best farmer with know-how and the finest seed corn mechanical planter cannot make corn grow on the floor of a meeting room. Neither can all the mechanical and visual devices in the world do any appreciable good unless a company develops a concept that communication is a process of management which begins prior to the selection of an employee and carries on through the process of recruiting and selection into his everyday contacts with his supervisor.

It is this kind of effective communication that I would recommend to help you in your job of developing safe employees.

HOW TO TRAIN LOGGERS

by H. J. DEABAY
safety director, Woodlands dept., Great Northern Paper co., Ashland, Maine

"How to Train Loggers" covers a broad field and varies because of different hazards caused by terrain features, snow and ice and different sizes of timber being cut. However, training is basically the same whether you teach a man to fell a tree or operate a drill press.

My experience has been in the Northeast, so my remarks will be based on cutting and handling small trees as compared to the large Western timber. In the Northeast the one man chain-saw is used exclusively, as in the lake, southern states and Canada.

The frequency of the logging industry is twice or three times greater than it should be as is our severity. It is hard to believe some companies still do not have a formal safety program in their woods operations and that others charge the safety work to someone in personnel as a secondary duty. This is certainly not the way to reduce woods accidents.

There are several reasons why the logging industry is more hazardous than most industries.

1. Work in the bush is seasonal. The lumberjack has lost time during each year. Since most work is done on a piece work basis, the men work at excessive speeds earning as much as possible while the job lasts.

2. Every cutter works with very sharp tools, i.e., axe, chain-saw, cantdog, bark spud, and works with either a horse or tractor. The new direct drive chain-saw which turns fast, is used on snow and ice, in brush, steep terrain, all weather conditions, and by all types of workers regardless of their intelligence. There is no such thing as choosing the right man for the job during the cutting season.

EXISTING HAZARDS

3. All types of uneven terrain, rocks, roots, mud, snow and ice, and other hazards cannot be taken care of with "Non Skid Paint" or "Speedi-Dry Absorbent." These hazards exist, are exposed to all kinds of weather, and have to be accepted as part of the occupation.

4. In most of our Maine forests (and in sections of Canada) there are dead hardwood trees and stubs that are a menace overhead. Some are so rotten that the least jar will cause them to fall. Many are around yards where wood is piled and along twitch trails, but it would be costly to saw them all down and would also be dangerous.

5. Our large labor turnover is another factor that has an adverse effect on our frequency. There is much discussion on how it could be stabilized, since a lot could be

and should be done. However, it can never be as stable as our mills and factories where people live, own homes, and depend on the work in that town for a living. Several incentives would help stabilize our labor and also help us keep a better caliber of men:

1. Bonuses.
2. Contracts drawn up with employees guaranteeing them a certain number of months work during the year.
3. Sick benefits insurance and retirement benefits.

TRAINING PROCEDURES

Indoctrination is one of the most important steps of any training. A new employee is more receptive to instructions before going to work. All the instructions possible should be given at this time. A successful safety program is largely dependent on the attitude of management, supervisors and the worker, but it must start at the top. In an indoctrination program, we must tell new employees what is expected of them and what they can expect of us.

They should be briefed on the company rules and policies, who will help them with problems, where the first aid room is and to be sure and get treatment for minor injuries. Men should be told about the safety clothing and equipment available for their use and protection, and of their responsibility for the safety of their fellow employees as well as their own. Make them feel we are interested in their welfare and if time permits find out something of their past and their families.

This is not always possible in our woods camps where turnover is sometimes great, but we should do what is most important. The first impression a new employee gets of his boss and the camp he is to live in, plays an important part in how long he stays at that camp and how content he will be.

FORMAL TRAINING

Formal training is given by specially trained instructors or foremen. There are many stages of training: there may be men who know nothing about the work, others who have some experience, while some may be semi-skilled.

These men should be divided into three different groups so the ones with less experience would not hinder the progress of the others. However, until labor is stabilized, this type of training is not feasible. In addition, we may feel some men need training while in their own minds they are experts. If asked to attend a training session and be paid on an hourly basis they would be apt to pack up and go elsewhere.

Our company has tried twice to train some of our American youths. In May 1952, we went to all the high schools in the surrounding areas and talked to boys 18 years old. We explained our planned program telling them they would be paid on an hourly basis until they could produce enough to make more. We showed the earnings of skilled woodsmen and estimated their earnings in two months. We also advertised our program in the local paper. Few boys showed interest but some said they might try it. On the opening day we had one recruit from the southern part of the state.

Our second attempt was in 1955. This session began after our employment manager received letters from college boys who wanted to cut pulpwood during the summer to get in shape for the football season. Eleven boys showed up and the company started its program with a very capable instructor. They were healthy, rugged fellows with no experience and had to start out with the basic fundamentals of what tools were used and how to prepare and maintain them. They were enthusiastic and started out very well. With the exception of a minor scratch, none of the boys were injured during the summer. This was quite an accomplishment because after the first three weeks the boys were producing in crews of two or three and were on their own because the instructor was with one crew at a time.

ON THE JOB TRAINING

On-the-Job training is the type of training our company has concentrated on for the past six or seven years. Most of our employees come from Canada and are skilled to some degree. "On-the-Job Training" we make extensive use of visual aids. We show safety movies and slides which emphasize the proper and improper working habits. We also have camp meetings with the men to discuss work hazards during the current season, brief the men on our accident analysis and discuss means of eliminating reoccurrance by better working practices and techniques.

Our foremen see their men at least twice a week. Unsafe practices are corrected and any possible unsafe condition eliminated. Here are some of the common unsafe practices noted:

1. Bucking on cluttered yard (too many logs yarded in).
2. Bucking too close to pile.
3. Starting chain-saw from knee.
4. Failure to clear around tree to be felled.
5. Walking with chain-saw with motor running.
6. Men working too close together.
7. Occasionally a man is found not wearing his hard hat.

Common unsafe conditions are:

1. Working on yard with a dry stub or tree overhanging.
2. Poorly maintained tools.
3. Working on icy truck bodies.

These are only a few of the unsafe practices or conditions that may be noted. If an employee needs more attention than the foreman can give him, we could send him home because our Bood Quota calls for *SKILLED* woodsmen. However, this is a rare case. If the man was willing he could work at our experimental camp where the supervisory force has time to train him properly.

When making his rounds in the woods, the foreman talks with each crew three to five minutes about some of the hazards or an accident that happened at another camp. The safety supervisors visit the men in the woods and work with new foremen to assist and encourage them to speak to the men. One important, never ending task is keeping our employees safety conscious.

It is a foreman's obligation to inculcate a sense of individual responsibility in each employee, to himself and his fellow worker. To accomplish this, it must be made a daily task that is never completed. Should an accident occur, our foremen and clerks are trained in first aid to make a man as comfortable as possible until a doctor arrives or the injured is transported.

SUPERVISORY TRAINING

Supervisors are not necessarily all good instructors. Therefore if we expect them to do "On-the-Job" training, they should attend an instructor training course. Most insurance companies offer this service to their insured.

Good instruction is as important as good tools. A man should be told why he should do something, and should be shown in an easy manner, and observed while doing it. The supervisor should return frequently at first to make sure the job is done as he taught it.

An annual refresher training course is almost as important as the initial one. Some supervisors have done a better job of instructing after they had the course for the second or third time. There are steps and techniques that are a MUST for effective instruction. These may not be fully retained by the supervisors until they have taken the course for the second or third time.

SAFETY IN THE SMALL SAWMILL

by **FREDERICK B. MALCOLM**

technologist, Forest Products Laboratories, U. S. Department of Agriculture, Madison, Wis.

The numerous scientists on the staff of the Forest Products laboratory study every property of wood—how strong it is, how it can be made stronger—its chemical nature—what can be made with the chemicals derived from it—how it can be made more useful. In other words, these men are trying to make a better way of life through the use of wood. Why do I emphasize the small sawmill? A brief sketch of the character

of the industry will be helpful. In general, there are 50,000 sawmills that annually produce 36 billion board-feet of lumber products. One-half of this amount, or 18 billion board-feet, is produced by 2,000 large sawmills. The other 18 billion board-feet, are produced by about 48,000 small sawmills, each of which cuts less than 5,000,000 feet of lumber a year. It is this group of small sawmills with which I am primarily concerned.

They are operated by small businessmen—rugged individuals—and are located in the timbered areas or rural farm areas of every state. On the average, these operators employ no more than eight men, although a number employ as many as 30, depending upon the extent of their logging and remanufacturing activities. This is not a large labor force per sawmill, but collectively it is sizeable.

In many small communities these mills are an important industry, and most owners have a strong sense of responsibility for every employee. These small units are essential tools in the effective harvesting of our timber supply—one of our most important natural resources.

SMALL MILLS AID IN EMERGENCIES

About 75 per cent of our private commercial forest land is in the hands of four million farmers and other owners of small timber lands—in tracts of less than 5,000 acres. In many tracts the small sawmill is the most efficient method to harvest timber.

This is another reason why the small sawmills are a highly important part of the lumber industry and why it is important to keep them operating. In times of emergencies such as disastrous hurricanes that blow down huge areas of timber, these small units can quickly move in and harvest the timber before it spoils.

Few of these small mills operate anywhere near capacity. The large mill, on the other hand, is operated near capacity because the owner, with a large investment, cannot afford to do otherwise and increased production requires additional equipment and men.

Consequently, during World War II the small sawmill was an important source of increased production when lumber was critically needed. For the most part this was accomplished not by adding men or equipment but simply by increasing the operating efficiency of the mills and by operating more days of the year.

The unfortunate part of this whole picture is that small operators usually work so hard they seldom recognize that efficiency is the key to greater profits. Large mills readily recognize the need for efficiency and often hire special engineering firms to solve their problems. The small mill owners generally cannot afford such services.

Added to the small sawmill operator's difficulties is the fact he has the reputation of being a poor financial risk and of producing poorly manufactured lumber. But that picture is changing. Today a large number are efficient, produce accurately made lumber, and are quite successful financially.

These usually produce three to five million board-feet annually. Unfortunately, there are many small mills producing large volumes of lumber not nearly so efficient because they operate close to break-even cost margins. They are so absorbed in keeping out of financial difficulties they fail to see inefficient and unsafe practices which cost them money.

As a part of my work, I help small sawmill operators improve their practices. This responsibility is met through research on ways to improve small mill operations and by developing informational literature on improved practices. But one of the best mediums is to work directly with these people showing them their problems and how to overcome them.

PERSONAL CONTACT BEST

Because it is impractical to visit many mills individually, we work with state forestry agencies, forestry colleges and other organizations, conducting short courses or sawmill clinics. As many as 200 sawmill workers may attend, although small groups of 25 to 35 are best to work with. We cover most phases of small mill operations and their associated problems. But the successful meetings are those run for more than one day covering problems in more detail and giving individuals more time to "air" their problems.

Prominent among the subjects covered is production efficiency and its relation to reducing operating costs, and mill setup and alinement. Worker fatigue from unnecessary lifting and carrying contributes to production slowdown. Associated with this is that unsafe conditions and practices increase production costs. Workmen's compensation insurance is a direct cost that operators readily recognize. However, few small sawmill operators recognize that unsafe practices contribute to his cost of operation.

However, the small operator sincerely wants to practice safety but does not know how without interfering with normal production. In the past year I have been emphasizing safety as a factor in production costs, although I spend only about 15 to 30 minutes on safety as it applies to efficiency in sawmill operation.

My approach is to show them unsafe operating conditions that contribute to inefficiencies and higher production costs. I use pictures of actual conditions taken at various mills to point up my discussion.

SLANTED LOG DECK

One picture shows the log deck has considerable slant, and it is obvious the logs are heavy. They are restrained from rolling only by chuck blocks. The question here is, how can the logs be efficiently and safely brought to the carriage?

The workers must pull the blocks and run. A badly bent turn-down device is mute evidence of this. The sawmill carriage and track likewise had borne the brunt of pounding by similar logs. A slip, and a man can be badly injured or killed. The poor design of the mill deck slows production as well as being unsafe.

Another picture shows a worker dodging a log overhead. The crane operator was being crowded to unload logging trucks and was swinging the logs directly to the mill deck. The man in the center was supposed to be a spotter, but the crane man could not wait for him, hence the crew was not forewarned. It almost was an accident. The mill manager was with me at the time, and measures were taken to correct the situation. Nevertheless, these men were constantly conscious of looking for danger, and their actions—and consequently their production—were slowed.

One picture of a man chopping truck stakes shows a practice sometimes outlawed. Trucks must be equipped with safety trip stakes. However when wooden stakes are used, the truck driver chops the stakes nearly through. If he chops too deep, the entire load will come tumbling down on top of him or his helper.

Another hazard is caused when a sawyer reaches for chips alongside saw to remove chips that wedge against the saw. A slip, and the sawyer may lose an arm or his life. Another stunt sawyers sometimes pull is brushing the saw with their hand to find out if it is overheating.

In all such cases, the tax cost is only a minor consideration. The really severe cost is the loss of a key man, and possibly one's entire business, because of one careless act.

DANGEROUS KICKBACKS

The third area extremely dangerous is kickbacks due to jamming saws which are one of the main causes of accidents at the edger. The board through the edger is cut on the bias, because of poor mill layout. But equally as important was the dangerous working situation. Once an edgerman tried to slow down his end by holding it. One-half slammed back against the end of the mill just missing the sawyer. The mistake was in placing the edger too close to the headsaw. The edgerman did not have room enough to handle long boards. Not only was this a definite hazard, it greatly reduced mill production because the sawyer had to wait until the edgerman was out of the way.

A hazard that small sawmill operators do not recognize is failure to shield moving shafts, pulleys, and belts. The small mill is not the main offender, either, for many larger mills are equally at fault. Often the end of the saw mandrel and the driven pulley are practically "ready to reach out and grab" a loose piece of clothing. Even more hazardous are keys that stick out from pulleys attached to the ends of shafts.

AID MILL OWNERS

Until this past year practically no concentrated safety effort has been made to help small sawmills. They occasionally received safety literature, and a few operators posted it at their mills; but such cases were the exception rather than the rule. Nor does that material constitute a safety training program. Responsible for safety programs among these small operators is of course, the mill owner. But how can he start a

safety program when he does not know how to go about it? He needs help.

This past year I asked at each of the 30 sawmill clinics how many had had safety inspections from any organization or agency. In 26 clinics only scattered hands were raised; at a few, there was no show of hands at all. At the last clinic I attended, only 3 of 25 attending raised a hand—and that was in a state with one of the highest accident frequency rates.

If safety inspections at such mills are just casual visits, how can you expect them to have a safety training program?

Small operators may well ask whether, if they start a safety training program, they will get their insurance rates reduced. If not, they may not understand how they will benefit. Someone must show them, and there must be concrete evidence that their efforts are being appreciated.

Some effort was made this past year; nothing in the way of a broad safety program, but still a start in the right direction. The Northeastern Logging Congress, spearheaded by Fred Simmons, logging and sawmilling specialist of the Northeastern Forest Experiment Station of the U. S. Forest Service had a panel discussion on small sawmill safety as a part of its program this spring.

Kenneth Compton, professor of wood utilization at the State University of New York's College of Forestry, devoted a section of his small sawmill short course early this fall to sawmill safety. These are excellent starts, but unfortunately they are only "a drop in the bucket" compared to the need that exists.

SAFETY SAWMILL CLINICS

Not only that, but safety is not the primary work of either of these men. They are doing this because they recognize the tremendous need. However, there is a great, immediate need for safety men to spearhead some of this work. Possibly this should not be done strictly as safety training sessions but rather as overall sawmill clinics in which good safety practices are given the spotlight.

These small operators are not going to be converted overnight. One thing that must be avoided if possible is the mandatory attitude of "do it or we shut you down." Regulatory measures have been with them for years, and to clamp down suddenly or to initiate new measures would only hamstring the industry.

These operators work on a small profit margin, and if another burden were placed on them, one which they do not understand, many would shut down. These men need to be shown that good safety practices pay off, and helped to accomplish it.

DEVELOPING SAFE WORK METHODS

by **WILLIAM E. HUIE**
personnel & safety supervisor, Crossett Lumber co., div.
The Crossett co., Crossett, Ark.

Regardless of whether or not our plants undertake a methodical job-safety analysis in the near future, we will benefit from a description of something about the techniques and its purposes and how they are accomplished. Within relatively few years, accident prevention has progressed from a hit-or-miss proposition to a technique closely approaching the scientific method.

The humanitarian appeal to management and workers is not as great today as yesterday. Today, methods are employed which isolate and identify the causes of accidents and which permit direct and positive action to be taken to prevent their recurrence. Accident prevention must be based on facts which clearly identify the problem.

The techniques approaching the scientific method work nearly 100 per cent with the exception of lumber industry—I am talking about southern sawmilling. Due to the type of labor employed in our sawmills, it would pose a big problem to get away from the humanitarian appeal to these workers. Although we as supervisors understand the technical side of our problems, we *must*, appeal to the humanitarian side of our employees.

There are four steps in a "Job-cycle":

"JOB-STEPS"

A "job-cycle" is a unit of work, from the time it begins to the time it is completed. A foreman or supervisor must analyze an operation to some extent before he can come to any sound conclusions about safe work practices, guards, or protective equipment. In some jobs, such as inspections or assembly work, the basic work cycle may be completed in minutes. In others, such as certain milling machine operations, the cycle is quite complex, sometimes involving two or three days time.

However simple or complex the cycle, the objective is to list, in logical sequence, every step taken in completing the unit of work you have set out to analyze. Include every single element, every action, every inspection, every delay, everything that is involved in accomplishing the job purpose. The more complete the breakdown, the better the chance for improving the operation from the safety or health standpoint.

Once you have the whole pattern down on paper, double check it with the most experienced employee performing that particular job. By combining your knowledge and observation with his, you should be able to break the job down to its finest details.

The next move is to list after each step in the job cycle, every exposure to potential danger, every health hazard that is involved. Indicate the exact cause and its source. Keep looking, questioning, experimenting, imagining, analyzing, until you are positive that you have combed out every potential hazard for every step in the job cycle.

"ACCIDENTS CONTROL"

Looking over the entire job pattern, ask the following of every detail: Is it necessary? What is the purpose? Can it be eliminated through substitution or change? Can it be combined with other details to reduce exposure, cut down on handling, storage or transportation? Can any details be rearranged for smoother sequence, to make the job easier and simpler? Can any details be simplified to reduce or eliminate the danger?

Searching questions such as these are all important, because in this questioning process ideas for improvement are usually generated. The ideal action, of course, is to wipe out the exposure if at all possible: substituting a safe material or process for an unsafe one; replacing manual with automatic feed; changing the design or operation procedure to eliminate handling, and smooth out a dangerous kink or erase an unnecessary job step.

Sometimes the only answer will be to guard an exposure, fencing off a hot spot with a barrier guard, developing some adequate way of keeping the operator's hands away from danger. For unavoidable exposure, protective equipment is often the best control: goggles, face shields, safety shoes, ear protectors, aprons and gloves.

After you have exhausted all physical controls, there is still the possibility of special instruction, warning, and retraining as control devices. If the exposure cannot be eliminated or safely walled off, the employee must be taught the best possible method to avoid injury, and it will take persistent education and supervision to see that he uses this method.

"FOLLOW-THROUGH"

When the analysis brings about changes in equipment, arrangement, operating methods or work practices, you must thoroughly sell the employee on these revisions. It is important that he clearly understands the reasons for the change. Those employees who assisted in the analysis and the planning of controls will have a natural enthusiasm for seeing that the new method is constantly in effect. This is one of the valuable benefits of "job-safety-analysis" work.

Finally, remain alert to the necessity of keeping job safety breakdowns up to date. Changes in materials, processes, and equipment often create new exposures, and the necessity for new controls. There is a need for constant analysis in industrial supervision, for change and progress are the natural laws of our existence.

In accident prevention, and in the general business life, we never have the final answers to anything—there will always be a better way and a better result.

DOES SAFETY TRAINING PAY?

by A. R. MOBBS

manager industrial relations, Abitibi Power & Paper co., Ltd. Toronto, Canada

As the largest section of our operations is located in Ontario, I will concentrate my next few remarks on that province.

The Ontario Workmen's Compensation Board administers the Workmen's Compensation Act. The original Act came into force on January 1, 1915. An article entitled "The Workmen's Compensation Act, How It Works," published in *ABITIBI*, our employee magazine in April 1929, was written by Victor A. Sinclair, K. C., who was then chairman of the Ontario Compensation Board.

"The Act was passed in the year 1914 but came into force on the first of January 1915, and so accustomed have workmen become to the fact that the Act is in force and that they can rely on its provisions that practically all except the older workmen have forgotten the conditions which existed prior to the Act being brought into effect, when the workman in case of being disabled by accident in the course of his employment either had to depend on such voluntary contributions as were made by his employer to him or had to endeavour to procure damages by an action at law.

DIFFICULT VERDICTS

"If an action were brought, usually he might be delayed from six months to a year in getting his action tried and having any appeals which might be taken disposed of, accompanied by large legal costs, and in the end, if he were successful, so much would be taken up in costs that the actual amount received by the workman would be small, even in cases of serious injury.

"There was also the difficulty of recovering any verdict in such action because in the first place he had to establish that his employer had been guilty of some negligence, either in the plant itself or in the machinery used in it or in his method of carrying on the business, and that there was some carelessness on the employer's part which caused the accident.

"Also the employer had a number of defenses, such as contributory negligence, which would deprive the workman of his verdict if he had in any way contributed by his own carelessness to the accident, or if the accident had been caused by the negligence of a fellow-workman who was not in the position of superintendent or foreman he would not collect. So that the workman had little real compensation for injuries received in the course of his employment."

This was written 28 years ago.

The Workmen's Compensation Board endeavours to administer justice to the injured man, speedily and humanely, and it has three main motivations:

- The prevention of the accident in the first place.
- Failing this, the paying of maximum benefits at the least possible cost to the employers.
- The return of the injured workman to employment in the shortest possible time and with the minimal permanent disability. This of course requires first-class medical and hospital treatment.

Their schedule of benefits to the injured workman is not exceeded anywhere and the administration costs are low; on the average 92 cents of the employer's dollar is spent in one way or another on the injured workman. Maximum weekly compensation is $72.11.

The average rate charged in all industry, from mining and heavy logging to the needle trades, is approximately $1.19 per $100 of payroll. As the Act forbids litigation, there is no wastage on lawyers' fees.

PERMIT INDUSTRY SAFETY GROUPS

Another important feature of the Act is the provision to allow the Board to assist all Ontario industries in accident prevention by permitting companies in the same industry to form an association to promote and carry on the work of prevention of accidents. The Board may make financial grants to assist them.

The pulp and paper industry in Ontario has its own, the Ontario Pulp and Paper Makers' Safety Association, non-profit and without share capital. This Association is governed by a Board of Directors consisting of 20 top-ranking executives of member companies. Together these companies make up 96 per cent of the total payroll in the industry.

A new Board of Directors is elected each year at the annual meeting of members. The directors in turn choose the president and vice-president from their number. The only paid officer is the efficient secretary-engineer, D. B. Chant.

STEERS CLEAR OF AUTHORITY

This Association believes that accident control in industry is primarily a management function, inseparable from other duties and responsibilities of productive organization and leadership. The Association avoids any attempt to perform that function for its member companies and confines itself to activities designed to encourage, stimulate and assist them to do a good job of controlling work injuries in their operations in frequency, severity and cost. It employs no inspectors or field men and does not try to maintain a routine inspection service.

The Association believes that accident control is one of management's responsibilities and should be carried out with the same efficient attention to detail as is given to all other operating functions.

We in Abitibi have always been interested in accident prevention. In fact, in our mill labor agreements, one of the clauses reads: "The mutual interest of employer and employee is recognized by this agreement for the operation of the entire plant under methods which will promote to the fullest extent: safety to the employee, economy of operation, quality and quantity of output, cleanliness of plant and protection of property."

FIGHTING HAZARDS

In labor agreements with our woods workers we say: ". . . and to ensure to the utmost extent possible the safety and physical welfare of the employees, economy of operation, quality and quantity of output and protection of property."

In 1953 in most of our mills and woods operations we had safety first committees on which hourly workers and supervisors served with great interest, discovering unsafe conditions, pointing out dangerous practices, studying accident causes and devising ways to prevent them. We had machinery guarded and encouraged the use of goggles, respirators, masks, hard hats, safety shoes, buoyant vests and gloves. But in spite of everything, our lost-time accidents in 1953 in the mills were 191 and the woods 937.

Late in 1953, our president, D. W. Ambridge decided that he would concentrate his close attention on accident prevention and safety. Besides the human suffering and loss of earnings to the injured, he was sure that accidents were causing us increased production costs.

Authorities on the subject today estimate that the indirect cost of accidents are at least four times the known costs. Indirect cost items are: confusion and loss of production at the time of the accident, training new workers with loss of production and quality, possible equipment damage at time of accident or in training, cost of safety programs and other miscellaneous items.

We have a Quarter Century Club in our company with nearly 1,000 active members. On the occasion of their 1953 annual banquets in the company, Ambridge in his message to them, said: "The number one problem in our industry is safety and I can think of no better or more challenging one for your group to take on.

TARGET FOR THE YEAR

"Let this be your target for the coming year—to eliminate the needless human suffering caused by accidents. I would like each member of the Quarter Century Club to make a realistic effort to assist wherever and whenever he can in this most humane cause. You set the example for those who do not have your quarter century of experience.

"Take an active part on safety committees. Form a committee of your own and tell us what we need to do to make safety work. Consider yourselves 'commissioned' as of now to point out to individuals hazards and any unsafe act you see being committed. Make safety a religion and your efforts will have the blessing of all."

He also talked to Toronto office officials and to all mill and woods managers, stating that their responsibility for safety was as important as operations.

He also told presidents of the International Unions with whom we have labor agreements of our campaign. They replied in turn endorsing the work. Copies of their letters went to all the locals. Safety committees in the mills and woods were organized or improved. They included members of supervision and workmen.

For the first time, a safety committee was organized in our Toronto office to keep close tab on the mill and woods activities and to advise and act as a clearing house for all safety information between the mill and woods divisions of the company.

So, in 1954, Abitibi Safety Year was launched.

MEETING OF DIVISIONS

It is our custom each year to hold a labor-management meeting in Toronto to which we *invite* a delegate from each of our union locals and their international officers and company representatives from our divisions. At these meetings we have frankly discussed problems of interest to all of us. So in March, shortly after our campaign had started, we held the 1954 Conference.

The subjects were "Economics" and "Safety." The principal speaker on safety was Al E. Brown who at that time was vice-president and regional director of the International Brotherhood of Paper Makers, now the United Papermakers and Paperworkers, on the west coast. Brown told us of the good work being done by the industry on the Pacific coast, and following his address there was a challenging question and answer period.

As proceedings of our Conferences are printed and distributed to all employees, this conference also played its part in highlighting safety and accident prevention.

Also about that time, after a survey of film libraries, we found that there were not many safety films available in Canada dealing directly with mills and woods operations. So we *produced* two films—one, the use of hold cards on machinery when shut down for repairs or inspection, which we called "It's In The Cards" and the other, for the woods operations, portraying the use of safety equipment, shoes, hats, buoyant vests and gloves. It is called "Saga of Safety Sam." This film was produced in English and French.

The preparation of the scripts and shooting of these films all helped to highlight safety and they were well received by our employees. They are still in service—refreshing older employees' memories and instructing new employees. The film "*It's In* The Cards" was awarded top honors by the National Safety Council's National Committee on Films for Safety in the Occupational Field for Non-Theatrical Films on Safety Produced in 1954.

NEED POWER SAW FILM

Today, if we were making a similar woods film, we would have to include scenes showing the handling and maintenance of power saws. In our woods operating year 1953-54 when the films were being made, wood cut *by power saws was only 12 per cent* but last season it had increased to 82 per cent and I am sure that it will be higher again this season.

There is no doubt that the introduction of power saws to woods operations has created additional hazards and problems and we try to make sure that our employees recognize them. In fact, at one of our divisions, we have had experienced men go through the woods inspecting and examining power saws in the same manner as a highway traffic officer inspects automobiles for defective brakes. If the saw is in good order, it is so tagged. If not, and if adjustments cannot be made there and then, the man must return to the camp and get his saw fixed.

EFFORTS PROVE EFFECTIVE

Before 1954, we had trained many of our foremen in job safety. We again gave them and many members of ther crews J.S.T. Courses. We utilized every device we could find to keep safety continuously in front of our employees. We used our employee magazine, *ABITIBI;* held more St. John Ambulance First-Aid Courses and held contests in the mills and woods. In the woods we gave a turkey dinner each month for the camp with the best lost-time accident record in its division.

This combined effort by all of us from the president down, ended by reducing the number of lost-time accidents in the mills from 191 in 1953 to 98 in 1954, and in the woods *from 937 to 648 the same year.*

The 1954 results proved what sustained effort can do—and I mean sustained—because accident prevention must be everlasting and we in Abitibi are continuing on that basis. Since then we have continued our efforts to eliminate accidents. For instance, *last year some men attend a Lateiner method* of accident control course and they, in turn, have instructed all mill foremen.

Briefly, our record of lost time accidents to date has been:

	1953	1954	1955	1956	First half 1957
Mills	191	98	101	102	49
Woods	937	648	531	476	237

I have not confined myself entirely to training because we think that our other activities are equally important but we are convinced that the only effective way to approach accident prevention is from the top and all management, from the president down, must consider safety on the same basis as every other important business function.

Does safety training pay? We believe that it does and that a good accident experience reflects an efficient operation and both together add up to lower costs.

TRAINING FOR SAFETY ATTITUDES

by GLENN F. GRIFFIN

director, Industrial Training, National Safety Council, Chicago

Attitudes of people are undoubtedly the most important factor in the prevention of accidents. For this reason we should give *much serious thought and study to attitudes* to understand them and do something about them.

There is danger that the term "attitude" will fall into misuse, that it will come to cover many unexplained or difficult to explain kinds of conduct, something like the word careless which is so carelessly used.

For example, a man neglects to lock out an electric switch when he is working on a line. He knows he should lock the switch but he doesn't. So we say, it's his attitude. Another hurries too much to get a job done and *doesn't secure* a ladder and falls. He has been told. He knew better. Then why did he do it? Attitude.

The American Standard Code for Classifying injury causes lists the several improper attitudes thus:

—Willful disregard of instruction
—Violent temper
—Absent-mindedness
—Willful intent to injure
—Nervous, excitable, etc.
—Failure to understand instruction
—Improper attitudes not elsewhere *classified*

"Violent temper, absent-mindedness, nervous, excitable, etc."—they are not attitudes. *To call them attitudes, to think of them as* attitudes is harmful, because we tend to concentrate our efforts on these overt manifestations and miss entirely the real attitudes which underly them.

UNSAFE ATTITUDES

What is an attitude? Again, I am not searching for a dictionary definition, but for one that most of us accept and use in everyday conversation. *An attitude is* a belief, a way of thinking or feeling about things, a principle, a conviction, a usual way of reacting. Literally, an attitude is a position we take.

President Dearborn, a few years ago, drew up a list of unsafe attitudes which he called seven deadly beliefs.

1. I'll get it when my number comes up.
2. It can't happen to me.
3. It's the law of averages.
4. Danger is the price of progress.
5. An accident is an act of God.
6. *I'm tough, I don't bruise easily.*
7. Safety is sissy stuff.

And here are a few I have added:

1. Resentment of authority.
2. I don't like my boss.
3. They can't teach me anything about this job.
4. Practicing safety slows me up.
5. The other fellows will laugh at me.

6. It looks smart to take a chance.
7. Slogans and posters and contests and safety meetings are for kids.

A man who holds any or several of these attitudes is likely to disregard instructions, fail to learn safe practices or to follow them when he does learn them. He may lose his temper and blame bad luck or somebody else for his own mistakes. In short, he is likely to act unsafely and hurt himself and others.

SAFE ATTITUDES

This paper began by discussing attitudes for safety and now the subject is attitudes for accidents. Let's change that. Here is a list of attitudes for safety. If we expect other people to develop safe attitudes, indeed, if we want to develop them ourselves, we must know what the safe attitudes are.

—Accidents can be prevented.
—Preventing them is more important than blaming the people who cause them.
—The company I work for is sincerely trying to prevent accidents.
—The safety regulations are reasonable and important.
—The foreman is for safety.
—The fellows I work with will respect me for practicing safety.
—Safety is a mark of intelligence and skill.
—It's dumb to take chances.
—I have a responsibility to correct any hazard I see.

Because management attitudes are important too, here are three especially for management:

1. Safety is good business.
2. Safety promotes efficiency.
3. We can't afford to have accidents.

ACCEPTING THE PRINCIPLES

Simple, aren't they? If we could get these attitudes universally accepted, we might have the accident problem licked. How can we do it?

Can we give a course in attitudes? Can we tell people how they should feel about things and have it take? For supervisors, there are many good courses, but workers and supervisors, too, we need to think of training as something a good bit broader and deeper than the classroom. Training is forming or shaping, giving direction to, stimulating the growth of a person in the way we want him to go.

The first, and possibly the most important influence in training is the environment. New attitudes develop in an environment favorable to them. Many things make up the environment: physical surroundings, the boss and the other employees.

By physical surroundings I don't mean new buildings and air conditioning. I do mean that the work area should be clean and orderly. The comfort and safety of the employees should be considered. Unnecessary noise, smells and extremes of temperature must be eliminated. Good attitudes can develop in a place like that. They don't stand much chance in the other kind of work place.

EMPLOYEES' BEHAVIOR ESSENTIAL

The boss is part of the environment. And fellow employees are an important part of the environment. Their influence is probably greater than that of the boss, company management or the safety engineer. Think how much time employees spend together, compared to the amount of time the foreman or any management person spends with them.

Tell a new man the importance of some safe practice, wearing safety glasses for example. He agrees and looks around to see what the other fellows are doing. If they are not wearing glasses, you know what happens. But if they are wearing glasses, the new man will go along.

If you want to build favorable attitudes don't overlook the crew and their influence on one another. Get them into the act. If you have a gang with pretty nice attitudes, treasure that possession, cultivate it, and don't let any person or any incident spoil it.

Attitudes are influenced strongly by two kinds of examples. First is the boss who practices what he preaches, who, if he says you should wear safety shoes or a hard hat wears them himself. The second kind of example is that set by the management, the foreman and the safety engineer, who think safety is important. If a safety suggestion is made it gets prompt attention. They are willing to spend money for safeguards or safety activities. Never forget that a guard does more than keep hands out of danger. It shows everybody that the boss thinks keeping hands out of danger is important. And that goes a long way toward building good safety attitudes.

INSTRUCTION REAPS RESULTS

Given a favorable environment, and a good example, the next thing that influences attitudes is instruction. Instruction starts with the first introduction when a man comes to work. He needs to be told what the company believes and practices about safety. You can't assume that he knows and you can't leave it up to a printed book or posters on the bulletin boards. You need to tell him, simply and earnestly, without a lot of phony preachments.

The old timers who weren't told this when they came to work, should be told also. Make a project of it. You'll be amazed at how much they will appreciate it and how many will tell you they never heard it before.

The next kind of instruction is, of course, job instruction on every job and repeated as often as necessary. This is not off the subject of attitudes. Knowledge and skill are one thing and good attitudes are another. But we can not have the attitudes without knowledge and skill.

If a man knows a job thoroughly, his attitude is likely to be good. Moreover, when a foreman gives good, careful job instruction he gives evidence that he thinks the man and the job are important. That's a strong support for a good attitude toward the job, the foreman, and safety.

SUPERVISION BENEFICIAL

Instruction leads to supervision. If every man has been carefully instructed about every job, the foreman needs to correct any worker who does the job unsafely or in a manner differently from what he was taught. And he needs to do it every time he observes it. Two great weaknesses of supervision are reluctance to correct people for wrong work methods and lack of skill in correcting them.

I know foremen who get scared or angry because they see things getting out of hand, but more often than not, these situations come from letting wrong work get by because the foreman doesn't want always to be griping about something.

Bad attitudes develop where supervision is lax and men are never quite sure how much they can get away with. Then, when laxness leads to a serious mistake or a bad accident, comes the big blow-off. Good attitudes develop in a department where supervision is firm and consistent and decent.

Finally, good attitudes about safety are formed by talk. I don't mean preaching. Irving Lee said that preaching is the great instrument for strengthening beliefs that people already hold, but for changing beliefs, preaching is such a direct assault on the personality that it arouses resistance.

LET'S NOT PREACH

No, I don't mean preaching, I mean lots of talk in small meetings and with individuals about accidents and safety. Supervisors should talk with workers in the same way we safety people talk among ourselves, the subject being, "How can we prevent these accidents, or this accident."

They should consider the whole problem, the unsafe condition, the unsafe act, the wrong method, and they should agree upon remedies and help to carry them out. When they do that, every worker tends to become a safety man. When their minds turn to the subject of how we together can prevent accidents, we will have achieved what we have hoped for in their acceptance of good safety attitudes.

SAFETY IS PROFITABLE

To build safety attitudes we need to know what the safety attitudes are. It is profitable to spend time discussing them with associates.

The first requisite for attitude building is a favorable environment. Management and supervisors must set an example of safe practice and an example that they think safety is important.

Instruction, the great cure-all for social problems is necessary to build attitudes; instruction in management safety policies, instruction in how to do every job.

Supervision follows instruction. Bad attitudes grow out of lax supervision. Good attitudes develop where supervision is firm and fair and consistent.

Finally, taking people into our confidence, talking out our mutual problems with them, giving them something to do for safety, getting them onto the team, is the ultimate goal. When we do that we quit worrying about attitudes for safety. The attitudes will be OK.

USING AMERICAN STANDARDS IN SAFETY TRAINING

by HENRY G. LAMB
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Training can be simplified by the use of standards. Some people have defined a standard as a solution to a recurring problem. A standard solution available for instructors saves him the time and effort of finding a solution of his own, and helps him to get on with the job.

In any training program there must first be standard tools, standard processes or procedures for doing the job, and lastly standard procedures for training.

American Standards are just one of many working tools for the instructor. Like any other workman with any other tools, he should know their strengths and their weaknesses.

American Standards are agreements reached after discussions and consultations between the representatives of the various national organizations which have an interest in the problem. The best experts in an organization meet with the experts of other national organizations. When these representatives come to an agreement, it is approved as a standard. It, therefore, seems safe to say that an American Standard on any one subject probably represents the best group thinking of the best experts on that particular subject.

HOW STANDARD IS DETERMINED

One weak point of an American Standard is that too frequently a standard simply states a specification, but does not tell why this is required, or how the committee came to this conclusion.

There are many situations when the committee actually bases its final decision upon long and expensive research on the subject, but there are other times when the committee just has to use its best judgment in coming to a given figure or value.

Whenever a training instructor tells an employee what he should do, he should also explain why it is important for him to take that particular action.

To overcome this difficulty, several American Standards now include an appendix which provides a discussion of the standard, and sometimes includes why a certain value was selected. The latest development on this point is the newly approved American Standard Safety Code for the Use, Care and Protection of Abrasive Wheels, B7.1-1956. Here an entirely new format was used. The left-hand column printed in bold face type states the specific requirements of the standard. In the right-hand column on the same page, appendix and explanatory material in light face type tell why certain provisions were included or give helpful information on how to achieve the objective of the standard.

SAFE PRACTICES IN STANDARDS

Much of the American Safety Standards is devoted to specifications for machines and physical conditions. These may not be of too much help to the training program. Even from the very beginning, however, provision has been made to include safe practices in these American Standards. A safe practice included in the standard should be considered as important as physical requirements, and should be specifically stated to determine easily whether or not the safe practice is observed.

B7.1-1956 on Abrasive Wheels.

This standard includes special instructions on handling abrasive wheels. These are fragile and therefore, it is important not to drop them or give other sudden impact. This standard also provides for the inspection of wheels and instructions concerning their mounting on arbors. For instance, it is important to pick the right wheel for the right job.

Accidents have occurred when a slow speed wheel was accidentally mounted on a high speed shaft. Needless to say, the wheel exploded. There are also instructions concerning the flanges and the tightening of the mounting nuts. It is surprising how minor details, such as a sprung flange, can affect the safety of these abrasive wheels.

A14.1 and A14.2, Safety Codes for Ladders.

A14.1 concerns portable wood ladders, and A14.2 portable metal ladders. The bulk of these standards is devoted to specifications for the ladders themselves. These specifications are important to decide whether or not a particular ladder is safe, or may now be defective.

In addition, each of these standards includes a separate section on the use, care and storage of these ladders. They include suggestions on the proper angle for placing straight ladders. For instance, in the metal ladder standard one specific recommendation warns against using these ladders in locations where the ladder may possibly come in contact with electric wires.

Several American Standards contain provisions for minimum age of operators, to protect operators on hazardous machines, and protect other workmen when the actions of the operator might affect other employees, such as in the operation of cranes, derricks, hoists, elevators and industrial power trucks.

CODES FOR TRUCKS AND MACHINERY

B56.1-1955, American Standard Safety Code for Industrial Power Trucks.

In addition to the qualifications of operators just mentioned, this standard includes 35 specific safety rules for operators, and provides a firm foundation for any training program for industrial truck operators.

O1.1-1954, American Standard Safety Code for Woodworking Machinery.

This standard concerns specifications for guarding woodworking machinery, but Section 7 of this standard is devoted to operating rules. For instance, it is important to select a suitable tool or machine for the job. There are certain jobs which are far safer on a band saw than on a circular saw.

These operating rules also require the removal of cracked saws. This may not be as important a problem with small saws as it is in logging operations or other operations where some of the circular saws may be as much as five or six feet in diameter. When one saw costs a large sum of money, it is not practical to discard it as soon as one crack appears in a single gullet. Therefore, the standard recommends the correct procedure for repairing cracked saws, and it also discusses the causes of saw cracking and how to prevent these.

P1.1-1956, American Safety Standard for Pulp and Paper Mills.

This safety standard is one of the latest of interest to the wood products section. It includes safety requirements for piling pulp logs at the mill to prevent the pile from sliding and to provide the proper clearance for cranes, trains, and equipment so employees will not be caught between the equipment and log piles. This standard also includes four safety rules which could apply to many operations as well as paper mills:

1—Wearing safety shoes in handling logs or other heavy equipment;

2—Using cranes with booms near overhead electric wires;

3—Providing for life lines and the two-man rule where one employee has to enter a tank, a pit or some other space where it is difficult for the employee to climb out by himself;

4—Providing the lock-out practice for both electric motors and pipe lines where an employee has to crawl inside equipment to clean or repair it.

These are just examples of some of the safe practices contained in American Safety Standards which should be of real help to instructors in training employees.

REHABILITATION IN ONTARIO, CANADA

by DR. BRUCE H. YOUNG

superintendent, Hospital & Rehabilitation Center, Malton, Ont., Canada

The aim of our program of treating the injured workman is to prevent accidents and subsequent disability and loss of skill to industry. To accomplish this, the united effort of legislators, management, labor and medicine is required.

The immensity of the problem is seen in the statistics of Ontario, where more than 120,000 work accidents occurred resulting in more than 70,000 persons being off work for more than five days. The answer to this problem is sought through the combined effort of the legislators, management, labor and medicine, with legislation interpreted by the Workmen's Compensation Board, consisting of three members. It is within this framework that we can accomplish some success in rehabilitation.

I shall discuss our work in cases where an accident has occurred and injured the workman. Our program considers the injured person as its key.

AIM OF PROGRAM

A definition of rehabilitation is "the process of returning an injured workman to a normal and healthy position in his community." The basis of our process is rehabilitation, and to be successful it must be continuous from the first aid station to the return of the injured workman to suitable and gainful employment. In the majority of injuries the patient's own community is where this program should be carried out. Consequently, we strive to utilize the community's resources in medicine to their maximum.

There is a point in the injury when more than the supervision of a doctor, physical therapist or any other single person is necessary. There is also a point in the process of the patient's recovery when the patient's belief in himself begins to wane. To deal with this set of circumstances the Ontario Workmen's Compensation Board provides a Hospital and Rehabilitation Center.

At this Center are the various skills to accomplish our objective, and to superimpose leadership towards recovery for the man by a team. The needs of any given individual vary. Consequently the services offered by the various representatives of this team will vary, depending upon the individual patient requirements. Thus, we provide a program that may be fitted adequately and suitably to an individual's needs.

LADIES GUIDE MEN

We do no active surgical care at our Center. Ours is the care of the patient after the initial medical and surgical therapy. The members of our team are staff doctors, occupational therapists, physical therapists, remedial gymnasts, rehabilitation officers, psychologists, nurses, recreational officer, part time teacher and an administrative staff to see that the overall unit functions smoothly and without delay. In addition, we have the various elements of a maintenance staff, such as cleaners, kitchen and dietary personnel, making a total of 225.

Only male patients are treated at our Center. Therefore, we choose a good percentage of female therapists, since it is my firm belief that we are all notoriously lazy and selfish, and have a natural instinct to exhibit our talents in front of members of the opposite sex.

In this way we have an atmosphere which is void of any militant routine and one in which the necessary element of patient co-operation is stimulated. The young ladies on our staff are particularly skilled in the approach to our workmen, and in obtaining a maximum performance under a given set of conditions.

Our program is basically to gain the maximum physical performance which a man will do. Any program under any circumstances, is only an observation what a man will do, not what he can do, for none of us really know what we can do in terms of physical output, but we all are aware of what we will do. We will do best only what we want to do (the selfish side of our nature), and in our own time (the lazy side of our being).

Certainly the old adage that "you can lead a horse to water, but you can't make him drink" applies in our work. It must be remembered that the sum total of this program is the assessment of the individual from start to finish, and this assessment is only on the basis of what a man will do, not what he can do. In ascertaining the physical capacity of an individual, we must have the patient's full co-operation. This can only be achieved by gaining his confidence.

GAIN MEN'S CONFIDENCE

At the outset we attempt to gain the patient's confidence by a thorough discussion of his problems with a staff doctor. This discussion is then followed by a complete examination of the injured part. We must remember we are treating an individual, not merely an injured part.

Therefore, during this interview and examination we relate the man to his injury. Our patients frequently remark this is the first time they have had an opportunity to discuss their problems thoroughly with a doctor. This initial period also gives the doctor an opportunity to understand the patient's problem, and from this a program of active treatment, based on physical function, is assigned.

There is a saying at our Center that if the man remains with us for four days he will remain willingly until his treatment is completed, because he observes the staff's personal interest as well as his own opportunities for improvement. He also talks with fellow patients and they impart to him knowledge that we try to assist him in getting better.

PHYSICAL THERAPY

Just as it is essential to have the patient's co-operation, it is equally important for the patient to see the actual benefit from his treatment. Most of our patients feel the only form of treatment which benefits them is physical therapy. This is the application of heat to a given part to ease discomfort, the use of massage for relaxation and to ease discomfort, the applications of electrical therapy, or the use of the full length water bath for relaxation.

Any one or all of these methods are interpreted by the patient as being active and useful treatment. These various forms of therapy by easing discomfort, facilitate the next step of the rehabilitative treatment—functional treatment.

In this treatment various occupations offer the necessary use of muscle co-ordination to increase strength so the patient will gain confidence in his own ability and make progress. The use of these methods prepares the man for the work he has to do. I try to explain this to my staff by using the analogy of taking a quinine capsule. None of us would take a spoonful of quinine and drink it down with water, even though we knew the results would be beneficial, because of the extreme bitter taste of quinine.

However, in a capsule it is easy to take and we obtain the same beneficial results. So, with the passive forms of treatment, these act as a capsule around the next step —obtaining proper muscle action individually and in a group manner, thereby increasing strength, as well as re-establishing patterns of movement. It is in this particular field that our Center has made its unique contribution.

PATIENT SELECTS ACTIVITY

We use occupational therapy to develop and re-establish muscle patterns, adapting a craft or activity to a production function. In choosing an activity for the patient, we find if a patient chooses to make a product he or his wife or mother might be interested in, then we have the first evidence of good co-operation. We follow this, with direction by the occupational therapist, into that activity which will produce the most benefit for his injured part.

The activities which we use of a lighter nature are arts and crafts, of a moderate nature we use carpentry, handling projects made from wood, and in our heavy program we use gardening, or simulate or duplicate the man's activity. For example, if it were a hand case, we may want a fine movement such as a needle and thread activity.

However, we go over a list of projects with the patient to find out what he would like to make for himself, or others. His choice will be guided so that making the article will require proper functional use of his hand. It will have the interest necessary, because our patient is doing something he wishes to do, and he will also be exercising his hand properly, regaining its proper co-ordination with other parts of the body.

In this way we have rugged lumbermen, miners and construction workers accept light, unrelated activities with enthusiasm. Certainly a few patients are not interested in this project, so we must look further to find what will satisfy their desires and our requirements. It is necessary that the patient understand his activities.

CASE HISTORY

I like to mention the case of John, hospitalized at our Center after an amputation of his right arm above the elbow joint. On the first day of his hospitalization, he came to me in my office to say in a very belligerent manner, "I don't see any reason for staying here at all. That girl in green gave me, if you can imagine it, a ball to throw, and horseshoes to pitch with my left arm." He said, "I certainly see no reason why I should be required to do this, nor am I going to stay any longer to find out."

After discussing his problem for one hour, he was convinced that although we were going to fit him with a prosthesis and that the prosthesis would help him in holding and carrying activities, he would have to utilize his minor hand and arm to a greater degree than before. The principle behind having him throw a ball and play horseshoes was the first step in gaining co-ordination of this part into a new muscle pattern, and gradually finer skills could be introduced for this previously little used hand.

REMEDIAL GYMNASTS

This patient was the secretary of a local press plant union, and in a week he became one of our staunchest advocates. One's greatest support comes from the opposition who have been converted, because he has been converted by reason. By the same token, men with shoulder injuries work on looms, working at the level of the shoulder, which requires increasing range and muscle power to hold the arm in its new position, and all the time the arm is exercised in its proper manner.

In this stage, to gain muscle power we utilize resistance exercises through the guidance of male therapists. These therapists are called "remedial gymnasts." In this field we consider the male represents a better leader than the female. Under the remedial gymnasts we also have group exercise activities graded into classes. These classes are organized on an anatomical basis, for example, the back class, shoulder class, foot class, hip and knee class and special hand class. In these classes we have group morale development which stimulates the patient. Here the patient sees those about him who are much worse off physically. It is generally true that the more severely handicapped put forth a greater effort, and, in truth, shame those less severely handicapped into a greater degree of co-operation and performance. After a patient says he feels he can go back to work if so-and-so, who is much worse off than he, can perform the way he does. He sees no obvious reason why he should not be able to carry on at his former gainful occupation.

MEN, GARDEN, PAINT, PLASTER

In this group of classes we also have an obstacle course, which is a means of increasing physical exertion, as well as a lot of friendly competition among our more advanced patient groups. As the patient progresses with his program, we try to increase his activities so that he is putting forward an effort as near to the maximum as possible. To do this we utilize a variety of media.

We have 12 acres of grass to cut, and purposely do not have power motors. We have our patients with various types of injuries push the lawnmowers in groups, and thereby keep the lawns in shape. We have flower gardens prepared, planted and maintained by patients. We paint the insides of our buildings, not once, but many times by patients who are painters by trade, or require shoulder activity on their particular job. By graduating these activities the patient gains confidence in his ability to handle his own work.

WORK ON BOXCARS

We have the shortest railway in Canada, which is frequently raised and lowered by injured railway personnel. For the plasterer, we have an area of wall which is continually being plastered to test the man's skill in plastering; for the bricklayer we use the bricks of his trade and allow him to re-establish the fact that he can bend, if he is a back case, or lift and handle bricks, if he is an arm or shoulder case.

He may also carry the hod to gain confidence in ladder climbing. We also have provided a boxcar for those railway men who have to climb and walk, and otherwise handle a boxcar. All these activities are used on a graduated basis to regain the conditioning of the workman for his previous occupation.

If a medical or surgical consultant is required on case, we refer these men to specialists. In our particular area we utilize the staff of the University of Toronto to assist us in sorting out the difficult problems regarding treatment. One year ago we acquired the services of two highly skilled psychologists to evaluate a man's potential for work, to give aptitude tests to those who must change occupations, and assist us in counselling patients who are not responding to the program. We represent as large a psychological unit as there is in this type of work, because our program stimulates psychological health.

A question commonly asked us is, "Do you have out-patients at your Center?" The answer is, "We do not." We can better rehabilitate the patient if he remains for the entire treatment day. By doing this we can control his daily routine.

In addition, we provide him with recreational facilities during the off hours and evenings. A patient who takes our program is required to maintain a reasonable habit as far as work hours are concerned. He is up at 7:30 a.m. for breakfast at 8:00, and commences his daily six hour program by 8:30 p.m.

WALK 2-3 MILES DAILY

Every patient is required to walk a minimum of two to three miles a day. Actually most of our staff cover the same distance. This is true without any other treatment consideration—about five to 10 times the distance he would walk while at home. There are no places nearby to obtain food other than that provided at the Center.

Consequently, our patients are reasonably prompt at meal hours, and this keeps them in touch with the type of control most are accustomed to in industry. The program is on a timetable basis, which requires their attendance—and their attendance is checked. This, again, is supervision comparable to that in industry.

When the patient is sufficiently improved to return to employment, we arrange his discharge from the Center. Approximately 80 per cent of our patients return immediately on discharge. This is arranged through our industrial placement officers during the patient's stay at the Center. They contact the patient's employer and try to give him an idea when the man will be available for work. From the medical side, the original attending doctor is informed by a full medical report on his particular patient every two weeks.

No matter what type of program is set up, we cannot really duplicate all aspects of a man's occupation, and therefore, return to work represents the fourth stage in the man's recovery.

THE REAL TEST

The fourth stage means returning to old friends, to areas where his skill was used before, but where he tests his real ability in competition, and must not only co-operate, but co-operate and produce at the same time. This is an added factor which is most difficult to duplicate.

We, therefore, ask our employers to consider this fact, and many patients receive some form of work modification. The duration of the modification varies with the individual case.

The employers in our province assume a moral obligation in the vast majority of cases to take back their injured workmen. This is a purely moral obligation, because no employer is, by law, forced to accept a workman after injury. We feel that those who do not return to work represent the failure from the Center, even though they may have recovered sufficiently to become independent.

We like to feel that there is a place back in industry, since each of these men came from industry. We do not want to see a scrap pile of broken, unproductive bodies, which represents people whose whole aim in life has been shattered by an industrial accident. However, some end this way despite all our efforts.

The greatest contribution to lessening serious industrial disablement is preventing the accident which has caused the disablement. If it does occur, however, I have

described a program of activity led by a team of dedicated people, from the sweeper to the doctor, whose only interest is locating a solid road to recovery for the injured workman.

We do our utmost to abolish disability which can be abolished by treatment. But if this is impossible we then assist the patient in accepting his disability, and attempt to motivate him to come out with an accepted disability with which he will meet his future in the industrial world.

SAFETY TRAINING FOR FIRE PROTECTION FORESTERS

by JOHN F. SHANKLIN
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An official report transmitted by the Bureau of Land Management to the Secretary said of the bad fire situation which existed in Alaska this past summer:

"As a result of a combination of factors, the Bureau of Land Management is experiencing a serious fire situation in Alaska. The driest year in the interior since 1906, coupled with the normal difficulties of vast areas, isolation and rough terrain has created a "bust" fire suppression condition. To combat this situation the Bureau has expended Emergency Fire Funds at a rate of 15 to 20 thousand dollars per day during the month of June. Such expenditures are continuing this current fiscal year and will probably continue through July unless normal rainfall occurs.

"Approximately 400 fire fighters have been mobilized and dispatched to going fires, 12 supervisory personnel were drawn from Area 1, Portland, for assistance in directing fire fighting during June, and 12 replacements have been obtained from Area 2 at Salt Lake and Area 3 at Denver for similar aid during July. Extra tools and equipment have been purchased through GSA at Seattle and flown to Fairbanks. In addition to the six BLM owned and operated aircraft, light planes and helicopters have been chartered from private sources. The military forces have provided excellent cooperation on an emergency basis by providing helicopters and manpower. In addition, the military has assisted the logistic situation by flying gasoline and other supplies into air strips being used as fire operations bases.

THREE FIRES DAILY

"An average of three or four new fires has been and is being reported daily. Most of the fires are lightning caused and appear to have started high on the ridges in spruce timber. During the initial period of the fire fighting season simultaneous lightning fires at great distances apart forced the Bureau immediately to commit its full fire fighting resources to its physical limit. Continued dry weather, increasing hours of daylight, and exhaustion of manpower soon created a lag in the number of fires reported and the number upon which initial action could be taken.

"To meet this continuing demand, the Area Fire Control Officer was forced to establish areas of priority within which initial action could be taken consistent with existing transportation and communication facilities. Manpower has not been the critical item. Once a fire crew was committed to action on any one fire, additional demand immediately developed for the air transportation of relief manpower, additional tools and supplies. The air transportation of these items thus became the limiting factor.

"Action on all new fires occurring outside of the limits of air service had to be postponed or ruled out. It is for this reason there has been an average of approximately 40 fires burning daily with about half of them being manned. Complete control action without rainfall on fires in excess of 40,000 acres appeared to be physically impossible. By July 1 an increasing smoke pall from the several large fires in excess of this acreage had made aerial reconnaissance and regular fire line service practically impossible in some areas."

During that period contact was lost with fire fighters for as long as three days at a time, due to the tremendous volume of smoke. Difficulty was experienced in dropping food supplies and additional fire fighting equipment. More than five million acres were burned over. The tremendous and hazardous operation to bring these fires under control has a direct relationship to the training in safety instituted by the Department of the Interior.

To understand the problems confronting the Department in its safety training program as related to the forest resources administered by the Department requires first, an understanding of our responsibilities.

EXTENT OF RESPONSIBILITY

The Department of the Interior has a total of approximately 57 million acres of forest and woodland in the continental United States. In Alaska it is responsible for some 125 million acres of forest and woodland, including 40 million acres covered by mature timber and 85 million acres of woodland most of which has been devastated by fire and in various stages of natural revegetation. There is an additional 225 million acres of range, marsh and timber requiring protection.

The annual utilization of timber from forests administered by the Department has been averaging approximately 1½ billion board feet in volume and with a value of nearly 25 million dollars. The average number of fires for the past 10 years has been slightly less than 2400 and our average fire loss for the past 10 years has been slightly more than one million acres.

Four Bureaus of this Department are concerned with land management and especially with forest administration; the Bureau of Land Management, the Bureau of Indian Affairs, the Bureau of Sport Fisheries and Wildlife and the National Park Service. Wide differences exist between these Bureaus as to their basic objectives.

The National Park Service administers approximately six million acres of forest lands in the States and approximately one-half million acres in the Territories of Alaska and Hawaii. The obectives of management are primarily to maintain the forests as nearly as possible in their natural undisturbed condition. These forests are cherished for their aesthetic and scientific values. Portions of them are heavily used for recreation.

CARES FOR WILD LIFE

The basic problem of management is to devise ways and means of handling the increased visitor load to the parks safely and at the same time conserve the forests in their natural state. A total of 55 million people visited our national parks and monuments in the calendar year 1956.

The Bureau of Sport Fisheries and Wildlife administers about ¾ million acres of forest lands of which ½ million acres are considered as commercial forests. The timber lands found on the national wildlife refuges are managed to demonstrate practical means of developing and maintaining optimum game populations, to produce removable surplus wildlife species for restoration projects undertaken by other Federal and state agencies, to determine the practicability of research findings in the management of forest habitat, to explore means of managing wildlife population, for removal of animal increment through regulated public hunting and, consistent with these objectives and in accordance with sound forest management practices, to obtain the maximum timber yield and return from the refuge forests.

OPERATED FOR INDIANS

The Indian forests, of which 6½ million acres are considered commercial, have the distinction of being managed under the first Federal legislation in the United States in which the practice of sustained yield management was definitely prescribed. The management of the Indian forests is directed towards the same objectives sought in the managament of a public forest. However, there are certain

fundamental difficulties which give rise to radically different management problems.

Indian lands are private property held in trust for the Indians by the United States. As such, the timber resources must be managed for the best benefit of the Indian owners. Moreover, by reason of the fact that the Indian forest property is so closely interrelated with the welfare of the Indians themselves, forest management plans must recognize the general Indian problem and be coordinated with the whole program of social and economic betterment for the Indians. This necessitates a far greater flexibility in long-term forest management plans than is ordinarily required or considered ideal from a purely technical viewpoint.

Generally speaking, the first objective of Indian forest land management is to obtain high level timber production. The second is to obtain for the Indian owners the highest possible income not only through the sale of stumpage but also through the direct employment of Indians.

The forest lands administered by the Bureau of Land Management fall into three major categories. The first, the revested Oregon and California railroad grant lands and reconveyed Coos Bay Wagon Road grant lands in western Oregon, commonly referred to as the O & C lands. Second, the public domain forest lands in the continental United States, and third, the public domain forest lands in the Territory of Alaska.

TOP AMERICAN FORESTS

Forestry on the O & C lands presents one of the most challenging problems in American timber management. On these lands are some of the finest stands of original timber left in this country. Their economic and social importance both locally and nationally places them in the front rank of American forests. In accordance with basic legislation, it is the policy of the Department to restrict cutting timber on these lands to their sustained-yield capabilities.

It is the policy of the Department to direct all timber cutting operations under approved rules of forest practice. Moreover, it is the policy of the Department that these rules of forest practice shall be established only after full consultation with a local advisory board consisting of citizens of the State of Oregon who represent the lumber industry, the forestry college, conservation associations, labor unions, grazing mining and agriculture.

The management objectives for the approximately three million acres of commercial public domain timber in the West are much the same as for the O & C lands. However, these plans are subject to the establishment of policy determinations as to whether the lands should be retained under the jurisdiction of the Federal Government or should be disposed of to public agencies, private citizens or corporations.

In addition to these commercial timber lands there are 25 million acres of woodlands on the public domain. These are found chiefly within the grazing districts and are of considerable importance locally as a source of fence posts and related material for use by the range industry. The management of these lands is definitely keyed to the objectives sought in the management of the range lands.

FIRE SAFETY MAJOR PROBLEM

In the Territory of Alaska a major problem confronts the Department in determining proper management for the tremendous extensive areas of forest and woodlands. To date the objective has been to provide something approaching adequacy of protection from fire. This has not been entirely achieved, as reference to my opening statement in this paper will show. But the future appears to be much brighter due to a better understanding by the citizens of Alaska of the need to exclude fire from the Territory.

To relate safety training for fire fighters to the fire situation referred to in the opening paragraphs of this paper, let us look at exactly how the Bureau of Land Management provides safety training.

The Bureau at the present time does not have either a safety manual or any specific safety instructions issued solely for training in safety with respect to forest management. General instructions pertaining to the entire work of the Bureau have been prepared by several of their field offices. All field areas use safety material issued by other agencies, Federal, state and private.

The Bureau does not have a safety committee functioning at its national level, but each of its major regional offices has a functioning committee. None of these regional, or area offices as they are termed by that Bureau, nor any of its state offices have made any special safety studies in the field of timber management, and no analyses have been made of accidents occurring in the timber management field alone.

TRAINING SESSIONS

However, each year training sessions are held for fire control and timber cruising. Such programs always include training in first aid and safety.

The Bureau has approximately 300 permanent foresters and 60 temporary foresters. It operated during the past year 18 fire training schools at which approximately 250 employees were present. It also operated five timber cruising schools at which approximately 100 employees were present. Furthermore, 24 Bureau employees attended some six training schools supervised by other agencies.

All employees are required to follow certain safety practices including those employees concerned with forest management. These safety practices include:

1. Equipping all of the Government vehicles with fire extinguishers and first aid kits.
2. All fire fighters are being equipped with hard hats as rapidly as sufficient funds are made available.
3. On all project fires a first aid station is manned by qualified first aid attendants.
4. All employees are encouraged to take the essential courses in first aid.
5. It is general practice not to permit single persons to work in an isolated area. Two or more are always assigned.
6. Radio communications are being installed as a safety measure in fire control.

As examples of the exact safety program, two states will be described quite comprehensively.

IDAHO SAFETY PROGRAM

The Bureau's program in Idaho is fairly well organized. It so happens that the Area Fire Control Officer is also the chairman of the safety committee. Accordingly, he also handles the safety programs at the fire training schools. All Bureau vehicles in this state are equipped with a safety packet which includes a first aid kit and instructions for first aid treatment together with the necessary forms required for accident reporting.

All grazing districts in this state are equipped with a very high frequency radio communications network. A base station is located at strategic high points to insure communications to mobile units operating in other parts of the state. From a safety viewpoint, radio communications are very necessary.

Second, the Territory of Alaska. In Alaska, as we have already indicated, special problems confront the Bureau in safety training. In Alaska, two foresters serve on the Territorial Safety committee. All permanent and temporary foresters and temporary fire guards are required to take first aid training. This training includes instructions on survival in the Arctic. To insure the safety of employees working on fires, cruising timber or on routine inspection, it is mandatory that the crews consist of two or more.

USE CHECK-OFF LIST

In order to insure the safety of all employees involved in air operations in connection with the fire control and timber sale programs of the Bureau, the Civil Aeronautics regulations are followed explicitly. This includes the use of a printed chek-off list before each takeoff.

The Bureau has developed picnic areas along the highways in Alaska especially at those points where the highways either cross streams or are close to lakes. This was done essentially as a fire hazard reduction measure. Campers, picnickers and travellers who stopped along the highways to cook a meal usually found heavy debris and deep organic material. To clear out a place for cooking or warming fire was quite discouraging. Many times fires were built on wet organic material that was in some cases mistaken for

mineral soil. Many fires have originated from such a situation. However, with the development of over 30 picnic areas by the Bureau, the incident of man-caused fires along the highways was measurably reduced.

Comparable training is given in the Bureau of Indian Affairs. However, there is a very interesting development in the field of fire safety training which involves the Indians under the administration of this Department. We have what is called the Red Hat Program in which several hundred Indians from the Southeastern states are annually trained. These Indians, it has been found, make the finest fire fighters of any personnel in the United States, and their services are utilized by all forest fire services both in this Department and in the Department of Agriculture as well as by state agencies.

LOW ACCIDENT RATE

This training program, initiated by the Bureau of Indian Affairs, includes training by the Forest Service and the National Park Service. The training afforded these Indians has certainly paid off well, not only in bringing fires under control but in taking care of themselves while on fire lines with the least possible record of accidents of any group of forest fire fighters commonly used in this program.

The isolated nature of the installations maintained by the Bureau of Indian Affairs on each large reservation presents serious problems in protection and safety training. Many of the reservation agencies are in close proximity to extensive areas of forested land.

The protection and training of thousands of Indian children who attend reservation schools in programs designed for their safety are of special concern.

Fire hazards are high because the agency buildings are generally old. Consequently the wiring and heating systems are often inadequate by present day standards. Occupational hazards are ever present in the numerous garages and other service shops where power tools are in use.

In recognition of its special problems the Bureau has a safety committee functioning at the national level. Similar committees function at the Area and Agency levels. In all, there are over 100 safety committees. A Safety Director has been appointed to head up the program. Two safety engineers were hired within the year to provide guidance and impetus to it.

NATIONAL SAFETY COMMITTEE

The enthusiasm created in all ranks of personnel by these developments in the safety field insures that this program will take its rightful place among all the others carried on by this Bureau. The safety training of fire control personnel should benefit under the skilled direction now available.

Finally, let us look at a problem in safety training which is allied with our management work. Recreation is considered one of the multiple uses within the over-all forest management programs of most land managing agencies. For example, more than 55 million visits were made to the national parks and monuments last year, and while these visitors are on Department lands every effort is made to insure that the visit includes a safe experience.

SAFETY FOR VISITORS

Here are some of the activities in health and accident prevention which are applied to visitor activities and also to employees in general by the National Park Service. In order to insure visitor health, many types of actions are required including:

a. Provision for potable water.
b. Provision for sanitary rest rooms.
c. Provision for adequate garbage disposal and camp ground cleanliness.
d. Provision for first aid facilities.
e. Provision for inspections of eating and lodging facilities in order to insure adequate sanitation.
f. Provision for hospitalization and medical care.
g. Periodic inspections of bathing and swimming facilities.
h. Elimination of noxious insects, plants and animals in public use areas.

Many things are done for the safety of vistors. Highway safety practices are included in the design, construction and maintenance of park roads. Hazardous trees such as leaning or dead trees are removed from the public use areas and road sides. Elevators, used principally in those parks with caves, are regularly inspected.

All structures within the National Park System are given regular periodic fire hazard inspections. Fire control facilities for all structures are available and building fire brigades trained in structural fire control. The Service maintains regulation and inspection of all mountain climbing activities. It maintains regulation and inspection of many water activities. It inspects ski lifts and tows and provides for safe practices for winter use activities. The Service trains and provides lifeguards, patrols and rescue teams.

It provides for safe walking surfaces, including hand rails and guard rails at hazardous points within the parks. It provides boardwalks in the thermal areas and enforces all visitor activities pertaining to enjoyment of bear and deer. The Service insists that safety features be followed in the designs of new public use structures. It also has regulations for the installation of automatic sprinklers in multiple story hotels.

EMPLOYEE PROCEDURES

As employee safety has a direct relation to visitor safety, the National Park Service has developed many specific general employee safety procedures. It has safety committees at all field and regional levels and follows the dictates of the Department requiring Government drivers' licenses.

It provides orientation training and on-the-job training for employees, including training in safe practices. All employees' quarters and working structures have regular periodic structural fire hazard inspections. First aid training is required of all protection personnel. It requires training of all personnel involved in structural fire control, water activity protection, and all mountain and winter sports personnel.

The Bureau of Sport Fisheries and Wildlife has an over-all safety program which applies to the management of its forest resources as well as all other activities. The program is based on the Bureau's safety policy which, in essence, states that safety is an integral part of every task. No job is so important or no service so urgent that sufficient time cannot be taken to perform them safely.

Each employee is directed to give safety the same serious thought and consideration that he gives other phases of his work. The rules for safe operation of motor vehicles and certain other equipment and tools as well as safety in construction work are set forth in a Safety Requirements Handbook and other instructions.

EQUIPMENT STANDARDS

The Branch of Engineering is responsible for the establishment of standards in respect to the acquisition, operation, maintenance and review of operating methods for all equipment from the standpoint of job adaptability and safety, industrial safety, fire prevention, public and employee safety and provides technical assistance to the regional safety committees in evaluating the causes of accidents and making recommendations for remedial actions.

Each Regional Office has a safety board and a fire board responsible to the Regional Director for program development, directed toward improving safety conditions and reducing fire losses. The fire board is specifically directed to assist the Regional Director in determining responsibilities, developing programs to prevent fire losses and in improving fire presuppression and suppression.

The National Wildlife Refuges and Fish Hatcheries hold monthly safety meetings and on-the-job training in their respective work activities, including timber management and fire suppression. Periodic fire inspections are made on all buildings and facilities. Over-all safety inspections are required of Regional Supervisors on each visit.

Public education and active participation in fire pre-suppression and suppression are sponsored in those areas of high

fire hazard and extensive public utilization. Radio communication facilities are used extensively in the National Wildlife Refuges to facilitate patrol and for directing fire fighting activities. Controlled burning is practiced as a means of wildlife management and to reduce fire hazards in certain areas. Slash disposal and other fire safety requirements are written into timber cropping contracts. Each National Wildlife Refuge and Fish Hatchery has a fire plan appropriate to its problems.

The Department provides for safe working conditions for employees and where functions are hazardous, provides the necessary training to alert employees how to handle themselves safely.▲

HOW TO SET UP AN INDUSTRY SAFETY TRAINING CONFERENCE

by W. C. CREEL
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Safety training is one of the greatest needs in accident prevention work. While this need is generally recognized, very little has been done on an industry basis to promote safety training. One idea used successfully by one section of the National Safety Council is to use the conference method to promote safety training.

The leaders of the fertilizer section of the National Safety Council promote safety training for the fertilizer industry. They believed that the need for safety training was so great that a special committee was set up to promote safety training.

The committee further felt the greatest need was on the supervisory level, and therefore, set up the Supervisory Training committee. This committee, with the full assistance of the entire fertilizer section has conducted two successful industry safety training conferences.

MUST TRAIN SUPERVISORS

The first objective in setting up an industry safety training conference, is to sell the industry on the idea. In the fertilizer section, the selling job started with the entire executive committee of the section. The proposals of the Supervisory Training committee were explained, and suggestions were received at a regular executive committee meeting. After complete plans were approved, the executive committee was asked to endorse the plans, and give full cooperation. Securing this cooperation was probably the most important step in assuring the success of the safety training conferences.

The great need for safety training in the fertilizer industry is on the supervisory level, as is true in the wood products section and the pulp and paper section. Once the level of the conference was established, emphasis was placed on making the conference as practicable as possible. With these ideas in mind, it was decided the conference should be in the form of a training course—more of a school than a social get-together.

The general idea for the meeting was to instruct fertilizer industry supervisors in the latest techniques of accident prevention and to train them in setting up their own plant safety programs. The importance of a supervisor in a plant safety program and the ways he could reach the worker was stressed throughout the program.

The topics on supervisory safety training included "Safety and the Foreman," "Know Your Accident Problem," "The Human Element," and "Safety Education and Training."

Besides the topic of supervisory training, basic subjects in a plant safety program were presented. These included "Safety Organization," "Materials Handling and Storage," and "Housekeeping."

A special session on "Practical Problems in Supervisory Safety Training" was held to allow all participants to take part in an open discussion.

The course was based on the needs of the industry and followed the suggestions in the National Safety Council's Supervisory Safety Training Manual. In fact, this was one of the two textbooks used for the course. The other was the Safety Subjects, revised 1956, U. S. Department of Labor.

The agenda for the meeting was planned so that a wide variety of methods of safety training could be used. The straight lecture was used only in combination with some other method.

DISCUSS MAJOR HAZARDS

A most important part of the two day program was a planned group discussion on major hazards in fertilizer plants.

Each student was asked to designate on a card the group discussion section he wished to attend. Assignments were made on the basis of these requests and each student attended one of the three group meetings where the leaders presented the problems and lead an open discussion. At the end of one hour the groups met together and a designated person reported for each of the groups.

The audience participation plan was used in the "The Accident Problem" presentation. Each student received a series of 12 questions to answer. At the end of the period the instructor gave the correct answers. The questions covered basic information on the accident problems in the fertilizer industry.

The audience participation method was also used in the presentation of the topic on "Plant Inspection." Each student was given a flow chart showing the steps in the operations of a dry mixing plant and asked to mention hazards with which they were familiar. The instructor then summarized likely hazards for the important fertilizer plant operations.

MOCK SAFETY MEETING

A mock safety meeting was used as one form of panel discussion. The instructors acting as members of a plant safety committee actually conducted a plant safety meeting. The instructor briefly gave the fundamental ideas of a safety committee before the mock demonstration, and summarized the safety committee's part in a plant safety program after the mock demonstration.

The instructors for the safety training course were selected to give variety to the sessions. A college professor presented the basic ideas of training, and an industrial safety engineer with teaching experience gave the basic ideas on accident prevention. Discussion leaders from the industry were selected to give prestige and guidance for the meeting. The idea of balance, as well as variety, was stressed throughout.

The accepted basic methods of presentation were used, including some from our visual aids. In every unit, one of the best received visual aids material was the new National Safety Council series of training films, "Safety and the Foreman." This series is recommended for any safety training course.

The committee went to great lengths to plan details for the meeting. Besides the usual name badges, banquet and local newspaper publicity, two or three different ideas were successfully used for instruction. At the mid-morning and mid-afternoon breaks, cokes were provided saving time and offering an opportunity for fellowship. In addition, all participants were given an opportunity to meet with one of the industrial leaders for an individual conference, on their specific problems.

The two conferences were attended by 94 people representing 56 plants. Each participant received the basic ideas of safety training and instructions and materials to set up a safety training program for their individual company or plant. Other regional conferences are being planned for the fertilizer committee. The executive committee of this section has completed a successful project and has done much on an industry wide basis for the cause of accident prevention.

I believe the following conclusions will be of interest and benefit to all engaged in industrial safety.

- There is a real need for supervisory safety training in the fertilizer industry as well as the wood products and pulp and paper industry.
- The industry recognizes the need for supervisory training and will send plant

representatives to a regional safety training conference.

- Full cooperation of the National Safety Council, state agencies, and safety leaders can be obtained for conducting supervisory safety programs.

The fertilizer section of the National Safety Council is comparatively new. The wood products section, and the pulp and paper section are not only much older, but are larger and more influential. It is a real challenge to you as individuals and representatives of your section to do something about the need for safety training in your industry. If you want to make a lasting contribution to the cause of accident prevention in your industry, urge the executive committee of your section to start immediate plans for safety training.

PROMOTING WOODS SAFETY

by J. KENNETH PEARCE

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In considering what I, an amateur in safety, could say to you professional safety men who represent firms with excellent safety programs and award-winning safety records, my thoughts wandered back to my laboring days in the woods. Thirty-seven years ago I was hired as a third rigger on a Lidgerwood skidder out of Union Mills, Washington, now a ghost town. I had worked on ground lead and high-lead yarding crews but had no experience with skylines.

My first morning on the job the head rigger handed sledge hammers to me and another green young third rigger and told us to go knock the tail hold on the skyline loose. That was all the instruction we received. We proceeded to the back end where the one and one-half inch diameter wire rope skyline was wrapped around a stump and fastened with railroad spikes. One thousand feet of skyline was suspended 100 feet in the air between head, tree and tail tree shoes.

SAFETY ORIENTATION

The surplus length of the skyline lay stretched out on the ground to one side of the stump. We started knocking out spikes, and soon the skyline started to run. The wraps sizzled and smoked around the stump and the loose end flailed around like a snake. How we got out of there alive I don't know.

That incident typifies the "let him learn the hard way like I did" attitude toward the green hand coming into a logging camp in those days. No one told him how to do the job safely. Great progress has been made in woods safety since those days. In the operations today safety goes hand-in-hand with production and safety-minded foremen keep a watchful eye on the training of the green hand. But are you doing all that could be done to promote safety at the time the worker is most receptive, most eager to learn? This time is when a young man first comes to work in the woods, or in your operation.

Many of my senior logging engineering students have worked one or more summers in logging labor jobs. Some have worked for companies with outstanding safety records. When I asked the students what orientation or safety training they received, all replied that they started right to work with the whistle the morning they reported. Any orientation they received came from their immediate supervisor.

They felt it was just luck if they started under a helpful, safety-minded supervisor. (Of course it was good management, but they did not realize it at the time, and no one told them this was part of the safety program.) The concensus of the students said that the weakest part of the safety and labor-relations program of the employer was how they were handled when they first went to work in the woods.

Some executives in the Pacific Northwest logging industry have felt concern that young men from communities which traditionally furnished woods labor are going instead to aircraft and other industries. One deterrent to recruiting the active, intelligent young men is the accident record of the logging industry, well known in woods communities.

ACCIDENTS DISCOURAGE WORKERS

Not so well known is the fact that logging accident statistics show the highest accident frequency rate among the youngest age class and the group with the least number of months experience. Efforts are being made through Junior Logging Congresses, vocational talks to high schools, and industry films, to attract young men to the logging industry. A good safety record could be a potent recruiting aid.

The book "Safety Subjects" published by the Bureau of Labor Standards, U. S. Department of Labor, used as a textbook in my class "Safety Practices in Forest Industries," makes a distinction between safety education and safety training. Education is defined as broadening of knowledge and understanding; training as the development of skill in performance. Safety training is usually competently handled by the safety-minded supervisor. But what about the safety education, particularly of the new employee? Is this a weak link in the chain of woods safety promotion?

University authorities have found it worth while to take the first one, two or even three days at the start of the new academic year for the orientation of the freshman and other new students. If college students need orientation, is the man in the same age group entering industry any less in the need of orientation?

SAFETY EDUCATION PROGRAM

The following program of orientation, and initiation of safety education, is suggested for groups of new employees of large operations. It embodies suggestions from students as to what they would have liked to have had when they first started to work in the woods, as well as my own ideas, as an ex-logger, foreman and superintendent.

1. *Orientation Session.* The first morning they reported the new men would be brought together for an orientation session. The Logging Superintendent would tell them of management's interest in safety and other company policies. An organization chart of the operation and authority might be shown.

Opportunities for advancement in jobs with the development of skills and learning by experience would be explained. The timekeeper would explain pay periods and procedure, deductions and insurance plans. The forester or fire warden would emphasize the importance of fire prevention and the organization for fire-fighting, since every man in the woods is a potential fire-fighter.

2. *Safety Education Session.* Following the orientation session, the safety supervisor would take over, and tell them of the safety program, first aid facilities and the training program. Safety training films are available from the various Loggers Associations, the American Pulpwood Association, State Safety Departments and the National Safety Council.

REPETITION VALUABLE

Booklets or cards covering job safety instructions would be issued and discussed. The value of repetition cannot be over-emphasized. Even college students can learn only by the repetition of reading the textbook, taking notes on the lecture, and writing the examination.

Ample opportunity and encouragement to ask questions should be given. Time for private talks with the personnel man should be made available for men who have a question or problem they do not want to voice in the group sessions.

3. *Observation.* Opinion among my students was divided as to how the first afternoon should be spent. Some thought that a tour of the whole operation, and observation of the various operations, such as yarding and loading, felling and bucking, road construction, and the shop to give the whole picture, would be helpful. Others thought that the afternoon might be better spent by observing the particular activity or job in which they

are to work, in company with their foreman, who would point out the safe and efficient way to do the job.

The foregoing orientation and safety education program is obviously not suggested for boomers or drifters who will hit the road with their first paycheck. Rather it is intended for the "home guards" who can be expected to stay on the job long enough to justify the time and money expended on them. It would be followed up at intervals with evening safety education sessions, using audio-visual aids.

Since the average 20 to 24 minute film teaches more lessons than can be absorbed, combining the running and re-running of short sections of a training film with the discussion-conference technique, is advocated. As an example, the Rarig Motion Picture Company of Seattle reproduces the sound-color film "Hauling Logs" which they made for the British Columbia, Pacific Northwest and Redwood Loggers Associations, in six four-minute sections. They publish a film guide of questions and answers for each section and a "Conference Leaders' Manual" to accompany the films.

The small operation, or the one to which new men come singly, presents more of a problem. However the same objectives of orientation and safety education, accomplished by individual discussion, rather than group sessions, would improve labor relations and promote woods safety. This is only a preliminary to the most important on-the-job safety training under a safety-minded supervisor.

TEXTILE SECTION

TRIAL BY SURVIVAL

(A Skit)

WITNESS NO. 1

Q. Name?
A. Don Maynor.
Q. Do you work in Gullyjumper Mill?
A. No, I was fired.
Q. Why were you fired?
A. I had an accident.
Q. What was your job?
A. Baler in cloth room.
Q. When did the accident happen?
A. Last Wednesday.
Q. How did it happen?
A. Tells about falling in oil slick, etc.
Q. How long had it been there?
A. Ever since I started work.
Q. Why didn't you wipe it up?
A. Nobody ever told me to.
Q. Didn't your second hand ever tell you to clean up?
A. No, only to keep it off the cloth.
Q. Don't you know that good housekeeping is the first law of safety?
A. No.
Q. Weren't you instructed in safety when you came to work?
A. No. Nobody ever said anything to me.
Q. Wasn't your job explained?
A. Yes sir!
Q. Wasn't safety also explained?
A. No.
Q. Don't the inspection committee report things like oil on the floor?
A. We don't have any that I know of.
Q. Are you really hurt?
A. Yes sir, I knocked one of those little things, etc.
Q. Who saw you fall?
A. Nobody—I guess.
Q. Did you report it to your second hand?
A. No. The boys told me I'd get fired if I did.
Q. Did you see a doctor?
A. Yes sir.
Q. When?
A. That night. I got to hurting, etc.
Q. Does it still hurt?
A. Yes sir.
Q. Where?
A. Right here. I have to walk all bent over like this.

(JUDGE: "How did you walk before the accident?"

Defendant illustrates—cocky walk across stage and back.

JUDGE: "That will be all.")

Q. Who is your second hand?
A. Mr. Ed Dickert.
Q. Who was the doctor?
A. Dr. Cuttem.
Q. Show me again how you have to walk since you got hurt.

PROSECUTOR: "Your honor—I'd like to call Dr. Cuttem in order to determine if this man is really hurt. I think he is malingering."

WITNESS NO. 2

After being sworn in:

Q. Now, doctor, give the court your full name.
A. Gladly sir. Doctor I. Cuttem, M.D., Ph.D., BVD.
Q. Dr. Cuttem, what do those degrees mean and where did you get them?
A. Well, sir, the M.D. and Ph.D. I got from medical college and the BVD I got from Sears Roebuck.
Q. Doctor, are you what is commonly called a bone doctor?
A. Yes, you might say I am a bone doctor. In fact I worked my way through college with bones (pulls out some dice and rattles—try to work up a game).

(Prosecutor and Doctor get on knees—Judge breaks it up.)

Q. But, doctor, did you study about the human bones?

A. Oh yes, I know all about them things.

Q. Now will you tell the jury what you know of the injury of Don Maynor? He says you treated him after he got hurt down at the Gullyjumper Mill.

A. Yes, this young fellow came to my house and woke me up about 3 o'clock in the morning the other day and wanted me to treat him—said he got hurt. Well, after I had time to get a credit rating on him, got him to sign over his car to me, promised me his Christmas Savings at the Mill, just a precautionary measure or two, I decided to look at him—and BOY what a sight—what a wreck—this fellow must have been hit by a train!

Q. Doctor, can you tell us exactly what is wrong with him?

A. Oh sure, but I'll have to call in my partner for a demonstration, my silent partner. (Pull out skeleton.) (Go through a routine with Ralph holding skeleton for me—using terms—also using song, "Dry Bones"). Finally getting around to the back and bringing out that the injured has a dislocated intertube in his sacrocrackerjack.

Q. Doctor, is this serious?

A. Tell about one out of ten gets along fine and this fellow has a good chance since my last nine patients died.

Q. Doctor, after getting this man to give you all the security you mentioned and after the examination you made, do you think his present condition is a result of an accident on the job?

A. (Thinking out loud) I'll get more money from a compensation case. Yes, that's my opinion.

WITNESS NO. 3

Q. Name?

A. Ed Dickard. (Have a handful of papers.)

Q. What is your job?

A. Second hand—cloth room—Gullyjumper Mill.

Q. Do you know that man?

A. Yep—I know him.

Q. Where did you know him?

A. He worked as a baler in the cloth room.

Q. You mean he is not there now?

A. No. We had to let him go.

Q. Why?

A. He couln't run his job.

Q. Do you know why he can't run a job?

A. Yeah—he claims he got hurt.

Q. Did he get hurt on the job?

A. I dunno whether he did or not.

Q. You mean you don't care. Your attitude is not so good.

A. I can't be bothered about guys like that. All I ever hear is my overseer on my back about getting out the work. Quality and production and seconds is all I hear around here. What am I doing here anyhow? I was called off the job and was told to come down here with no explanation.

Q. You are here to determine if this man had an accident. Now, did he report his accident to you?

A. No.

Q. Did he go to the nurse?

A. We don't have a nurse.

Q. How do you give First Aid?

A. I just slap a little iodine on 'em.

Q. Do you have a department safety committee?

A. Heck no. We don't have time for that stuff.

Q. Doesn't your overseer make you keep a safe department?

A. Goodness no, All he cares about is production and baseball.

Q. You mean you don't have any kind of a safety program at Gullyjumper?

A. I guess that's right. If they've got one I never heard of it.

Q. Who is your overseer?

A. Mr. Owens, who is also manager of the Mudhens.

"Call Overseer"

WITNESS NO. 4

Q. What's your name?

A. Red Owens.

Q. Where do you work?

A. Gullyjumper Mill.

Q. What's your job at the mill?

A. Cloth room boss and manager of Mudhens ball team. What y'all want with me? I was called from the ballfield, etc.

Q. How many employees do you work?

A. 18 working and four ball players.

Q. What are your duties?

A. My biggest job is getting out production, etc., ball team.

Q. Do you know that man—there—who got hurt in your department?

A. I've seen him around.

Q. Do you have a report of his accident?

A. Nope. I didn't even know he got hurt till the super told me to come here. I need to get back to the ballfield.

Q. Do you agree with his statements?

A. Heck no. They are a pack of lies.

Q. Do you have any kind of a departmental safety program in your department?

A. No. We don't have time to take people off the job for that stuff, etc.

Q. Hasn't your superintendent told you to start some safety activities in your department? Hasn't he told you what to do?

A. He told me what to do all right—not to have any seconds. He says that safety stuff ain't worth a darn.

Q. Who is your superintendent?

A. Mr. Fred Thackston.

"Call Superintendent"

WITNESS NO. 5

Q. What's your name?

A. Fred Thackston.

Q. What's your job?

A. Superintendent.

Q. How long have you worked at Gullyjumper?

A. 25 years.

Q. How many employees do you work?

A. About 600.

Q. Do you have a personnel department?

A. No, it would cost too much money.

Q. Well, who hires your help?

A. Overseer.

Q. Does he explain any safety rules to the employee?

A. No, he doesn't have time.

Q. Do you have a cost department?

A. Yes, we have a cost department.

Q. Why do you have a cost department?

A. Because it is necessary to know what it costs to make a yard of cloth.

Q. Well, why don't you have a safety program?

A. We carry insurance to take care of our accidents. We can't see where it would save us any money.

Q. Do you know what your insurance costs you?

A. Yes, it costs about $15,000 per year.

Q. Has the insurance company ever sent their safety engineer around?

A. Yes, some little college engineer came around. He wanted to tell me how to run my plant; wanted me to spend $10,000 to change my elevators, cables, etc.; and they have been running for the last 20 years and no one has gotten killed yet. He wanted me to put a guard on every motor; even wanted me to change all the electrical outlets; said somebody could get electrocuted. So, I just told him to get his little handbag and go back where he came from. I didn't have time to fool with him.

Q. Whom do you take your orders from?

A. From Mr. Sawyer up in Massachusetts.

Q. Has he ever told you anything about having a safety program in this mill?

A. No, all he is interested in is how much money I make for him each year. He expects me to make him money and if I don't do it, he will get somebody that will.

Q. Who is in charge of safety?

A. Nobody.

Q. Who keeps records of accidents?

A. Don't keep any.

Q. What is your frequency?

A. I don't know what you are talking about.

Q. Do you have a nurse?

A. No.

Q. Do you have a physical exam when you hire new people?

A. No.

Q. Do you hold any safety meetings with your overseers?

A. No—only production meetings.

"Call Owner"

WITNESS NO. 6

Q. Could I have your name?

A. J. A. Sawyer.

Q. Are you the owner of the Gullyjumper Mill?

A. Yes, I own that mill.

Q. Would you tell us where you live?

A. I live on Beacon Hill in Boston, Mass.

Q. Now tell me, is it true that everything that is done or goes on in the Gullyjumper Mill is your personal responsibility—all decisions, all new machinery, all maintenance, etc?

A. In general that is true. I only get to the mill about five times a year but in general I do make all the major decisions.

Q. Now in this trial we have been trying to find out who was responsible for the accident to this poor claimant sitting here. All the other persons have told this court that they were following their orders and they all appear to be doing just as they have been told. Is that about right?

A. That may be true but I've never told them to get anyone hurt.

Q. You personally don't like to see anyone hurt, do you?

A. No, of course not!

Q. Do you at this time or have you ever taken any personal interest in the prevention of accidents at Gullyjumper Mill?

A. No, that's not part of my job or my responsibility. The people down there have got to look out for themselves. Our job is production—not worrying about who might get hurt.

Q. Do you know how much you are paying for W. C. insurance?

A. I don't know exactly—I do know it's too high.

Q. Have you ever discussed the cost of accidents or insurance costs with your superintendent?

A. No.

Q. Have you ever instructed the superintendent to install a safety program, or to make sure he runs a safe mill?

A. No.

Q. One last question, don't you agree that if you personally have never expressed any interest in the prevention of accidents, that the superintendent and all his overseers could easily have the same opinion?

A. I am afraid that I cannot go along with your reasoning. What I say or do has no connection with an accident that happens at Gullyjumper Mill. People have to look out for themselves. We can't waste our time worrying about a spot of oil on the floor.

Q. Do you believe in good working conditions for your employees?

A. Yes. We will do anything to get out production and improve our work.

Q. Do you ever discuss safety with superintendent?

A. No. His job is productioin.

Q. Do you ever mention costs of accidents to superintendent?

A. No. His job is production.

Q. All the testimony you have given shows that no program has been injected in Gullyjumper Mill for anything but production and costs. Nothing for the safety of your people, which means that you are overlooking the best possible way of reducing costs, reducing seconds and therapy increasing efficiency and production.

A. Now wait a minute. I don't see how all this is any business of yours. Dragging all these witnesses down here etc., etc.

Q. Your Honor, I rest my case, as I have proved without a doubt that all supervisory personnel are guilty of this man's accidental injury, and I demand a verdict of guilty and the supreme penalty of conviction. I would now like to put my case before the jury.

JUDGE: You may charge the jury.

Prosecutor to Jury
(Face Audience)

Ladies and Gentlemen of the Jury. You have heard the injured explain how he got hurt. He worked in a mill utterly devoid of feeling for the worker. He was driven to seeking medical attention on his own hook because the mill provides nothing in the way of a medical program. For his trouble he was fired for not being able to run his job.

You have heard the second hand explain that he had no time to operate a safe shift. He stated he was driven constantly for production and quality.

You have heard that ignorant overseer testify that his only interest was in the baseball team. He hardly knew his own employee. Production and baseball was all he cared about.

You have heard the superintendent testify that he took no active interest in the welfare of his employees and that he didn't have time for safety.

You finally heard the owner state that his only interest was in money and that he felt no obligation to provide even the rudiments of good working conditions for his employees.

Such a history of buck passing I have never seen. Not one of these men has proven himself fit to run a mill.

I ask you to return a verdict of *guilty* in the first degree. I ask this court to invoke the extreme penalty on all of these men. I demand that they make full restitution to this poor man and that they be required to operate in the future according to the strictest Safety Code.

I rest my case.

Judge charges the jury and finds that they are all guilty and sentences them to one full year of having a safety program in their respective plants. Then asks if they think each individual is guilty and brings them up before the bench to be tied by the bailiff and carried out to jail.▲

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and MAN-MANAGEMENT

by DR. J. L. ROSENSTEIN

Delivered as four
Early Morning Lectures
at the
45th National Safety Congress
(Oct. 21-25, 1957, Chicago, Ill.)
Vol. 30 of Current Safety Topics, 1957

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by Dr. J. L. Rosenstein

INTRODUCTION by R. L. FORNEY

secretary, National Safety Council, Chicago, Ill.

Welcome once again to the early morning sessions of the National Safety Congress. I am sure that a great many of you were here at these sessions last year, but I wonder how many of you were here in 1947, 10 years ago? Will you hold up your hands? How many of you were here in 1947? Well, a fairly large number at that.

Those of you who were here that year will recall, I am sure, that the speaker we had was a smashing success to us—a theatrical term. He was so good in fact we had to turn around and bring him right back the next year.

Now, although Dr. J. L. Rosenstein has not been back at these early morning sessions since 1948, he has certainly been a part of the American safety scene during all these years.

He has performed many services for the National Safety Council and has gone back and forth across this country and Canada, conducted training programs for community safety organizations, ASSE groups, industrial concerns and organizations of all kinds.

All during these years, we have had a good many letters from people saying that, "Isn't it about time to get Dr. Rosenstein back to the early morning sessions of the National Safety Congress?"

The thing sort of built up from year to year until we felt that it certainly was the right thing to do to bring this man back to this crowd and to these early morning sessions, and that is what we have done this year.

Now, as you know, these sessions will continue through tomorrow morning, Thursday morning and Friday morning at the same time. The general topic for the series is, "Human Relations and Man-Management."

I am happy to present to you Dr. J. L. Rosenstein, who is Assistant Director of the Management Center of Marquette University, and a nationally recognized training consultant.

I am sure we are all glad to have Dr. Rosenstein back.

THE ART OF MANAGING MEN

SESSION ONE

I HOPE that every one of us here likes to think in practical terms because this entire program is concerned with the practical problems of practical men.

Practical problems met with and dealt with by every supervisor eight hours a day on a realistic job, not in theory.

In many places, I am introduced as a psychologist, but my pride is not related to being a psychologist. Rather, it is related to being a teacher and as a teacher my job is not to tell you very much but to try to say something which will cause you to think. And if anything I say or do causes you to think, then I think it will have been an awfully good and a very successful program.

Today we are going to be concerned especially with the practical problems of specifications—leadership, discipline, and the needs of men, realistic, practical needs.

One of the aspects of being practical relates to the recognition that every business is different from every other business; and that every executive's job is different from every other executive's job; and that every supervisor's job is different and every foreman's job is different and everybody's job is different from every other man's job. Everybody deals with different economic and different policy problems. Everybody deals with different social, personal and personnel problems. Everybody deals with different equipment and has different mechanical and different production problems.

But, as true and corny as it seems to those of you who think of yourselves as being sophisticated, the most important thing I have ever learned in 55 years of living, is that with all the differences that exist from company to company and industry to industry and job to job, every one of us has one thing in common that we deal with, and that is people, and they are exactly the same everywhere, and not a thing ever happens anywhere, and that is the most important thing I have ever learned.

If I ever forget that for one moment I am being impractical.

I know there is antagonism between so-called objectively-described groups as management on the one hand, labor on the other, but I am too old to be scared by words.

Management, to me, is people; labor is people. They are men and women with hearts and souls; they are fathers and mothers and sisters and sons and brothers. I know that management is people. I know that labor is people. And I know that strikes happen under all kinds of conditions for all kinds of reasons in all kinds of industries. But it is always people who are antagonistic. It is always people who go out on strike. It is always people who have these man-made antagonisms, and it is always people who work out their man-made differences with man-made solutions.

I know that you all receive the publication from the National Safety Council called "Accident Facts," and I know that all those figures and all those statistics relate to accidents. But don't fool me and don't try to kid me. Every one of those statistics is a person, not a number. We are talking about people. After 20 years around the Safety Council and working and talking with safety men, I know that accidents happen in all kinds of industries for all kinds of reasons, under all kinds of conditions, but I have never yet seen an accident which was not made by a person. I did not say people have accidents. People have babies. They make accidents.

. . . CAN PREDICT ACCIDENTS

Being a practical person, I would not dare say to any of you, "What is an accident?" You might reply with the classic definition which makes me angry every time I hear it. It starts out like this, "an accident is an unexpected occurrence." But don't tell me that an accident is an unexpected occurrence." Maybe it happens when you don't want it or least expect it. But every one of us knows an accident is expected. Every one of us knows he can predict an accident. Any time you show me an unsafe condition or an unsafe act, I can guarantee there will be an accident. Maybe

it will not happen when you want it to happen or when you are ready for it, but there is going to be an accident.

So, let's be practical. Accidents are to be expected and they can be predicted, whenever an unsafe act is performed or an unsafe condition exists.

In these meetings we are concerned with the management of people. And these people are the same everywhere. They present the same kind of problems everywhere. They all have the same kinds of worries, the same hopes, the same fears, the same dreams, the same aspirations, the same grievances, and the very same human nature everywhere.

So, we are going to talk about the one thing which is universal in every business and industrial activity, people.

It seems to me that as practical people we ought to be concerned with what I consider to be a most important word in industry and business, and that is specifications. You and I know that everything we deal with and everything we are concerned with in our jobs, has its own specifications, which means it has its own peculiar attributes, its own peculiar qualities, its own peculiar limitations of performance.

We know that brass is different from wood and that gold is different from steel. We know that a lathe is different from a punch press and that an airplane which is a conveyance is different from an automobile which is also a conveyance. We know that a washing machine is different from a dryer and that a hand tool like a hammer is different from a hand tool like a chisel or a saw.

As practical men, we are never provoked if glass won't do what gold will do. We just do not expect it. We are not upset when wood won't do what steel will do. We don't expect it, and we are not disturbed if a garbage disposal will not type letters like a typewriter, which is also a machine. We don't expect it. We are never upset if a punch press says, "I'm not going to turn stock, I'm no lathe." It doesn't make any difference what the pressure on us may be. It makes no difference what we want or must have. We just do not expect and we know that we can not expect to get from things anything which is not in keeping with their own specifications. That is being practical. We work within the specifications. We do, if we have good sense. Even if we are not satisfied. Even if we are unhappy about what we are going to have to accept as a final product, we know we have to work within specifications.

Are you practical? How can you call yourself practical if for one moment of any eight-hour day on the job, you forget that people too, are phenomena of nature and that they too, have their specifications, their qualities, their attributes, their properties, their limitations? Human properties, human qualities, human attributes, human specifications, which are the same everywhere. There is a logic and a common sense in dealing with these human specifications too, whether you like it or not, whether it is difficult to believe and accept the first time you hear it.

HUMAN NATURE NEVER CHANGES

The first and most important of these human specifications, the one we must live with and work with even if we don't like it, is that human nature is immutable. It is unchangeable.

Our first principle in dealing with this human nature is to recognize and know that of all the things you can depend on in this ever-changing world, you can always depend on human nature. It is always the same. It has always been the same. You just can't change this human nature.

Of course we like to think of normal human nature as a changing or changeable thing. But then we are thinking about the way it expresses itself, not human nature itself. Many of us would like to change some of the ways which human nature uses to express itself and we try to do so, by teaching people, by making rules or laws. We think we make better people that way. But human nature itself cannot be changed. It may be understood, it may be guided, it may be directed, it may be led, it may be controlled, but it cannot be changed. It has never been changed. It has never been changed since the beginning of time.

Everything that we talk about concerning human nature today you can read about in the old Koran, in the Old Testament, in the New Testament and in the Chinese Literature of 7,000 or 8,000 or more years ago. It is exactly the same.

Well, if it cannot be changed, maybe as practical men and women we ought to stop

wasting our time trying to change it and begin spending our good energy, and good intelligence, trying to discover ways and means of controlling, guiding, leading, directing and managing it.

Teaching practice requires that we repeat ourselves from time to time. So, at this point, let me repeat.

Hasn't your experience taught you the logic that you must never expect anything out of a tool, out of a machine, out of anything you deal with, a pencil sharpener, a typewriter, a generator, a truck—you must not expect anything which is not in keeping with its specifications?

If we invent a tool or a machine, that tool or machine is planned and controlled from the idea stage to the paper stage, mock-up, trial, and production stage. Every single step of the way we put into it the specifications we want, exactly as we want them, *if possible*. Sometimes it is not possible. Sometimes, we have to compromise, which means we also have to compromise with what we are going to get out of it, and we don't like that and we are unhappy because we have to compromise. But, at least we try to recognize that it is the specifications which are important to the end result not the things that we want.

If we go out to buy a tool or a machine or anything at all, we think in terms of specifications.

When the personnel department starts testing and interviewing and goes through all its various steps, it is trying to discover specifications as it relates to people for a job. We talk about and are concerned with specifications because we know that if we don't know specifications or if we work outside of or demand things beyond specifications, something is sure to go wrong.

WORK IN SPECIFICATIONS

We have mistreated that device when we work outside of specifications. If we make demands of a machine, not in keeping with specifications, if we use it improperly and something does go wrong with it, we don't say the machine is vicious: We don't say the machine is anti-management. We don't say the machine is uncooperative. We don't say the machine is a Communist. We don't walk up to the machine with a wrench behind our back and say, "You're not giving me what I want. I will show you who is running this outfit." We don't hit the machine and say, "You have too many teeth in your gear wheels anyway! That will teach you."

We don't go up to the machine and say, "If you think you're going to waste my good time and the company's money you're crazy. You are not giving me what I want. So, no grease, no oil and no maintenance for you for the next 10 days and when you start hurting and squeaking and groaning and squawking, you'll know. You'll learn."

We don't walk up to the machine and say, "Hey, listen, you're either going to or not going to give me what I demand. You're not? OK. I'll pull the switch and shut you down. You're laid off for three days. No work. That will teach you."

We don't take this machine and throw it out the window or fire it. That would be silly, wouldn't it? Oh, are you really practical? Think about it a moment.

We do make demands of people, don't we? We make demands of ourselves too, without ever being concerned with the special specifications of ourselves and others. When people don't come up to our demands or don't give us what we have to have or what we need because we are under pressure to get it, we do have a lot of dirty names for them don't we? We use words like lazy, vicious, antagonistic, anti-management, insubordinate, uncooperative, disloyal, Communist. And we do discipline them, don't we? We punish them or fire them if we can. It is not as easy as it used to be to get rid of them. And if they are no good at all, we try to transfer them over on to somebody else. There must be a national manual of standard practice because it is that way clear across the country everywhere.

With people, we do not do what we know should be done, as practical, intelligent people, we don't stop the man just like the machine, do we? What do we do with the machine? For that machine, we set up a completely formal program of preventive and corrective maintenance. Prevention comes first. If something despite our preventive plans begin to go wrong, at the first sign of something wrong, we stop the machine, shut it down, take it apart as quickly

as possible, correct what is wrong, put it back on the job as quickly as possible and not in anger or hostility or with a sense of aggression.

What happens with people? We don't stop a man like we stop the machine. Take him off the job; find out what is keeping this good man from being the good man he could be and would like to be; correct what is wrong with him and put him back to work on the job as quickly as possible. You don't have to be a professional psychologist to be aware.

How do you know when to do this? The moment you say to yourself, "What's eating him?" or "Joe isn't himself today" or "Brother, he must have gotten out of the wrong side of the bed today," you have recognized that something is wrong with that man.

Would you let a machine with something wrong continue to work?

Why ignore the man?

We know that with ourselves, there are many days when we say, "Oh, brother, this is one of those days I should have stayed home." Things happen to people. We know that. But, are we practical when we forget to use what we know? What is the use of collecting all this know-how if we don't use it? We are impractical if we don't use it and we know there are things that happen to people over which they have no more control than a machine has over something that happens to it, which keeps it from functioning like it could and should and would.

CAN'T REASON ABOUT PEOPLE

Our own human nature seems to be especially peculiar in that we can reason rather reasonably about things, methods, materials or equipment, but not so reasonably about people. Primarily, this is because we have never been taught so consistently and insistently about people and their normal functioning as we have about things. So, when human nature is expressing itself normally, it seems to be vicious or radical and exasperating and distrubing and we want to slug it.

Are you practical? Stop a minute and think. When was the last time you said to yourself, "Am I perfect?"

When you reluctantly agree that nobody is perfect, including yourself, what does that imply? Well, you know that if you are not perfect, and none of us is perfect, that there are many hundreds and hundreds of so called imperfections.

You've always known that people just don't seem to look ahead. Neither do you too much.

People are impulsive and petty and they are sensitive and they like assurance. They are proud and their feelings are easily hurt and they lack initiative and resist change and don't have any real long-range goals in life.

People are not self-starters or self drivers. They want to be liked and babied, and want to be identified with good things and things they can be proud of.

They will deny making mistakes. They will pass the buck and try to pull fast ones on you.

They are always on the defensive, always looking for an angle, a curve or break.

They see good in the things they like and see things wrong in the things they don't like, and always have a good reason for doing the things they want to do, and a pretty good reason for not doing the things they don't feel like doing.

We are certainly most impractical if we ever forget for one moment that these and many hundreds of other every day performances are ordinary expressions and symptoms of a normal realistic human nature which just can't be changed no matter how we try.

Imperfect? Of course it is imperfect. Difficult to deal with? Why sure. If it weren't difficult to deal with we would not need any of those so-called leadership qualities in supervisors and all supervision problems would be simple ones. Anybody could handle them.

It is those hundreds or thousands of inadequacies and imperfections that create the need for man-managers and leaders.

What have you considered to be the mark of a real leader? What is your concept of a real leader? Well, you may be sure that all of us, loaded with these inadequacies, spend a major portion of all of our mental and physical and emotional energies trying to make it look as though we don't have any inadequacies, because none of us is proud of them. The good leader knows it. We are ashamed of our inadequacies, our imperfections. We don't want people to know what is wrong with us.

We say, "Sure, nobody is perfect," but we don't go around bragging about what is wrong with us and we spend a major portion of our mental, physical and emotional energies trying to make it look as though we don't have anything wrong with us.

We would rather have people see our good qualities. We have all been taught as though it were immoral and delinquent, not to be perfect or ever to do anything wrong or to make a mistake. So, we learn to deny and hide mistakes or error or doing wrong because from the time we were children we have been trained by a sock across the ear or across the rear that when we do something wrong, we are always going to be punished.

SELF-EVALUATION

We are not proud. Rather, we are ashamed of not measuring up to some standard, a standard established by society in the form of our parents or the school, or maybe the world all around us. But more important we are especially ashamed of not measuring up to some standard which we set for ourselves.

Just remember, that the true psychological measure of any man or woman is not what we actually are or what we might become or what people think of us. The true psychological measure of every single person is what he thinks of himself. The pictures which he has of himself—and every one of us has many idealized pictures of himself as a good man, as a good father, as a good husband, as a good workman, as a good citizen—these are the pictures he holds up as personal standards and these are the things he tries to be or aspire to; those are his standards of values.

All pictures which a man has of himself; what he thinks of himself provides the motive power, sets the standard and is the incentive for the way he thinks, the things he will do, the things he will be proud of or ashamed by.

We have known for years that the racketeer or the embezzler of widows and orphans, despised by decent men and women, can strut down the street in great pride, all wrapped up in his warped and twisted, self-esteem. This racketeer, this embezzler, has a picture of himself too. He sees himself as a big shot, and as long as he sees himself as a big shot, he does not care what you think of him. He will fight and kill if necessary if anything threatens his stature as a big shot or he thought it did, and his kind have killed in order to be and remain big shots.

At the other extreme are the things we accept casually. Parents sacrifice and give up necessities in life for themselves if necessary to take care of their children and give them a better break in life. When you talk to them, you find that it doesn't make any difference what the world thinks about the wisdom of their secrifices. It has nothing to do with reality; it has nothing to do with intelligence; it has nothing to do with the world and true life. They have a picture of themselves as parents and what parents ought to be like and they will live up to that picture if it kills them.

They couldn't live with themselves if they did not live up to their picture of what good parents ought to be like.

What about the workman on the job? What picture does he have of himself which causes him to be a co-operative, hard working, decent workman, anxious to do a good job? Golly, I don't know. But basically, he is a good man. He has a picture of himself as a good man and he wants to be known as a good man and he wants the world to know him as a good man.

MAN WORKS FOR MONEY

What motivates good men? Of course we work for money. Everybody who works has to work for money. That is the only reason we work. We would be silly if we didn't. But, a man may work grudgingly or he may work cheerfully. He may work indifferently as a machine or he may work with a purpose as a man. He may see his work as a means to attain all those things for his loved ones which provide comfort and security, or he may despise his work as a perpetual burden to be hated.

There is no workman so stolid, but that he tries to find a way not to be ashamed of his work. There is no man so ox-like, but that he tries to find meaning and soul in the things he has to do for a living. There is no workman so dull but that he looks for ways to enliven and find color in his work.

Yes, we applaud the actor and hockey player and the racer who knocks himself out for applause or the fighter who lets himself be punched silly so he can get a pat on the back from the audience, and if there is no audience, then the boys in the gym will say, "That guy is really a fighter's fighter, a man's man," and so on.

No genius ever drudged away long, lonely hours, hoping to produce a painting, a symphony or a great novel unless he believed or hoped throughout all his labors that one day his work would be acclaimed and he would get recognition and praise for it from the world at large.

Praise, applause, recognition are necessities whether the man is a clean-up man or a hod carrier or a window washer or genius.

At any level of performance, praise, recognition, expressed appreciation or, a word of thanks for good work done are the psychic shots in the arm, that provide continuing energy to keep on slugging. Recognition for having tried even if things don't come out right is the basic incentive. Praise and recognition make possible that the necessary work of drudgery be done and have even converted drudgery to a labor of love as you all know.

On the other hand, what is the worker's picture of himself, which leads to resistance, antagonism, destructive anger, rage, and aggression? Well, I don't know that either.

But, studies in psychology have taught us that destructive anger and rage in adults will result from restrictions and controls which are imposed by others. Controls are imposed on a man by others and so bind a man's mental or physical freedom that he will rebel and try to break out of these bonds, even if they are imposed for his own good.

That is why we do touch, when the sign says, "Don't touch." That is why we do balk at and break restrictive safety rules. That is why we still go out there when it says, "Stay out of street," or "Don't light a match," or "No smoking."

Did I say adults? I always love to brag and I have been bragging about my grandchildren all over the country. I used to brag about Holly. Well, she is seven now. Then, I began bragging about Cynthia. She is past four. Now, let me talk about Lisa. It is wonderful to see this thing going on from one child to another. Those of you who have young children or grandchildren know what I am talking about. And one thing, for a guy as old as I am it is bad to start out a day with an hour and a half of playing around with a couple of grandchildren. By the time I get ready to go to work I am no good for anything. As my wife says, "Grandchildren are wonderful for young people."

But, if you come in as we do, on a visit two or three times a year and there is our daughter and she has Lisa in her arms and I wiggle my fingers at her and I say, "Come to Poppy," and the baby makes a dive for me and my daughter says, "See, she recognizes you," you know that your granddaughter would go for anything that wiggles but with mine it is a sure sign of intelligence. She recognizes me.

You take this child and throw her around and laugh and sing and croon and hold her close to you, and she is happy too and she laughs and slobbers all over you. But soon her Mama says, "O.K. Poppy, let's go. Soup's on. Bring her in. I am going to feed her and put her to bed so I can relax too."

REBEL CONFINING BONDS

But you hate to give her up and just before you let her go, you want just one more cuddle, and you put your arms around her legs and around her body pinning her arms and you squeeze.

Then what happens to that sweet and happy child who was laughing and crooning with you and drooling all over you, having a wonderful time? Suddenly, she is converted from a sweet thing into a wild creature. Suddenly she cries out and begins to fight her way loose and breaks out in a loud scream. Your daughter says, "What did you do now? Did you hurt her or scare her?"—and you turn to her and say, "No—daughter. I didn't hurt her or frighten her.

You and I should get down on our knees and pray our thanks to God because this child was born normal with the built-in urge and drive to break out of bonds that are imposed on her by others. Thank God she is normal. She was born normal and will always rebel against and try to break out of confining bonds imposed on her, even if they are bonds of affection. She won't have to, as our men in industry think, get to be 23 years old and join a radical union to be antagonistic and try to break rules which are imposed on her by the bosses who call them policies or rules, regulations, even if they are good rules and wise policies.

Thank God she was born normal. If you are practical, you will never forget that.

Oh, we know too that people in pain will strike out and attack wildly. You have seen them haven't you? They are hurt in an accident. You rush to them, to try to help them. And they strike out and they say, "Get away from me!" People have been hurt in other ways. You have seen them, when they have been hurt inside—hurt terribly. You have seen them turn white. You have seen them withdraw. You have seen them tighten up and then you have seen them burst forth in a surge of anger and rage to attack you physically or verbally for having hurt them.

If you ever forget that even for one minute, of any eight-hour day on the job, you are being impractical. Because destructive anger and rage will always result from injuries to self-esteem, pride, self-respect.

Many men, treated unkindly by fate have nothing else left in the entire world but their own self-respect. They will fight to the death if necessary to protect [illegible] one little thing they have left—self respect.

Nobody likes to have his self-[illegible] lowered by anything or anybody, [illegible] by supervisors who demand things which he can't accomplish and which will surely result in a sense of shame and inadequacy or by supervisors who assign work to us we are ashamed to be seen doing, or the supervisor who repeatedly threatens and nags. You have heard them rave, "One of these days there are going to be some changes around here." So that, even if there is a union, a good, strong union, there is a sense of personal affront, a loss of personal self-respect and we are unhappy.

Maybe we don't pop off—because we need our jobs—but our unexpressed anger will express itself in some fashion against the supervisor who supervises so closely and keeps telling us how to do things so much of the time that we are publicly made to feel incompetent and so enraged that we feel like saying, "Why don't you do it yourself instead of trying to make a big shot out of yourself by making me look like a nitwit;"

or the supervisor who makes fun of us or makes wise cracks or is sarcastic especially when we dare not retaliate directly.

We all have a picture of ourselves which we like and we keep our mental fists ready to defend that picture from defacement, from anything or anyone. In the case of supervisors who do things which might lower our self-esteem, we do retaliate by striking back through lies, whispers, rumors, spoiling work, doing anything we can get away with which will make them look bad in return.

WE HIDE INADEQUACIES

When there is danger that the picture we have of ourselves and our self-respect might be defaced by the appearance of real, honest-to-goodness, genuine inadequacies and deficiencies, we try to hide these deficiencies and inadequacies from others because we don't want to be shamed in the eyes of others. But, because our own opinion of ourselves is more important than that of anybody else, we especially try to distract ourselves from our own inadequacies. And we try to cover up and hide our deficiencies from ourselves, and go through all kinds of defensive actions and develop all kinds of compensatory devices, including lying to ourselves as well as to others in order to make us seem the kind of person we like to think we are and which we can admire and not be ashamed of.

Because all of us are so loaded with inadequacies, (so many of them), we are constantly walking around with our fists up, trying to maintain our self-respect. We see this sort of thing in the six foot four, 250 pounder. He is easy-going, placid, soft-spoken. He has always had a problem since he has always been big. He was always twice as big as his friends, and even in being playful with a light punch, he knocked somebody down. These kids ran to Mama and yelled Mama, "He beat me." Now if he bumps into you accidentally—and you protest—"Where are you going, you big lug. Trying to kill somebody?" He doesn't take umbrage. He might say "I am terribly sorry. I hope I haven't hurt you."

His size has always been a problem with him—he is just a great big easy-going, human, St. Bernard.

On the other hand, you have the little human Pomeranian, haven't you, always

ready for a scrap. His size is a problem to him too.

Sure, we little fellows have to keep proving to other people as well as to ourselves, "I am a man." This great big man doesn't have to prove it, he knows it. And any one can see it by looking.

You see that same sort of thing in the homely girl, who uses too much makeup, bad taste in the way she dresses, or maybe she wears her skirts a little shorter than they should be or her sweaters a little tighter than they should be or maybe she wiggles her rear end a little more than is necessary for walking purposes. She wants to be whistled at too. Being ignored is the most horrible kind of experience for any girl. She wants attention just like the pretty girl, even if it is an undesirable kind of attention. The important thing is that she not be ignored. Being given a second look, being "whistleable" is vital to the psychic life of women and there is nothing wrong in that.

Every woman has a picture of herself, regardless of her beauty or lack of it. She knows she is just as fine and maybe a lot better person than her prettier friend who gets attention.

You see self-esteem and pride defended by the girl who says, "Yes, I could be popular, too, if I wanted to do the things she does when she goes out with the fellows." You have heard that sort of thing. She isn't talking about her girl friend. She is talking about herself and what she is hungering for.

You see it in the man who says, "The dirty rat's got it in for me. He never will give me a chance." Or, the man who says, "I could have gone up the line. I could have had some of those swell jobs if I had wanted to lick boots and polish apples. Now, here I am, but I don't want to be a stooge or yes-man for anybody."

You have heard it. You have seen it in the man who tries to hide a mistake from his boss, who says, "Why didn't you come to me and tell me?" If he had good sense, he would know why he had not come. You get it from the man who comes home and his wife looks at him and says, "John, what is wrong?"

"Oh, nothing."

"What do you mean, nothing? It is written all over you. Something has happened." Finally she corners him. He says, "Just as I was getting ready to go home the boss laid me out and he was going to town and it had nothing to do with me and he finally threatened me and my job. So I said, 'Look, I have got a wife and a couple of kids and I need this job, but I don't have to take this from you or anybody else. You know what you can do with your stinking job.'" Being understanding she might say, "There are some things you have to do for a job and some things a man can't take and remain a man. I'm sorry about the job—but a man has to live with himself too."

Of course, he doesn't tell her he was telling the boss this while he was waiting for the red light to change on his way home from work.

Oh, sure, as a supervisor you are busy. Maybe you don't feel you have the time to give people all the praise and build-up they need all the time. That a man is always after you for personal attention may irritate you. You may feel that you can't waste time looking for pretty pictures and overlooking inadequacies.

NEVER SUPERVISE PEOPLE

But, let me remind you that you never supervise people. You have always known that supervision is never of more than one person at a time. The practical fact remains that the picture which this one person has of himself is the major key to understanding that man and what motivates that man and what is an incentive to that man, and it is the only guide to successful man-management.

Just as their equipment needs continuous and corrective maintenance, so people need continuous man-maintenance. It is the oil in their psychic parts. That is what makes them run smoothly. And whether you like it or not, whether or not you think it is a lot of foolishness and a waste of time, you have got to give them the attention and the build-up, and the praise and the psychic oil and the psychic maintenance that real leaders of men always give their men.

One of the marks of a real leader of men is an emotional maturity. It is from the infant, from the child, that we expect, "I want what I want when I want it and I'm going to scream and yell and kick and I'm going to raise hell until I get it." That is what we get from the infant and we call it infantile behavior. Even when it comes from supervisors and managers and executives it is still infantile and immature.

What do you think of as the mark of the real leader of men if these inadequacies require leadership? Is it the capacity for driving things into people? Is it the capacity to force and coerce? Is it the capacity to demand?

Isn't it true that for you the mark of the real leader has always been seen in his special ability to bring out the best in men? The best in good men? The best in weak men? The best in men with whom others have failed? Not the capacity for driving things into them, but the capacity for bringing out the wonderful things which are already in them? Of course, for some men their best is a tiny little best. That is all they have got to give. For some it is a great big best. But for each man, this man who is considered a leader brings out that best of which each is capable in keeping with his own specifications.

If that is so, then we ought to begin as practical people to become less concerned with the negative leadership of being so concerned with human inadequacies, so that we see only what is wrong with people. We must not permit ourselves to be constantly distracted and blinded by the continuation of a seemingly endless run of deficiencies and ineptitudes and what almost seems like a vicious effort to try to do things wrong. True leadership is not so much concerned with the negative of prevention of inadequate performance as it is with the capacity to bring out that positive, that best which is already in them.

Let me assure you that there has never been and there never will be a born leader. Every man that you have ever talked to or will talk to, who is now at the upper echelons, will tell you he had to learn his the hard way. That means that you can learn it if you have any intelligence. Your major need is to develop that capacity to bring out that best in men, because every man knows just as you know, that inside him he has depths which have never been plumbed. As you well know, some of you who have been in service know, that men will fight and follow and even die for the men who can inspire them, motivate them and bring out in them their best.

We are hungry for men who will encourage us and make us more than just the *mediocre, everyday, run-of-the-mill selves* which we, left to ourselves, seem to deteriorate to.

Ask yourselves as practical people what it is that your major problem is. Isn't it true that we are impractical if we ever forget for a moment that loyalty to us and cooperation with us are reciprocal reactions which result from an unshakeable faith that loyalty and co-operation can be depended upon from us?

Isn't it true that we are impractical if we ever forget by our actions on the job to motivate men by giving them a feeling of being needed?

You have heard some so called supervisors, "Well, we got along all right for 27 years before you got here and we can still get along without you." What a way to motivate people to knock themselves out. Isn't it rather just the other way around? "I need you. I couldn't do my job without you." Isn't that the thing that motivates you —knowing you are needed?

But we are decidedly impractical if we ever permit the pressure of the moment to cause us to forget that sentiments and emotions are the most important motivators of us all.

We are impractical when we forget that all men, whether on a truck, in a store, office, or shop, all the men want from you, their bosses, is the same things that you want from your bosses, your superiors, your executives, your leaders. What is it that you want from your own superiors? What is it that you want which you don't always get?

Every one of us wants financial security. Sure, we want economic security, but beyond that economic security which we may already have, we want an emotional and psychic security. And our economic security comes from knowing that we have a job which is sure and steady and an income which can be depended upon from year to year. But, psychological security comes only when our leaders give us a sense of trust and a sense of self-reliance, a sense of initiative, a sense of equality as men, a sense of individuality, and personal dignity.

SUPERIORS MUST SUPERVISE

Is there one of us who does not want from his superiors a sense of trust which comes only when we know that our superiors never have abused their authority, never have taken advantage of us or pulled fast ones on us, or tried to steal credit or pass the buck on us for something that went wrong?

Is there one of us who doesn't want from his superiors a sense of self-reliance and self-confidence which come only from the knowledge that our superiors believe in us and in our ability to do our job well and stay away from us and let us do our job instead of bossing all the time and trying to tell us how to work?

Is there one of us who doesn't want from his bosses a sense of accomplishment which comes when they don't just merely accept good work but express appreciation for work well done? Is there one of us who doesn't want a sense of initiative which comes only with the assurance from our bosses that we won't be pushed around if we try something and it doesn't quite work out and if we experiment and it doesn't quite jel we won't be made to look like fools but that our mere effort to use ingenuity and intelligence will be appreciated and encouraged?

Is there one of us who doesn't want a sense of friendly equality as men? We don't want to socialize necessarily with the boss, but we want them to know and let us know, that we are equal as men. That comes only when our superiors exchange in a friendly and informal fashion hundreds of little bits of all kinds of information and comments and discussions about the Giants, about Eisenhower's health, about the Milwaukee Braves, about "Gee, they don't make a beer like they used to 30 years ago"—anything, hundreds of little inconsequential things that express a sense of equality as men. Little things which next door neighbors might comment on in passing.

Is there one of us here who doesn't want a sense of individuality which comes only when we feel that we are considered important as a person to our company with a personal dignity and a personal pride in our desire to earn our way in life honestly?

So it is, with all men and all women, in a realistic and practical fashion just as you need these things, every man needs from his boss, from you, this man-maintenance which comes only from a sense of trust, a sense of self-reliance, a sense of accomplishment, a sense of initiative, a sense of equality, a sense of individuality and personal dignity in order to be emotionally secure.

I know that every one of you has a full and busy schedule every single day, but if you don't take time to make time to give men these things, things which you need and which you have always known your men must need, then you are just too busy to be practical.

PSYCHOLOGICAL TOOLS FOR SUPERVISORS

SESSION TWO

I SUGGESTED earlier that it is my job to try to say something or do something which might cause you or stir you to think. Let's see what happens when practical men think about things that they always have known.

You know that nobody is perfect. You have always known that. Now, what does it mean when we stop to think about it? Where does our thinking lead us?

We say no one is perfect. That means every one of us is loaded with all sorts of inadequacies, all sorts of imperfections. Every one of us has things wrong with us, ineptitudes, ineffectualities.

If that is so, then it means that every one of us is a handicapped person, and every worker is a handicapped worker. Not just the man who has lost an arm or a leg or his sight. Not so obviously handicapped, but every one of us is certainly handicapped to the degree of our inadequacies or imperfections. Yet, every one of us knows no one is handicapped on a job if he is placed properly, let us say, on a job that does not require the use of a lost member or a weakened member.

We know that a man without legs can do just as good a job on a sitting operation as a man with legs; and a man with one arm can run an elevator as well as a man with two arms; and we know that a man with a bad back can do just as good a job as a man with a good back if he does not have to do heavy lifting.

We know there are many jobs being done well by so-called handicapped workers. We have at least one plant where blind people are doing final inspection of small parts—completely blind—not partial but with total loss of vision.

Some people are dangerous and accident-prone in jobs that require rhythmic coordination like on a printing press. Others are handicapped emotionally and do not have control over flare-ups or depression. Others are handicapped mentally. And all of these handicaps make people more liable to accidents and it also makes these people more liable to inadequate performance, and all kinds of emotional difficulties on certain kinds of work.

DISCIPLINE CAN'T CHANGE HANDICAPS

The fact is that people who are mentally, physically or emotionally incapable of keeping up with the job demands are unsafe and inadequate workers. There is not a single thing that you can do about it. No amount of punishment or what you call discipline is going to make the slightest difference in these handicaps. No amount of warning or no amount of instruction is going to change those physical or emotional or mental inadequacies.

Are you practical? We do need discipline, that is certain. But, we don't need the punishment which we substitute for discipline because we don't know what else to do.

Sure, we need discipline which will control people and their performances. But what is your experience with your kind of discipline? This so-called discipline which is really punishment?

What kind of punishment or discipline or warning or instruction will put a man's legs back where they belong so they are alive and active and function like normal legs after he has lost them?

What kind of punishment will put strength back into limbs which have become weakened through illness or disease?

You want men who are more stable and more dependable and more reliable and more co-operative. Has your experience taught you what kind of punishment will make them more stable and reliable? Do you know any disciplinary action which will give a man back his sight after he has lost it? Has your experience told you how much punishment and what kind of punishment will put a brain between a man's ears or give him foresight or insight?

Do you know from experience what kind of punishment, warning or instruction will

give a man good sense or good judgment? Has your experience taught you that any kind of punishment will do any of these things that you want?

We still call ourselves practical people and we still go ahead and dock them if we can, and lay them off if we can and we still fire them if we can, and we put little marks in ther personnel record and we demote them or transfer them all as disciplinary measures, and we still call ourselves practical men. That, despite the experience of 10,000 years of work history in which punishment has been used as a procedure which has never been effectual, and we still call ourselves practical people.

Sure, many of the inadequacies of people can be dealt with by education, training and placement. But, our major problem of managing men and their human nature on the job is related to the mental and emotional and physical inadequacies of people which just can't be changed, not by punishment, not by warning, not by instruction, not by anything. Yet our success as man-managers requires that we have a control, a discipline.

But, we can't watch people eight hours a day, 480 minutes out of every work day, so our discipline must be the kind that will work even if we are not there.

What controls you? Are you honest only because you are afraid of getting caught, or afraid of being punished, if you are not honest? That is ridiculous. You are honest primarily because you believe that is the right way to be. You believe that it is better to be honest than to pretend honesty. You believe it is wrong to do things dishonestly and unethically and immorally. That is what controls your behavior—that which you believe.

Instead of continuing to waste our time as men have for these thousands of years using punishment to control others, maybe if we are intelligent and practical supervisors and leaders of men, we will devise ways and assume the reponsibility for teaching them about our rules so that they say, "Hey, that is right. I believe that."

Once they have said that to themselves—"I believe that" "That is the right way"—you can go away and forget them because that discipline will be there. You have always known, as practical men, that the only real discipline is a self-imposed discipline, a control imposed on us by those things which we believe to be right. If we believe something to be right, we are going to knock ourselves out trying to do that which we believe is right.

Sure, this practical experience with human nature has taught us that we can't change it. This unchangeability makes difficult problems. But, our most difficult problems arise as the result of forgetting to use those things which we have always known.

A PRACTICAL MAN

You know what an impractial person is. A practical man is a man who has learned from 20, 30 years of experience what is right and what is wrong, what will work and what won't work. When a man doesn't use that experience and what his experience has taught him, he is impractical because he is surely going to do the wrong thing.

Therefore, supervisors are often impractical in dealing with people. It is a waste of time to look for whose fault it is, but let's put it this way, they have been trained improperly.

You have been taught haven't you, "Don't go off half-cocked when you are dealing with people?" "Be sure and get all the facts?" How silly can you get? Facts! Since when have the important problems of people been related to facts?

You know that in your life and in the life of every one of the people you have ever dealt with, that the important problems of people are emotional problems—problems which they make for themselves and for you as well, in trying to adjust to the conditions which come to them. They are emotional problems, not intellectual or factual problems. They make these problems themselves and for you in trying to save face and in trying to maintain their stature and that picture they have of themselves as a man or as a woman.

We all have just one fixed and limited amount of psychophysiological energy we can expend at any one time and when most of that energy is expended in trying to save face, trying to maintain a kind of emotional security, we don't have much left for anything else. That is why psychologists tell us that we rarely use more than 30 to 40 per cent of our potential. The rest of it is wasted trying to maintain our stature in our own eyes and in the eyes of others.

Normal people like you and I do it. We all do it. If you don't, you had better find yourself a good psychiatrist. There is something wrong with you. But we don't do it planfully, deliberately or consciously. We do it automatically and unconsciously. We do it by developing over a period of many years, a collection of habits, defensive, compensatory, and protective habits that function so automatically that people perform a great deal of the time as though they were automations.

Habits according to psychologists are our only perfect performances. Once a habit is established all it needs is a proper situation and it functions automatically. A habit is the most perfect and efficient of all mental, emotional and physical performances. The habit requires no mind, no consciousness, no awareness. It requires the least effort.

We can classify all these defenses and compensatory habits in a thousand different categories, if we want to, but it isn't necessary. I put them in four—cover-up, evasion, emotion and neglect. And they are not mutually exclusive. You can bet when a man is emoting he is covering up and evading, and when he is evading, he is covering up and emoting and so forth.

They are all artificial groupings and you can make up a thousand more categories. You have seen these performances, these cover-ups, and evasive performances. You have seen the man who uses one kind of defensive performance, the man who is always feeling bad—he is under the weather, there is always something wrong with him.

Sure, you know these people. You run into this man and all you say is a normal greeting—"Hi, Joe. How are you feeling?" —Instead of saying "Hi, OK" this fellow takes a long time telling you in great detail about what is wrong with him.

PEOPLE NEED ATTENTION

Our language tells us about how we think and how we express ourselves and what hungers there are and we are always hungry for things. When you say about someone, "Oh, he is such a kind person," are you talking about him or are you telling the world, "I don't meet very many kind people." "I don't get much kindness."

When you say, "Oh, he is so understanding." Are you talking about him or are you telling us about the things that you long for and don't get?

When people live their normal lives, they apparently don't get enough kindness and attention and consideration and gentleness and understanding. We are all hungry for it. But there comes a time when things are different. If I don't feel good and you are a friend of mine, you do have time for me. If I am sick, you take the time to find out whether you can do anything for me.

When people are tired you try to be helpful, don't you? When people have sorrows you try to be understanding and kind and concerned about them. When people are sick, you give them sympathy and attention. You try to make things easier for them. You do things for them. You take the load off. You say, "Don't worry about it, we'll handle it. We will take care of things for you." You give them lots of attention.

I don't know how intelligent you are. I don't know how old you were when you learned the value of sickness. I know my grandchildren learned awfully early.

I can remember way back, long before radio and long before television—it was swell. Today it is even better. Papa comes home every night from the mill. He is whipped. He has barely energy enough to eat and sit down and start reading the paper. And then he dozes off. He doesn't have time for us. Papa is tired. He works hard.

But, if he comes home and Mary or Johnnie is very sick, that is different. He is never too tired to go in there and see them. And the sicker a person is the more concerned he is. He even moves the television set into the bedroom and helps entertain, and you get ice cream. You don't hang asafetida bags on your necks any more. You get ice cream and fruit and funny books and Mama reads you a story. And everybody comes and they send you little gifts, and your friends remember you and so on.

How old or intelligent do you have to be to grasp the idea of relationship?" Sickness means attention. I am neglected and ignored —especially if I have five or six brothers and sisters." Oh, brother, what a wonderful career sickness can become!

If it weren't for that sort of thing psychologists would go out of business. Just what more respectable out is there than be-

ing sick? What more can you expect from a sick person than his best—which is less than normally demanded?

"Gee, this man is sick but he still came down to the office." You have heard them. "Boy, look at that, sick as a dog, but he still came down."

He never gets attention and is ignored all the time except when he is sick. His sickness even gets praise for him.

There are all sorts of variations on the same theme. You know the person who would rather be a failure because he knows that if he tries he might not make it. But he knows also if he doesn't try he can't fail and if he doesn't try and doesn't fail, he can always say, "I could have if I had wanted to. I could have been a writer. I could have been a musician if I had wanted to."

You have heard them. Even before you get started, they say, "It won't work. It's no good." They know it will fail even before you try it. Or, men who say, "How do you know it's going to work? I'm a married man, you know. I can't take a chance. I have responsibilities."

Imagine a man deteriorating to the extent of saying, "I am going to remain a failure because I have a wife and children. It is not my fault I am going to be down here and mediocre, but I can't try or take a chance. I've got responsibilities." A respectable out.

You have seen supervisors whose sense of unsureness is so great that even a good suggestion is unacceptable. If you could open them up and watch the wheels go round, you might hear something like this: "After all, a suggestion is an idea; an idea for correcting something wrong or improving something. Well, I am supposed to be on the ball and know what is going on and apparently this got by me and this guy saw something wrong that needed to be corrected and not only that, he has the answer. Furthermore he's going to put it on paper and send it upstairs. Like Hell!"

Then of course, you have other variations. You have the private office syndrome. I won't ask how many of you feel that you should have a private office. There is a good reason for having a private office. You may say, "I want an office because I earned it. I have been around here for 18 years and I want an office with my name in letters 18 inches high—gold letters. It is a sign of achievement. A general gets five stars. Some guys wear stripes. I want an office. I worked 18 years for it."

There is nothing wrong with that. Nothing wrong with a man saying, "I want a glass cage where I can lock myself in so people won't bother me." But when a man says, "I want an office because I want to sit down and think where the phones and the noise and all these things won't bother me."

Then you might say to him, "John, didn't you prove to the company you were an awfully good man *while out on the shop* floor with all that noise and stuff? Why do you really want an office? It occurs to me, John, that people who have good sense try to stay away from and evade getting involved in things which are competitively too much for them. A woman who is homely and has good sense stays out of beauty contests. A man who has a big pot-belly and is over 60 and has flat feet stays out of foot races, whether at church or company picnics. A person who knows he is not good in mathematics stays away from getting involved in complex mathematical computation work. That sounds like good sense.

Do you want a private office because you are unsure about your capacity and ability for dealing with your people? Is that what you want an office for? So you can shut yourself away from them? Is that it? Are you afraid if they get closer and closer to you they will discover some things you would rather not have known about you? Is that what you are afraid of? Is that what you want the private office for?"

Sure, you can say and honestly, "I want to be like those smart cookies with the crew cuts and the Phi Beta Kappa keys." They say, "We want a laboratory where we can do our experiments." Well, all I know is that if a guy's first experiment is no good he has to perform a second one. In other words, what he means by a laboratory is a place where he can make all his mistakes, then when he comes out in front of everybody, everything is wonderful. I want a place where I can make mistakes too, and nobody will find out about them until I am ready."

There is good sense in that. Why do you want a private office? Have you defended yourself by saying, "I don't want to shut myself away. After all, we have the open door policy here."

Then, someone says to the man, "Why don't you go in there?" And he says, "You just dare walk in through that open door and see what happens."

Why do you want a private office? Do you feel so inadequate at dealing with men that you want to isolate and insulate yourself against them?

WHY DO YOU CRITICIZE?

You know the man who is a constant critic. As a supervisor you are supposed to criticize, point out what is right and what is wrong and correct it and revise it. But there is the abuse of it, too.

If your criticism has for its purpose to teach a man, that before he gets into trouble, to come and see you so you can keep him out of it; if he gets into a jam, to come to you as a friend and let you keep him from getting into further trouble—if it has for its purpose to teach a man that he can learn to do a job and that you are there to help him, that is part of your job and that kind of criticism is good.

But, if it is for the purpose of putting a man in his place and letting him know who the boss is and who knows more around here, that is something else, isn't it?

Sure, there are ways of being superior. One of the ways of being superior is to look at a picture of yourself and to say, "I don't quite like what I look like. I remind me of you. I would like to look better. I am going to improve that picture of myself. I am going to try and work and grow and some day I am going to be superior to you."

Or he holds somebody else's picture up as a goal and says, "I would like to achieve to his stature and by study and hard work I am going to try to be better and superior."

There is nothing wrong with that kind of superiority. But, there is a much more common way. You don't have to grow. A man can stand still but the smaller he can make you, the more he can tear you down, the bigger he is by comparison with you. He can even deteriorate a little. But, as long as he makes you smaller and smaller, he is still superior to you. And that is a most popular way of being superior.

Are you perfect? You say, no. Well, why would you fight me if I said, "You know, John, you are not perfect."

You say, "Oh, I wouldn't fight with you. Nobody is perfect."

Now, let's see whether you would or not. Certainly, I hope that when you come home and your wife asks you, "How did you like Dr. Rosenstein's sessions?" you will honestly say, "They were terrific, wonderful."

I hope you say something like that. Or some time later, if she asks "What did you get out of those sessions?", you might show her the complete set of these lecture notes.

She might take those notes and flip through those pages and come to "No one is perfect" and she might say to you if she is a normal American housewife, "Well, Honey, you didn't have to go to those meetings. If you had stayed home and if you had listened to me all through the years—"

Later on, maybe you would be sitting over a cup of coffee she might say, "You know, Honey, it is a curious thing. Successful business men take the time to review performances and they bring in experts of all sorts to come into their business and tell them what is wrong with the way they operate and how to improve their operations. And this happens in big business, successful business, operated by highly intelligent people; they bring in the so-called experts as consultants to tell them how to improve; take a complete inventory of the way they perform and to analyze their various operations so they can do a better job."

"People don't seem to take that kind of inventory of themselves, the most important thing in the world to them."

TAKE SELF INVENTORY

She may say to you, "Honey, I hope you love me as much as you did when we first married and I know the longer we live together the more I love you. But, that is not because you are perfect but despite your imperfections. Now, there is only one way to improve. The intelligent way is to be like business men. The most important business we have is ourselves. We too should take inventory and do something about our inadequacies and ineptitudes. We can't ever be perfect but we can certainly strive for improvement."

She may continue, "There is no one in the world who is concerned with you and your well-being more than I—not even your parents. So, Honey, let me tell you what is wrong with you."

She may give you a long inventory of your inadequacies and when she is through, being the intelligent man you are, you may say, "Darling, thank you so much. Now that you have made me aware of all my failings, now that I know what is wrong with me and all my imperfections, now I can really go to work and do something about them."

Isn't it interesting? We are not perfect. We admit it, but we don't dare permit anyone, not even someone who truly loves us to point out a single imperfection about which we might do something intelligent.

Of course, we have others. One that I call the hardened arteries delusion. You never hear some young kid of 19, a fullback on the high school team or college team, walk around saying, "Oh, boy, I am just as good as I ever was." It is always some dilapidated old goat you have to carry in and out of the shop who keeps on announcing, "I am just as good as I ever was. They don't make men like they used to in my day. Men of integrity! If you think I am going to be dishonest in order to keep up with crooked competition you got me wrong."

There is a good reason why he isn't making the grade any more. But he can't say, "Look, competition isn't any tougher than it used to be. It is just that I can't keep up with it. I am getting older. My legs are giving out. I can't move as fast. My co-ordination is not as good—"

He can't say that. He has to defend himself by believing, as he thinks, "Why can't I keep up? Because people are not today like what they were. They are dishonest. They don't make men of integrity like they did in my day. I am a man of integrity. That is why I can't keep up."

Oh, what a wonderful way to defend the picture a man has of himself.

I have had people say to me, "Doc, I'll tell you we have got a terrific problem. How can we get the older men to teach some of the younger fellows? They just won't."

I say, they would be silly if they did. Any intelligent older man who looks around and can say, "You know, with consolidations and with mergers and all these changes going on, I am not too sure of my job any more. When they consolidate or merge or move a plar: from up in New England down to Florida—you know what they are doing. They look at me and say, 'He has only nine more years of service. Joe has 31 years more of service if he wants to be with us.' You know whom they are going to take. They are going to take Joe. But, the trouble is that Joe will have to spend 22 years learning what I know and if you think I am going to teach him all I know you are crazy."

Out go the tentacles in that octopus complex of apprehension and insecurity, to grab hold of and to hold on to everything that isn't nailed down, in order to be needed; in order to be less expendable. Does that sound like these variations of defensive behaviors?

Now, these things we have been talking about, they are in the realm of emotions, aren't they? They are emotional performances to protect and defend. And psychologists tell us that a true emotional state is truly a mentally blank state. It is a biological reaction.

EMOTING FOR PROTECTION

Psychologists and biologists will tell you that an emotion is a visceral thing. You may say, "I love you with all my heart." But if you were telling the whole truth, you would say, "I love you with all my heart, liver, kidneys"—and it may not be so romantic to say, 'I viscerate you,' instead of 'I love you' but it would be closer to the truth.

Love is blind, yes. It is deaf, dumb and blind. When we talk about the human animal, we come closest to animal in a state of emotion. An emotion is a purely biological performance. You have used the terms. You have used the language. You have talked about the man who was "frozen with fear," or the man who was "scared stiff." Have you ever said, "I don't know why I did it, my mind was a total blank." A little later you were all right. But at the moment—blank. You have driven down a wet highway or you have driven down a slick street and suddenly your rear wheels

begin to skid and you see somebody coming in your direction and you know he is going to hit you, and he misses you by the thickness of a layer of paint, and you turn to your passenger and say, "Oh brother, I saw him coming and knew he would hit us and if he had, he would have killed us both. But I wasn't the least bit scared. Funny thing, I knew what was going to happen and I was calm." Then you reach for a cigarette and your hand comes up shaking. Sure you were calm. You weren't even there. You were just a hunk of meat behind the wheel, and you began to get scared, when you came out of that state of blankness into your first state of awareness. That is when you began to get scared.

If you are normal, and I think you are, there are things that happen in a shop that can cause you to blow your top, and you get mad and do things and threaten to do some other things. You have had it happen, and if I were to come to you and say, "Hey, Bill, I could hear you two blocks away. Are you really going to do what you said?"

You might say, "Well, Doc, you just try and stop me." I'd say, "Not me. I am not going to try and stop you. I am an innocent bystander. I don't want to get hurt. I am going to stay away. But, are you really going to do it?"

"You just bet."

"Is it all right if I ask you a question?"

"Yes, but don't get involved."

"I won't. But do you remember our training program for supervisors?"

"Sure."

"Remember, about four weeks ago we got involved in a problem relating to emotions and everybody had to bring to class experiences of emotions when they went mentally blank?"

"Sure."

"Remember you had a couple of good situations in which you were emoting? You were scared to death, blank, you couldn't think, you didn't know what happened? You just sat like this?"

"Yes."

"Let me ask you something, Bill. It seems to me that what I just heard would prove that you were emoting pretty good. Are you going to force yourself to live with, abide by and carry out a decision which you made when you were mentally blank, mentally at your worst, mentally no better than an animal?"

He might say, "Doc, I knew darned well if I let you get started I would wind up being wrong. What do you expect me to do?"

"I don't know. Nobody knows all the answers. But, I know there have been times in your life when you have gone into your room, or gone somewhere by yourself, and prayed to God, 'if I could only have another chance,' and what you have meant is, 'if I had another chance, I would do it better.' You have here as part of your job, the right to give yourself a second chance. Maybe the thing to do is bop the guy as you plan. On the other hand, what you can do now that you have cooled off a little is think."

And as a result of your thinking, part of your thinking may ask, "what is it that I want to accomplish with this cookie which should be more than just slapping him down and watching him bounce?" You have the right to give yourself a second chance and no man ever lost stature who said, "I think that is a pretty good decision I made the first time, but if I went at it a second time, I think I could do it better, and the third time I could do it still better." And you have the authority to give yourself a second chance.

Only the man who knows that his first decisions are perfect, who can never improve—only that kind of stupidity causes loss of stature.

You can go to the man. You can say to him, "Joe, that was quite a thing you pulled this morning. There are some things that make me fighting mad and that is one of them. I want to see you in my office at two o'clock. You and I are going to have this out so it doesn't ever happen again, with you or anybody else. You can do that. You can give yourself that second chance.

What about your workman? If he is normal, things can get so wound up for him so that he too can blow up and tell you exactly what he thinks of you and the whole damned company, and normal people do that from time to time. He, too, is unhappy about his performance. But if you think for a moment he is going to come to y-u crawling on his knees for that job, you

don't have a right to your job as a supervisor of men.

He is a man, and even though he has a wife and kids and even though he needs the job, the first thing he is going to do is remain a man.

SUPERVISOR CAN GIVE SECOND CHANCE

If you are the true leader, it is your job again, to come to him and give him his second chance.

He can't say to you, "Hey, boss, that was quite a hassle we had this morning. I want to see you at my bench at two o'clock this afternoon. We are going to have it out so it doesn't happen again."

But you can and must say to him. "I want to see you in my office. We are going *to have this thing out.*" It *is your* job to go to him and say, "Jim, you know that was quite a blow off you had. Even the steward would back me up if I throw you out of the job. I want too see you in the office at two o'clock."

He may say, "We don't have anything to talk about. If you are going to fire me, fire me." And you can insist "If I want to fire you, I don't need your advice or permission. We are going to talk this out, find out what it is eating at your guts so much that you are willing to lose the job for it. It must be something awful."

You can give that man his second chance, and you must if you are really his supervisor. You have got to *make it easy for* him to clear the air and still remain a man.

Now, we come to this business of NEGLECT. I have asked this question from one end of the country to the other and I have had young men and old men and young women and older women who came up with the same answers.

I have said, "Look, we know you are concerned with your health. We know that you are concerned with all aspects of your health. But, suppose you had to make the tragic choice as a couple of parents did in Chicago a couple of weeks ago when they had to choose between permitting their child to be operated on or die, and their faith wouldn't permit the surgery. Their religion did not permit cutting of the human flesh. Can you imagine the tragedy of having to make that kind of a decision?

What happened of course, was the child was taken away from the parents, made a ward of the court, and the judge ordered the surgery. But, it still didn't please the parents. Suppose you had to make a tragic choice. Suppose you couldn't have a sound mind in a healthy body. Suppose you could only have a sound mind or a healthy body. Which would you choose?"

Invariably they answered, "I would rather have a sound mind. Sure, I would rather have a sound mind. A healthy mind."

Well, you watch your diet. If you have good sense you see a dentist a couple of times a year and if you have good sense you see a doctor at least once a year. And you take some kind of exercise, to keep yourself in shape, not to become a professional athlete. You do all sorts of things to stay physically well.

You learn and use the principles of physical hygiene in order to keep yourself in shape and healthy. You have a family physician whom you call up every once in a while and say, "Say what about this?"

Do you have a family psychiatrist or psychologist? Do you see one of them once a year, maybe, for preventive care? You don't wait until all your teeth are ready to fall out before you go to a dentist. You don't wait until you need major surgery before you see a doctor. Do you have to wait until you are ready for a straight jacket before you see a psychiatrist?

I am not exaggerating. Talk about neglect—12 per cent of the boys drafted for the Second World War were rejected because of emotional disturbances. They were emotionally unable to adjust. Of those boys admitted to all the services, army, navy, air corps and marines and so on, between 30 and 40 per cent of all those boys who were discharged for medical reasons were section eight boys. Psychos. Between 30 and 40 per cent of all the boys discharged for medical reasons were psychos.

I don't know what the figures are in your community, but we have heard for years and it is still true, whether it is 90, 80, 70, or 60 per cent, but your doctors say that more than 50 per cent of the people who go to doctors' offices complaining of physical aches and pains, don't have a thing wrong with them physically.

Where are these people? They are not in institutions. I will tell you where they are. They are in this room, in your offices, your shops, in your homes, in your church, in your club. They work with you and for you; they supervise you and they are your subordinates. That is where they are. They are trying under the stresses and strains of their lives to make adjustments to the best of their ability.

DEALING WITH MENTAL HEALTH

You may say, "Well, what do you expect me to do about it? I am no psychiatrist and I don't want to be a psychiatrist."

My answer is, "Mister, I don't care what you want. Whether you like it or not, you are dealing with the mental health problems and the maladjustment problems of your men and women who work for you and with you eight hours a day on the job. Whether you like it or whether you don't like it, you ought to find out something about it, instead of just kicking it around and ignoring it."

Don't tell me that you are not interested. These things are eating your heart out every day. You have seen the hot-shot. Don't tell me you don't know him. Conceited, care-free, over-confident, over-active, over-friendly, egotistical. He will tell you how to run the whole department. He takes chances just for the Hell of it. He knows all the answers. You know that fellow or girl.

You know the other extreme. Little boy blue. Life is real; life is sad and life is earnest for him. He is always unhappy. Things are always going to the dogs. Things are never going to work. Things are always going wrong for him. He has all kinds of problems and conflicts and his mind is not on his job but on his troubles and problems. You know Dangerous Dan the paranoid man who is always being pushed around, always getting the dirty end, the dirty deal, always being persecuted or taken advantage of by somebody. His mind isn't on his job either. He is always looking around to see where his supervisor is. If a couple of people are talking over there he knows they are whispering about him, and he is going to take care of them too, one of these days. And he is dangerous because he often attacks his imaginary persecutors.

You have a big mass of neurotics. Adult children, they have all kinds of problems; they need special consideration; and life is dull; and they feel sorry for themselves; and they pull hair and quarrel and they have family troubles and money troubles and marital troubles and they quit and then they beg to come back and they never learn their lesson and they quit again and come back and quit again. They have always got something going wrong. They are always complaining.

They come to you with their psychological cuts, bumps and scratches and want you to kiss them and make them well. You are the Papa for them. You have them.

Maybe you don't want to be a psychologist, but you are working with these problems eight hours a day and you are working with psychologically-induced sickness and illness and that is not such a rare thing either.

Permanent and temporary ill health is common and the physical manifestations of it are common. You have seen all the figures on the board. Talk about this business of a lump in the throat, pain in the back of the neck, ulcer-like pains and gall-bladder-like pains—50 to 80 per cent of those are not physical. Gas. Despite the laboratories who make the fizz stuff 90 per cent of gas pains are up in the head. Ninety per cent of it is emotional. Dizziness, 80 per cent. Headaches, 80 per cent. Constipation, well over 70 per cent. Tiredness, more than 90 per cent.

You are dealing with those problems every day. You have all sorts of people. You have the kind who balk against the restrictions; the kind who get into trouble when you put the pressure on them; you have the alcoholics and the gamblers and those who come in late and make up for it by leaving early; and those who get sick on Mondays and after holidays and at the opening of the hunting and fishing seasons. You have the men who make passes at women and the women who are unhappy because nobody is making passes at them. And you know women who spend much of their time in the rest room—

One of the big contributions I am going to make one day, after I do some research—some day I am going to find out what it

is that women do in the rest room two at a time, which men can do one at a time. Have you noticed that?

You can't change human nature, and you are not a professional psychologist, but you have got these problems with you every single day. If it is true and apparently it must be true, because the very same answer to the question comes from everywhere; "If we had to make a tragic choice between mental health and physical health, we would choose mental health."

If that is so, what are you doing about your own mental health? You don't expect to stay physically well by ignoring your physical self. Why do you think you are going to remain mentally well by ignoring your mental health? Most of your problems are in that area; most of your personal problems and most of your problems of man-management and supervision.

It would seem to be intelligent to learn the basic principles of mental hygiene and to use them. I recommend that you do so.

MENTAL HEALTH FOR SAFETY AND PRODUCTION

SESSION THREE

WE HAVE been talking about being practical. Aren't you bothered when things are going on all around you and you don't know what is going on? Don't you go around wondering or asking people, "Hey, what is cooking?" What is your trouble? Nothing.

You just want to know.

Do you forget that eight hours a day on the job your men want to know. They are anxious to know what is going on. They want to know about hundreds of seemingly insignificant things, which might or might not affect them. There are always things going on.

Somehow, people are not afraid of anything so much as not knowing what is going on. What is going to happen? They want to know how business is. They want to know whether they are doing a good job. I am sure that many men in these last three or four days were worried about what was going to happen because the stock market was going down and maybe there might be layoffs.

They want to know if there are going to be lay-offs. They don't want to be left hanging in the air. Even if it is bad news, they want definite answers to all sorts of questions that are bothering them. They need the assurance of definiteness. That is one reason rumors get started. Rumors are the answers to all the questions they have on their mind. They may be the wrong answers, but they are definite answers.

That is why it is necessary to let them in on changes that might be planned. That is why it is necessary to explain changes that are being made and what might be expected as a result.

Every one wants to be in the know. Everybody wants to know what's cooking and what's stirring. And you are never going to change it by saying, "It is none of their business. We are running this outfit," as I have heard people say, and maybe you have used that kind of language too.

As a matter of practical fact, if you don't tell them, there are others who know the needs of human nature as well as you know them, and don't forget them and who are therefore quite anxious to tell them, and will tell them, and because people are only capable of thinking with the information that is given to them and because some sources of information are anxious to provide only warped and twisted information, it is important that you let people know and keep them informed. If you forget that on the job, you are being impractical.

Do you like to be left out of things? Have you ever forgotten on the job that people are gregarious? It is only the screwball hermit who wants to live off by himself somewhere. People are hungry to belong to things, to be attached to things, to be identified with things that are important and worth while to them. They want to be part of something. That is why they will join clubs and join lodges, and that is why many of them join unions, even if they don't have to.

Few people are outstanding or have achieved the great things. Yet, they all want and need something to be part of, to brag about, to be identified with, so that they can say, "I, too, am one of this fine group."

Some of you wear spot pins in your lapel. Some of you have a chain with a key on it of some kind, and most of you probably have cards in your wallet indicating you are members of something. You don't wear the spot pin because you are ashamed of it. You want to be identified with it. When you walk down the street, you want people to look at it and recognize that not everybody can wear one of these. You can. You have achieved something. You are part of something worthwhile.

Nobody wears a pin that says, "I am a paid-up member of the Amalgamated Order of Thieves, Gunmen and Murderers. The pin you do wear represents things you are

proud of. People could just as well be proud of their jobs and their bosses and their departments and they would like to talk about them as well as they talk about "my lodge" or "my club" or, "my team" or, "my kids." And men have bragged about, "My boy is the greatest guy in the world" and "Boy, I sure do work for a swell outfit."

PRIDE IN ONE'S COMPANY

There is no reason why they can't be proud of their department and the fellows they work with as they are proud about their bowling crowd.

I think it is a worthy purpose to give men pride in their company and their jobs. If you are forgetting to make that an important part of your job, there is something wrong with the way you operate and you are being impractical, because nobody lives in a vacuum. Nobody in your department lives by himself. Everybody is part of a social group, a crew, gang, department, and everyone in your department is bound by a powerful workers' code of the proper ways to perform in order to be considered O.K., and in order to be accepted by his fellow workers.

Men don't want to be considered anti-social by their fellows, so they tend to be and do what is expected of them by that unwritten code which makes them part of and identifies them with the rest of the gang, with the rest of the men in the organization. And they want you to think well of them, too.

They would like to belong with you, too. But, they don't have the capacity by themselves to work their way out of the dilemma which you have permitted others to force on them. As a result of management neglect and other groups' very active proselyting they have been taught, haven't they, that if you are going to be a good labor man, you have got to be strong anti-management, and if you are going to be true to the company, that means you are going to be anti-labor.

They haven't been taught that labor and management are two facets of the same thing and that what hurts one will hurt the other. They haven't been taught that and if you neglect to teach them that, you are being impractical. Because, you are not facing the realistic facts of life on the job.

To me, that is a major managerial problem, and worthy of the attention of the best of brains in management, because it is an obvious fact of good human relations that if what you are after could be made part of their code—if being a top producer or safe workman or a co-operative workman were made a virtue among men, then men would try to live up to that picture they have of their good workman just as you try to live up to the picture you have of a good supervisor. And it should be you who should be providing the pictures for them to live up to.

"Going along with the boys" and "I'll stick with the rest of the gang," can be a most important asset, if the boys or gang are going in the directions set by you. They want to belong and if they can't belong with you, because you, like most brass are so tied up with important things that you ignore them, you are going to have trouble and you are impractical because there is no more important thing that you have around your shop than men. That is why on Sunday when you have all the same equipment and all the same machinery and the same buildings and the same rent and everything is exactly the same, you are not turning out a single thing. You are not making a nickel because nobody is around making money for you. If you ever forget that, you are being impractical.

PART OF THE GROUP

If they can't be attached to you because you are too busy with important things, they will find others, or rather, others will find them and attach themselves. You just bet. They can't float around in a human relations void or psychic limbo because human nature demands being attached to and being part of worthwhile things.

Do you know why you have your job? If you don't, you are impractical. Everybody ought to know why he is around, because nobody has much sense of security if he doesn't know whether he is needed or not. The only reason why you have—well, there are two reasons why you have your job. Certainly if we could get everything we need from our workmen without leaders and supervisors, we would not need you, would we? We could just ship the orders to workers through the vacuum tubes and they would get them and do the things necessary. But that is not how we operate because we need people with foresight and planfulness, and administrative ability and coordinating and integrating ability. We need people who can see ahead and organize and get others to cooperate. That is one reason why you will always be needed. That is one reason for your job security.

Supervisors are needed to make up for the difference between what we have got to have and what people can give us without you. You have got to make up for that difference. So, don't ever be unhappy because people are not giving you what is needed. No, your job is to add that little difference.

The other reason for supervisors is that most people don't have any particular goals in life which can be expressed dramatically. All we want to do is live and make a living. We want security, sure, but we don't want any bother, too much planning for it or striving for it and so on.

A lot of my friends are engineers and a lot of good engineers spend the major portion of their professional lives trying to discover ways and means to overcome inertia which is a natural property of all things in nature and that includes human nature.

Human nature, like all things in nature, is loaded with inertia and for that reason we may expect people to be basically drifters and just go along exerting as little effort as possible beyond that which is absolutely necessary to maintain themselves.

SUPERVISORS OFFER INITIATIVE

Don't criticize your people for lack of initiative or foresight. People don't have push. Your job is to give them a little push. You were chosen because you have that little initiative. People don't have initiative. Your job is to try to stir up a little.

They are not self-starters or self-drivers, and your job is to urge them a little bit, push them a little bit, provide the urge for them to go along by themselves for a while, while you are trying to devise new and different ways to motivate them again and again to try to provide a continuum of effort.

Don't let it irk you to have to fight constantly and push to fight the problem of human inertia. It is part of nature and if you don't like it, you are trying to buck nature. You are trying to resist the universe and what you should do is thank God for it, because if people weren't loaded with inertia, you wouldn't be needed, because they would have all the initiative needed without you. You have security because you are needed to make up for the difference between what normal people can give and what is needed. If you ever forget those things, you are impractical.

You know people who are always bucking you when you try to change things. We are afraid of new things. We are insecure with new things. We don't know if we can or how to handle them. Even if the old ways are uncomfortable ways, we have already adjusted to them and we are accustomed to them and we can go along with them. But, we are afraid of new things because we might make mistakes and might get into trouble. We might be criticized, maybe we won't do so well, and we try to avoid those kinds of situations.

We are afraid of new things and we resist new things. Many of us who had to quit school long before we wanted to, because we had to go to work and bring money into the household, seem to have an over-developed sense of sympathy for those who quit school.

However, most people stay in school only because the law forces them to stay in school. They quit learning long before they quit school. They hate school. They hate teachers. They hate learning. When you come along with something new and they are getting along comfortably and you insist they learn something new, they will hate you and buck you and fight you and resist you and if you ever forget that, you are being impractical.

You could provide similar examples of things which we have always known and forget to use them on the job, and therefore are impractical. Nobody is perfect. Everybody is a handicapped worker. Everybody needs praise and buildup and maintenance, psychic maintenance, and we all use habits of cover-up and evasion and emotion and neglect.

Everybody wants to know what is going on and everybody wants to belong to something, to be part of something they can be proud of and live up to. People just don't

look ahead. We are not self-starters or self-drivers, and we are all loaded with inertia and afraid of new things and change and we resist it.

Last but not least, just like you and just like me, normal people will remember small hurts for a *long*, long time. They will brood about them and enlarge upon them and permit them to fester and poison their souls.

PEOPLE FORGET FAVORS

Normal people will remember small hurts for a long, long time, and forget great big favors almost immediately. If you ever forget that, you are being impractical and don't belong in a job supervising men and women. They will remember small hurts for a long time and forget great big favors almost immediately.

Well, those are a few of the symptoms of normal human nature in action. Whether you like it or not, you can't change it. Where does that leave us? Does that mean that every one of us should quit our jobs and go back to college and get a Ph.D., in psychology in order to be a foreman?

You know that is silly. But, maybe we ought to again talk about being practical. If we were to remember all the psychology we already know and use it; if we were to realize what good practical psychologists we already are and use what we know on the job, maybe we would not have to worry about professional psychologists and psychiatrists and all these other things.

We don't expect you to be a psychiatrist any more than we expect the industrial nurse to be a doctor. But we expect the supervisor with intelligence to be able to recognize something when he looks around and says, "I wonder what the Hell is eating John today." When he thinks that, he has already said, there is something wrong with John, just as he might have said when he hears a squeal or knock in some machine, "This needs attention of some kind."

If he would use what he knows he would already say, "John is not himself, maybe I ought to do something about it." In the same way that the nurse recognizes those things that she can do and that at a certain point she ought to call for some better skilled professional help—the doctor—so, the supervisor can do some things about some things but should also be able to recognize the point beyond the simple counselling stage which needs highly skilled professional advice.

After all, psychology is a branch of study which is concerned with people. Psychology is concerned with what people do and how they do things. Some psychologists are concerned with interpreting why they do things, trying to discover ways of controlling, guiding and directing the performances of people, changing the expressions of this human nature, knowing we can't change human nature itself.

Certainly if you would get two well-trained psychologists and they were to sit on different sides of the room or in little cubicles separated from each other and they were to observe something going on and if they were well-trained, and you examined their notes afterwards, you would discover they were almost duplicates of each other. But, when it comes to interpretation, what this behavior means, if you get two psychologists together and they agree, I would like to examine them, because they need psychiatric care. There is something wrong.

In the same way that two good psychologists don't always agree, you and I might not. I might come into your department and say, "Vince, I have been studying this safety problem for 20 years now and it seems to me some of your guys should be wearing safety goggles."

You may say, "My boys ain't going to do it."

I might say, "What do you mean? I know the old gags about the rims get grimy and irritating and get *all fogged up and that* they cut out lateral vision. But that is silly. You have got to choose between goggles and losing a couple of eyes and the men will do it."

You may say, "No, they won't."

And I might say, "I am a psychologist. I spent 20 or 30 years of my life learning what I know about people and if handled properly they will."

You may say to me, "Well, Doc, with due regard to all your degrees, study and observation, I have been working with these boys 35 years, 12, 14 and 16 hours every day, and they ain't going to do it." You could be right, you know.

If your conclusion is based on and your interpretation of what might happen is based on observation and study of these people, your interpretation is as valid a psychological conclusion as anybody's, maybe better, because it is based on more and continuing observations.

Well, that is being a practical psychologist, being able to interpret what might be expected based on study, observation and experience.

When this young mother who has had maybe two years of high school, who has two or three kids, and is playing bridge with her girl friends and says, "Pardon me, girls, I am the dummy hand, I want to take a look out back. The kids have been too quiet for two long."

She is saying, "I am a practical psychologist without benefit of diploma or Phi Beta Kappa keys. When they are running around making a lot of noise, they are a nuisance, but when they are too quiet for too long, there ought to be some investigation." That is being a good, practical psychologist .

You just bet, Americans have their own psychology. Every people has its own social stereotypes and approaches to things. We are a nation of gripers. We feel we have a right to express our opinion about anything and we would like to see anybody stop us. We will gripe. So, along comes some smart cookie and says, "We don't want to have any more lost fingers or lost hands."

Some of you remember Art Secord. He tells a story about his father who had a shingle mill and the way he would hire men. He would have them hold up their hands and he would look at them and if you had all your fingers you were not even an apprentice. Because if you work around that industry, the longer the experience, the shorter the fingers, and an old timer—no hands.

So our employer says, "We don't want any more of that from now on. We have spent $38,000 and we have bought a bunch of wrist cuff pull-away guards. From now on, when this knife comes down or the rollers come around, *your fingers are not* going to be pinched or cut off. They are going to be pulled away." Sounds good doesn't it?

Do you know what is going to happen if you are working with a bunch of nice, clean-cut American boys. Somebody is going to say, "Wrist cuff pull away guards—hell—things aren't tough enough. Now the rats are going to shackle us to the damned machines."

Then, you put in a public address system, because now we don't build plants high, we build them horizontal. So we say, we are going to put in a public address system and somebody is sure to say, "Public address system! These white collar, yellow-bellies are afraid to face us. Now, they are going to give us orders by remote control."

You put in a music system and you know the old one. Somebody is sure to say, "Sure, those wise guys found out chickens lay more eggs or cows give more milk when they put a radio in the barn. You watch and see. They are going to start the music every morning real slow and then gradually as we go through the day faster and faster and faster."

You know, if you don't get that, there is something wrong. You know if you do any of these things and they are accepted quietly with a loud brooding silence of acceptance —that is where you have got trouble—not in the griping.

In Chicago near the Newberry Library, there is what we used to call Screwball Square. They let people pop off as they do in New York in Columbus Circle. They let them get rid of their hostility, get rid of their aggression, get rid of their griping. We give them a chance to do that because we know it is important for people to do so.

But not around a shop. If you hear a lot of gripes around you may feel it means there is somebody you have got to get rid of. If so you are trying to change human nature. You want to keep them all bottled up until the valve is not strong enough to hold it and it blows. That is not good sense. It is not good, practical common sense. That is not being a good psychologist.

SCIENTIFIC PSYCHOLOGY

Certainly, practical psychology is important but scientific psychology can help you too. It can describe *some things you should* expect as a normal or abnormal. It can give you guidance about how to deal with many of these things and how to prevent them. It can give you guideposts to the understanding of these people you deal with, by describing accurately many of their attributes and limitations.

It can describe to you where your demands are impractical and unrealistic because you don't expect enough or you are unrealistic because you expect too much.

But, psychology cannot give you a cut and dried list of human acts and controls which you can memorize and apply like a mechanic. There is no such thing. It can't give you the intelligence. It can't give you the insight. It can't give you the interest or the desire to do a better job than you have done before. It can't give you the clinical insight.

We are fortunate in that we have good medical schools no matter what part of the country we come from. Maybe you know a couple of young fellows who graduated just last June. They were the leaders of their class for several years. They were not just outstanding students. They were brilliant men and the school was proud of them and know that one day they would make their mark in the world.

Maybe a few months before graduation their deans or their counsellors called them and said, "Well, gentlemen we are sorry you are leaving. Your complete records show that you both came from the same little town and your folks were hard-working men, and they wanted you to have an education. We know you fought your way through grade school together and fought through high school. You fought for the same position on the basketball team and you scrapped with each other regularly. You quarrelled about the same girl, but you were always good friends, the best of friends. If one of you had a $40 jalopy you both had a jalopy and the major quarrel was who was going to drive it, not whose jalopy it was.

You went away from your mill town to college. You shared the same room and the same books. He who was up first was the best dressed and all that sort of thing. When you get out of medical school, you will have attended the same classes, have had the same instructors, the same labs, the same instruction, under exactly the same type and the very same kind of conditions.

"Tim, what do you plan for yourself? Where do you want to go? We look for great things from both of you fellows. We are proud of you and are concerned about your future. Tim might say, "Well, you know how fellows do around medical school. They all start out knowing they are going to save the world.

"Joe was going to be an obstetrician and I was going to be a pediatrician. He was going to bring them into the world and I was going to keep them here. Then he discovered that women seem to have their babies at four o'clock in the morning, especially when there is a big blizzard blowing and since he likes to sleep he was through with that. I decided once to be a skin man. Nobody ever gets cured from it; nobody ever dies from it and you can sleep as late as you want to and there is only one fatal skin disease.

"But, truly, I always dreamed I would love to be a surgeon. I would like to be the man with a scalpel in my hand. But only if I thought I had something more than the run of the mill medic to start with."

The professors may say, "That is a fortunate choice. We have always thought that surgery was the direction for you and had hoped you would go in that direction.

"Joe, what about you?"—and Joe might say, "Well, when my girl dumped me I thought I was going to be like Schweitzer, be a medical missionary, go off in the jungle. Then I met another beautiful little nurse and I think I am going to stay here, but, I am not like Tim. I don't care about this business of cut-and-dried stuff like the surgeons do. Once you have done that appendectomy they all look practically alike to me. I like mystery. I like to look at something that nobody knows what it is, can't figure it out. I like to try to solve that mystery. Tie things together into a syndrome and make a diagnosis. I would love to get into internal medicine and diagnosis.

"Yes, you both have made the most wonderful choices." These two young men might go away and 20 years from now you discover that one is a great surgeon. Among his fellow surgeons he is looked on as outstanding. And the other is looked on as an outstanding internist."

Did the medical school make one a surgeon? Did it make one the internist? Hardly. They got the same education at the very same time, under the same conditions, by the same men, in the same labs, same classrooms, from the same teachers. What happened?

The medical school apparently gave both of them exactly the same guideposts to the practice of medicine and then each had to take from himself, from his own temperament, his own personality, his own personal interests to guide and direct his energies and his knowledge.

Certainly we don't expect to make you a psychologist in one easy lesson, but it seems to me that we would be remiss if we did not try to give you some guideposts which you could throw away or do something with, think about, study and then from your own intelligence, your own temperament, your own personality, your own interests apply these things in your own way to your own practical problems.

GUIDEPOST NUMBER ONE

It is normal for normal men and women to be dissatisfied and discontented. Not unhappy. Just not satisfied and discontented.

The only reason why you or anybody else ever does anything is described in a basic law of biology to the effect that every living thing must adapt itself, must fit into and constantly adjust to the changing conditions which come to it, and solve the realistic problems of living which are forced on it or die.

That is the basic law of life. Every single thing a person does and every single thing a person thinks is based on his own personal effort of trying to better adjust to those conditions which come to him, over which he has no control. The basic reason why you do things as you do, why you think as you do, why you perform as you do, differently from all others, so that you are recognized as a distinct and different personality, is a simple one. The conditions and the problems of life which come to you are never the same as for anybody else. And so if you are normal, you should adjust in a different fashion.

All men have organic and physiological and economic and cultural and social and spiritual and psychological needs. But the conditions of living are never ideal and these human needs and human wants are never readily fulfilled. We all go through the process of trying to fulfill and satisfy these needs and these wants—and to try to make up for the difference between the needs and the degree to which they have been satisfied. It is that portion of the need which has been left unsatisfied which produces the dissatisfaction and discontent.

Oh, we can go into all sorts of examples, some of them profound. The most simple one is in the economic area.

If you need $300 a month that will barely satisfy your economic needs and you only earn $250, there is a difference of $50 between the degree to which that need has been satisfied and what is needed. You go through all kinds of behaviors trying to make up for the difference between the need and the degree to which it has been satisfied.

Maybe you ask for overtime. Maybe you try to get a job over weekends or on Saturday. Maybe you try to get another job at night. Maybe you try to reduce your budget so you can live within the $250. Maybe you go out and steal.

Whatever ou do, you go through all kinds of behavior to try to make up for that difference, and our lives seem to consist of trying to maintain a sort of unstable, unbalanced equilibrium between needs which are not completely satisfied and new needs which are constantly arising, trying to maintain equilibrium and stability in the face of unstable and uncontrollable needs.

So, no matter how complex, no matter how confusing, no matter how stupid or irrational the behavior of some people may seem, you may be sure it is based on their attempt to satisfy personal needs.

Often, you yourself have done something or said something and before you are barely started or before it is off your tongue you want to retract and say, "No, that is not what I mean. I wonder why I said that? You know I know better than that. Isn't that the craziest thing?"

Sure, a moment later, an hour later, or a year later you know better, but at the moment when the demand was on you to satisfy the needs of the moment that was the best you knew. A moment later you know better.

Now, since complete satisfaction requires no adjustment, and since adjustment is a basic law of life, and since the mere effort to adjust, which means change, indicates dissatisfaction, or the mere thought of change denotes dissatisfaction, it is normal

for normal men to be normally and continually in a state of dissatisfaction.

Men don't like to be bossed by men. Most men are honest men. Most workmen are honest workmen. When honest workmen take jobs, they expect to carry out all the demands of their job if they know what is to be expected of them and they will do so, if they agree to take their jobs with the full knowledge of what is to be expected of them.

GUIDEPOST NUMBER TWO

When a man says, "That ain't up to me," when a man says, "Hell, I don't have to do that for anybody" or "I don't have to take that from anybody," or when a man says, "Why don't he keep his nose out of it, that's not up to him?"—he is saying to you that he feels imposed on. That somebody is pushing him around. Somebody is getting into something that he considers is in his own province. He is telling you that *the basic guide for all supervisory practice*, is a complete and detailed job description which completely delineates job duties, responsibilities and authority. Without that job description, he feels like the man going to play poker with you while you have to change the rules of the game after you have looked at your hand for a minute.

"*I have got to do it because it is my job*," has a different connotation than, "I have got to do it because the boss says so."

Men are apprehensive of being taken advantage of. They will resent and fight against being pushed around. With the knowledge that what is demanded of them is truly part of the job, they will believe you are pushing your weight around and taking advantage of them and they will fight and buck you.

Human beings are still a phenomena of nature and will obey all the laws of nature, including the basic law that action is always equal to reaction and in the opposite direction. When men are pushed, you can be sure they are going to push back. No man ever bucks the demands of his job. Men will even brag about the dangers and discomfort in their jobs.

Talk to the men working out the long lines. All summer it is beautiful but with winter coming on, there will be rain, and sleet and snow and flood and all sorts of terrible working conditions.

But they don't squawk about the working conditions. They look around and say, "If you can't take this kind of thing stay away. This is a job for he-men." They brag about it. "It takes a man. If you can't take it down at the bottom of a mine, you don't belong there, that is all."

You know that resistance by men has nothing to do with the job at all because men do not buck the demands of a job, but they do buck the demands of men unless they know that these demands are demands of the job. Men don't want to be bossed by men, but they will be bossed by the demands of a job.

Most of us are not brilliant; most of us do not have the answers to everything, nor do we all have the ability to analyze and discover answers for ourselves. That is why we need someone whom we can trust to turn to and say, "What is the thing to do?"

GUIDEPOST NUMBER THREE

We need leadership. We need guidance. We need direction. We want to do the right thing, but are not always sure what the right thing is. We have a great need and a great hunger to have someone we trust to tell us what is the right thing, what to do and how to deal with the problems that are bothering us.

Once people have faith in a man, they will always follow him often to their own harm, because faith and trust are in the realm of emotions which blind people to the faults of those in whom they have confidence, and so they can be easily led or misled by them. Among the greatest human hungers, the one rarely satisfied is the need of people for something and someone to believe in, a faith.

They will turn to anything, they will follow anything, follow anyone, any scheme, any idea, any man who promises to alleviate their ills and correct their grievances; any man who claims to understand them and their problems, who by doing one simple thing, not by doing anything really constructive for them, but by merely taking the time to listen to them and encouraging them to talk, and merely giving them the opportunity to get it off their chests, (the psychological catharsis); by merely listening to them, he convinces them he is really deeply concerned with them and the things that are bothering them.

For the honest leader of great personal integrity, faith is a most wonderful tool, because when people have faith in a man, they will follow him, you can be sure. Their faith will make it instinctive, without ever having to think about it—"That my boss is the man to go along with"—because people always follow their faith.

GUIDEPOST NUMBER FOUR

This relates to bragging. I know a lot of people want to slap down a man who starts bragging and boasting. It can be annoying and he can become obnoxious. But what is a man doing when he is bragging to you? Isn't he telling you something? Isn't he describing something that he hungers for? Isn't he saying to you, "I don't know how I stack up in your eyes, but I want *to look pretty good*. I'll even lie like the dickens if necessary about my achievements so that you can think better of me." Isn't he trying to paint a picture for you, to see of him, which is a little better than the picture he thinks you see? Isn't he describing a dream to you of what he would like to be or like to be able to do?

Instead of slapping him down, why not encourage him to brag? You may say to me, "O.K., Doc, you straightened me out, so, I'll praise him. But what do I praise him for?"

Well, don't worry about it. Encourage him to brag and tell you exactly the things he would be proud to have you think of him or know about him. He is telling you what he would like to be like, by bragging. It would be a much more worth while and satisfying thing to try to help him be what he would like to be like. Encourage him to brag and listen to his bragging.

Bragging describes deep human needs.

GUIDEPOST NUMBER FIVE

People are not logical animals. People are psychological animals. People do not live up in here. (Pointing to head) Here is where they live. (Pointing to the heart) Here is where the most important things in your life happen. People don't react to conditions, people don't react to things. Good grief, we even pay to get involved in the most horrible conditions. A man will go out and spend several hundred dollars for a gun and several hundred dollars for equipment and go out and find some cold, miserable damp four o'clock morning and wait there shivering for some poor little, innocent duck to come flying across the sky. He says that is fun. It is not the condition which is terrible and unhealthy. It is the idea of the whole situation which this man has built up into a symbol of pleasure, sport, fun, something to be enjoyed.

People don't react to things. We wrap things up in emotions and feelings and they become symbols and these are the things we live for and die for. Special meanings are attached to things. The flag is just a hunk of cloth, but when the red and white and blue and the stars are arranged in a certain relationship with each other, it is no longer a piece of cloth. It stands for something we are willing to fight and die for.

Hours—you know people who put in 20 hours a day when necessary and then others put in two hours a day, and you can reduce hours like Reuther wants it, to four days a week, and reduce it to where a man needs only to turn over to answer the phone and I bet you still will have a gripe on your hands because he wasn't ready to answer it and you woke him out of a sound sleep or in the middle of a lovely dream.

Wages—you know as well as I know that wages are merely a symbol because intelligent labor leaders know that wages can't keep going up forever because there is an ultimate limit to what the consumer is willing to contribute to a company for its products.

Working conditions—we have talked about these. These are really symbols. The union is a symbol. The management is a symbol. The employer is a symbol. These are symbols. And we are willing to fight and die for or against these things, aren't we?

I can remember that some of the happiest years of my life were spent up at Loyola university in Chicago. Over the doorway of every one of my classrooms there was a symbol. It was black. I don't know if it was made of wood or clay, I have no idea. But, it had a different meaning for the boys and girls in my classes than it had for me

because I am a Jew. I am not a Christian I am not a Catholic.

A little piece of paper and people fight for it. Until I go like this (making a cross out of the paper) and say to you, "Do you think that people who fought for what this stands for, for a couple of thousand years—do you think they were crazy? Those men and women who fought and died for this?

You say to me that, "As a Christian, this stands for everything that is fine and beautiful in life and is worth fighting and dying for.

I say, "This?"

And you say, "Oh, not the piece of paper; what it stands for. It is not a piece of paper now. It is now a symbol of Christianity.

I say, "Well, you are a Christian. You tell me, if this were made of gold would it be worth fighting for more than a cheap piece of paper? If it were made of platinum encrusted with jewels would it have greater value for you?"

"No."

"If it were made of a hunk of wood or a cheaper grade of paper?"

"No."

This is not a piece of paper any longer. This has been wrapped up in emotion. It is not a thing. It is a symbol. It is something we are willing to die and fight for.

Don't be distracted in your daily human relations. A major guidepost is that people are not affected by things. They never get involved with petty things. They will never fight over little things. The thing itself may be nothing but a piece of paper, but it is the meaning of these things which is important and in dealing with people try to find out what conditions and things are symbols of before you try to deal with human problems, because some of them may not have the meaning for you that they have for others. Some of them superficially petty things, people are willing to fight and die for.

This means principles, doesn't it, that we are willing to die and fight for, not money. Ideals, yes; ideas yes; Things wrapped up in emotion.

HOW TO BE IMMORTAL

SESSION FOUR

IN TALKING about symbols, I pointed out it isn't things one meets in life which affect him so much as the meanings which they have for him. Parents take sacrifice in their stride. Religious zealots took suffering in stride. Everybody wraps up his own experiences with all sorts of emotional attachments and it is these that convert things into symbols, to fight for, to fight against, to fight about, to accept calmly and without emotional distress.

One man said to me, "Can you give us an on-the-job example?"

I said, "Well, maybe, we will try a little bit of participation in this last session."

Is there anyone here whose company has a job which pays let us say, $75.00 a week and that is considered fair wages for that kind of work?

Here is a gentleman. "What kind of a job would that be where around your shop they get $75.00 a week and it is considered pretty fair wages, or $80.00 a week, for that kind of work?

Member: That would be our minimum scale. Our janitor would get $70.00 a week.

Dr. Rosenstein: Your janitor would get $70 or $75 a week? That would be the lowest rated job. O.K., do you think that is a pretty good rate of pay for that kind of work?

Member: Yes, sir.

Dr. Rosenstein: Now, let's make believe. We are trying to develop an example. Now, suppose you were doing that kind of work, janitorial work, and you were getting $70 or $75, and you thought it was pretty good pay, and even though you would like to get more money, you still consider it fair pay. O.K?

Do you have the kind of setup in your plant, so that after a couple of years a man is entitled to a week or two of vacation with pay?

Member: Yes.

Dr. Rosenstein: Let's make believe then that you are on the job. You are doing the janitorial work. You are getting $75 a week and you have been there long enough so that you are entitled to two weeks' vacation. Today is the day. Come four o'clock, you are off—two weeks' vacation.

You grab your pay envelope and your wife is waiting out in the car for you and you run out and say, "Let's get going." She is very practical and before she gets going she says, "Did you get your money?"

"Oh yes, here it is."

You tear open the envelope and pull out the check and attached to it is a little slip which says, "Dear Jim, have a wonderful vacation. Be safe. Come home safe. Be careful.

"Here is a check for $150. That is $75 a week for the past two weeks—less deductions. And then underneath it is another check for $150, for your next two weeks while you are on vacation — less deductions of course.

"Have a wonderful time. Come back happy."

Your wife says, "What is that little pink slip underneath?"

You say, "Oh, no, they wouldn't pull that kind of stuff on me." But, you pull it out and it says:

DIFFERENT ATTITUDE NOW

"Dear Jim, because you and all the people in the company have worked so hard and we made so much money during the last year, we want to share our good fortune with you. From now on, you will still have the same job, have the same hours, and same working conditions, everything exactly the same, but instead of $75 a week, you are going to get $175 a week. Here is your check for the next two weeks, for $200.00 less the usual deductions. Have a wonderful vacation."

"Now Jim, tell me how you feel about that? After you decided that those guys upstairs must be insane. That they have all gone mad. How do you feel? Pretty good?"

Member—"You bet."

You know they are crazy, but you still feel pretty good. You don't feel the urge to go up there and say, "How dare you? The very idea of giving me that kind of money for the kind of work I do. If you are that kind of impractical business men, you are not going to be in business long. *I am quitting and looking for a place* where my job is a little more stable and dependable."

You don't do anything like that. You go away and of course yours is a wonderful vacation and you come back and go into the locker room at the end of the vacation and some of the boys say, "Hi, Jim, how are you? Tell us some of those lies about some of the hunting you did. Did you have a good vacation?"

"Sure. Good vacation? Holy cow, imagine getting $175 a week."

The fellows say, "What do you mean $175 a week?"

You say, "Didn't you get a raise?"

"Oh, sure, we all got a raise."

You continue—"$175 a week for a janitor. Imagine. I always wondered if I were ever going to be able to send my boy to college. Now I can. I have always been unhappy about how much insurance I carried. I have always been hoping some day maybe I could save up enough money to buy a house instead of renting it. Boy, 175 bucks."

One of the fellows says, "What is this $175 business?"

You say, "Well you guys say you got a raise."

"What are you getting if you're not getting $175?"

One man says, "I am getting $177.50."

Now, tell me how you feel about it?

Now, you are going to talk to somebody, aren't you? You are going to find out why you are being pushed around. Why is he getting $2.50 more than you? You didn't go and fight, and tell them, "Why am I *getting paid twice as much as my job is* worth?" But that $2.50 is different.

Is it the $2.50?

No. That two and half dollars has suddenly become wrapped up in emotion and it has become a symbol for being pushed around, being taken advantage of, prestige, self esteem and being put at the lower end of some kind of a scale are involved. There is something unfair about it now, and you are willing to fight about that, aren't you?

Talk about symbols. The old timer says, —"They don't make men like they used to in my day. We used to work 70 to 80 hours a week, boy, and we had time for picnics and parties and we raised good families."

So somebody says, "So what! Is it a virtue to die in the saddle, in harness like a horse?"

We have information from research which has already proven to us—research by Dr. Max D. Kossoris, Regional Director at the Bureau of Labor Statistics in San Francisco during the War, concerning the hours of labor and productive efficiency. He discovered as others have since that time, that any time a man works more than eight hours a day or more than 48 hours in a week, you are beginning to pay double time for half-time labor.

I don't say we ought to have a three-day work week, a seven day work week, a two-day work week, or an 18-hour week.

I say, let's find out which is most productive per dollar expended. What is there so holy about 40 hours? Golly, my Dad used to work 70 hours; ten or 12 hours a day, every day except Sunday when he worked a half a day, that was until one o'clock of course.

But there is no virtue in just hours alone. We hold it up as a symbol and the man who works more hours is a better worker.

Do you remember the day, when if you were tired and leaned against something and then saw the boss coming you had to stand up straight because if you tried to do something about your fatigue, you were lazy and something had to be done about you? Do you remember those days? I do.

INCENTIVE IMPORTANT

Now, we think that maybe a man can turn out more work, who is not tired—But the stereotype symbol of good worker is a hard worker, a tired worker isn't it?

I have newspaper clippings, I used to carry around. Up in Flint, Mich., you have high-powered labor boys, who are known as tough cookies. They won't co-operate with anybody. They even fight among themselves.

They say that more than eight hours a day is unfair. More than 40 hours a week is unfair. But along came a tornado a couple of years ago and wiped out *the whole town* of Flint and who rebuilt the town on their own time, using their own materials at their own expense, with their very own tools?

These very same men who wouldn't put in more than eight hours a day. Rather than do that they would go out on a strike. They worked around the clock and their bosses worked side by side with them in a common effort. A symbol of a true sense of humanity, overcoming animosity.

Here is another example. It is *pouring* down rain and the foreman says, "Joe, it is a quarter to five. It is a shame to get you at this time. But it is raining and they just brought in a *load* of cement and it is stacked in those sacks and there is a hole in the roof of that shack and you know what will happen if the rain comes through. I wish *you would go over* there and do this favor for me and put something across the hole, because if the water drips through there we are not going to have cement tomorrow but a bunch of lumpy sacks and that is all."

The man says, "I can't do it. I'm not going to do it. I asked you to get off early. This is Wednesday and we are expecting *some people* for dinner. In the meantime I have to take my daughter to the doctor for her third polio shot, and I have to pick up some beer and take it home and then we are going to watch the fights. I would like to do it, but I can't."

"Well, you are too.

"I can't.

"Yes you can.

"I won't."

If you come along and say, "Why don't you do this for Joe?"

The worker may say, "First of all I'm not a carpenter or maintenance man. Then I have got to do a lot of things." I talked *to him this afternoon* about getting off early.

You say, "Remember, Labor Day is supposed to be a holiday for the worker. Where were you last Labor Day?"

"Gee, I can't remember where I was last Sunday, not last Labor Day."

Well you say, "You remember last Labor Day, you were way up in the air doing a lot of hard work. You were sweating all *right*, like a horse."

"Oh yes," he says, "I remember it."

You say, "Where did you get the tools?"

"They were *my* own."

"Where did you get the materials?"

"Everybody chipped in. I only paid five dollars because I only have two kids. One fellow paid seven dollars and a half because he only has one."

"Where did you get the meals?"

"All the girls got together, cooked and fried chicken."

"And I suppose you got double time? Quadruple time? It was a holiday."

"Oh, no, nobody got paid anything."

"How many hours did you put in?"

"We started at almost sun-up. We wanted to get through. But, we got the job done at sundown."

"What were you doing? Why were you paying for the privilege of working in the hot sun for 16 hours, providing the materials, tools, equipment and work? What were you doing?"

"Putting a new roof on our church."

"Well, you weren't a carpenter then why don't you go up and put that patch on this roof?"

"Well, that is different!"

We are talking about, not the thing but the meaning of *the thing*, and that is what people live by. Not things but the meanings as attached to things. In order to deal with men properly, you have got to find out what *things* mean to them.

When people fight, it is never over anything trivial—trivial to you, but important and vital to them. Well, let's go on with *some more ideas* about symbols.

GUIDEPOST NUMBER SIX

I said we had six guideposts and I left the last one off. Maybe it would have been better, but let's go at it anyway.

This is that you can't cure diseases by dealing with symptoms. It seems to me we have been taking industrial aspirins for industrial headaches for 10,000 years, without doing a thing about the causes of the head-

aches. You know you can take aspirin until you are blue in the face without curing anything. You relieve yourself temporarily. That is exactly what we have been doing with contracts and negotiations and slapping them down and disciplining and doing this and doing that—taking an industrial aspirin to relieve ourselves of the industrial headache without getting back into the causes. We know those causes have always reproduced the same headache again and again and again.

Everything that happens has a cause. That is a basic law of modern science, nothing comes from nothing. Everything that happens has a cause and is the end product of something that happened prior to it. Every human performance is the result of something that came before it and produced it. Human performance is the result of a continuum, a stream of life.

Everything you do has a cause. There is a cause for what you think, the way in which you think, what you do, and the way in which you do things. Whatever you think or feel, your attitude of being for or against something, your desire to co-operate, all sorts of feelings of loyalty or, antagonism, resentment, admiration, hate, rebellion, love, faith mistrust—everything you think and feel and do is the end product and the result of those things which came before. They are only symptoms, all of these feelings and performances.

There have been times when, despite the fact that you are a good management man, you have hated the guts of your boss—. If you haven't ever felt that way you ought to go see a psychiatrist. Something is wrong with you.

There have been times when you have even hated your wife and your children, haven't you? You weren't too proud of feeling that way. You felt kind of guilty about it. You felt that there must be something wrong with you. But, if you are normal, the death wish for yourself as well as for others whom you love, is not uncommon. It is a normal thing. Those of us who know, are not frightened by such things or disturbed by them.

You may be sure that when somebody hates you or hates your guts, something caused that, just as something caused you to hate the guts of your boss. When some man is unco-operative, when a man is resentful, when a man is resistant, something caused it. When a man looks on you as a leader to be trusted and to follow, something caused that, too.

Everything has a cause. Nothing comes from nothing and if that is so, let's follow simple principles. If you deal with a cause, you deal with the end result. That means then, that you can control human behavior by controlling its causes. You can eliminate and prevent behavior of certain kinds by eliminating the causes of those kinds of behaviors.

CONTROL BEHAVIOR CAUSES

We spend most of our time dealing with these behaviors that make us unhappy and irritated and bothered. We don't spend much time with these causes, do we?

It would seem that in our search for understanding and control of people and their actions, most of us have overlooked the truly important aspect of control and understanding. We have been concentrating on people instead of the causes of their actions. We have been trying to manage and control people instead of the causes of their behavior.

By being so concerned with the control of people instead of the causes of their performances, most of us have overlooked the power to action, the power which forces action of so simple a thing as a shrug of a shoulder or movement of a finger or wave of a hand or lift of an eyebrow or a look —that kind of look, the executive look. All of these physical actions are so important.

A dear friend of mine has spent 40 years of his professional life as a psychologist being concerned with these autistic behaviors. The physical manifestations of what goes on inside.

You know what I am talking about. You have heard somebody say or maybe you have said to somebody, "You get that look off your kisser or I'll wipe it off for you."

The man says, "What do you mean? I don't have any look."

You reply, "Don't you tell me. I know what you are thinking. It is written all over you."

You have heard that kind of thing. Or the apocryphal story of the supervisor who was mad—fighting mad and pounding away and laying it into a man and going great guns and suddenly he stopped and said, "And don't you dare talk back to me!"

The man said, "But I haven't said a word."

The foreman said, "No, but you were listening damned aggressive."

On thinking in these terms, you can see that when men are anxious or cheerful or zestful or calm; when men are bored or active or enthusiastic, you must never overlook the fact that something caused them to be so. You must remember that men are not crystallized, static, fixed and unchanging. You must remember, you just can't talk about happy men, unhappy men, co-operative or uncooperative men, loyal or disloyal men.

Normal men and women—I said, normal men and women (only ones who are fixed and static and rigid and crystallized are those we describe as insane—they have reached a fixed, static state) are happy or unhappy, listless or active, bored or enthusiastic, depending on what causes them to be bored or unhappy, listless or active.

Sure, if you are hungry, your hunger causes you to look around for food. If you are normal, orders cause you to do things. If you are normal, unfair criticism makes you angry or resentful. If you are normal, what is going to happen causes you to be unhappy, worried or apprehensive?

Of course, if you are normal, constant nagging causes you to become insubordinate and want to take a poke at somebody. Sure, if you are normal, people who play favorites produce in you a sense of antagonism and disloyalty. You are not an angry man. What makes you angry? You are not a down man. What gets you down? What causes you to lose any incentive to exert yourself beyond what is necessary to get by? What causes you to say to yourself, if not aloud, "Oh, what is the use of knocking yourself out around this place anyway?" If you are normal, you have said that.

What makes you study? What makes you go to church? What causes you to pray? Do you think of yourself as an uncivilized barbarian, a vicious savage? Is that what you think of the people around you who work with you and live with you eight hours a day? Hardly.

You say, "I am not a vicious savage going around attacking people." Well if you are not, what are you doing with your fists up?

You say, "Well, when I have got my fists up, I am not going around attacking people. I have them up to defend myself from being hurt."

Don't ask me what to do about this antagonism on the part of the workers. When they have their mental fists up in your direction, you may be sure that rightly or wrongly, they have them up there to defend themselves against what they think you are trying to do to them, to harm them.

STUDY PEOPLE'S BEHAVIOR

Let me remind you that the psychologist says he isn't concerned with people and he says neither are you. He says he is concerned with people's behavior and you ought to be, too. He is concerned with what causes people to act as they do and what causes people to think as they do. He says, if you study the causes, you will understand the behavior. You will understand the result.

He says, it isn't the people, it is their behavior that bothers you. Why fool around with them? Why not start working on their behavior by dealing with its causes, because there is a straight line in normal people, between the cause and the end product, and if you control the causes, you control their behavior, which is really what you want.

Those of you who would take the time to talk to personnel people and remember these guide posts will find from talking to them that these six guide posts are so important that every man who has ever quit his job, been resistant, been antagonistic to his supervisor, who has stalled or refused to co-operate, has indicated as a cause the violation or abuse of one or more of these six common, simple basic principles.

Living demands constant adjustment and everything a person does, proves that normal men and women are normally dissatisfied and discontented. Men don't like to be bossed by men. They do like to be bossed by the demands of their job.

People will always follow their faith. They are always hungry for someone in whom they can have faith.

Bragging describes basic human needs and hungers and describes the things people would like to achieve.

People live by and would die for symbols.

Everything that happens has a cause and is only the end product of that cause, and will always recur until that cause is removed.

Now, we are practical people, we like to say—and I have never come across a supervisor who doesn't think of himself as a practical man. When you ask him what he means, he says, "I have been working for 30 or 40 years. I never had a chance to go to college. I had to go to a trade school at night. "I got it the hard way and I have had 30 years of experience and as a result of trial and error and getting my nose bumped, I know what is right and what is wrong, what will and what will not work.

You say, "Sure, a man puts in an apprenticeship and gets his card and says now, I am a machinist. But, everybody else says that it will take another 10 or 15 years and then he will be a machinist." Isn't that the way we talk?

But, the mere accumulation of experience doesn't make a man practical. Eisenhower had the answer to that many years ago when he was first running for office and someone asked him whether he thought the 28 or 30 years of experience in military administration would give him the background and the knowledge he needed to become a good civilian administrator in the top administrative job in the country.

Eisenhower said, "Well, I don't know whether my years of experience would or would not. I hope they might. But, I am reminded of this army mule we used to have at Fort Riley in Kansas. You know that thing had 35 years of military experience and it is still nothing but a jackass."

KNOWLEDGE MUST BE APPLIED

It isn't the accumulation of know-how, the collection of knowledge, of knowing what is right and wrong. It is using it, and if you don't use it, you are just as impractical as the man without experience and you might as well not have had any experience at all.

If you were hiring somebody would you think these are important—honesty, loyalty, stability, cooperativeness, reliability, industriousness, sober, no genius but capable of learning?

We all talk about qualifications, don't we? If you were an employer and you were *fighting for existence in tough competition,* would you hire my daughter as an office manager with these qualifications?

Member: "The answer is NO—she needs to know how to run an office too."

Suppose you had the authority to hire truck drivers and you had the big overland trucks that cost maybe $14,000 a piece or something like that. When they are loaded they have $30,000 or $40,000 worth of stuff on them. Would you hire me as a truck driver with these qualifications?

Member: You would still have to be trained.

Dr. Rasenstein: I don't want a job as a trainee. I want to drive a truck. Your truck driver died last night and we have to have a load delivered in Alabama. Would you hire me?

Member: "No. I'd want to be sure before I hire you that you know how to operate a truck."

Somehow or other, whether it is for an office manager or stenographer or truck driver or salesman or clerk or accountant, you want to know in advance. You want to have proven to you that a man can handle the job and know how to do it properly before he is hired.

When you are hiring a stenographer, you want to know in advance that she knows *how to type* and take *shorthand,* and being unreasonable, I would expect her to know how to spell, not all the words, just a few.

Well, let me ask you this question, you people who feel that this is the right way. I know you are doing a good job of supervision right now, but to whom did you ever have to prove yourself in advance? Supervising means leading, teaching, guiding, directing, managing, controlling, disciplining, inspiring, motivating, encouraging and again teaching.

To whom did you ever have to prove that you knew as much about these things as you expect that truck driver or the stenographer or that office manager to know about their jobs before you had the courage to take your job? Sure, you learned from experience. But, everybody knows, who has

good sense, that experience is a pretty poor and a pretty bitter teacher. You wouldn't say to this man, "You come on and get behind the wheel of that truck. *It is only* worth about $50,000 altogether, loaded up. Get out on the highway and learn while you are behind the wheel. After all, experience is the best teacher.

Experience is not a good teacher. You wouldn't say to this girl, "Come in and knock out those important letters to some important business men, customers of ours and potential customers—and in the meantime, go down to the bookstore and get a book that says "Touch Typing" and practice at home and maybe you can study a little shorthand and spelling."

You wouldn't say to this man, "Come in and audit our books and in the meantime go up to the University and take a course in Introduction to Accounting and later on you can take intermediate and later on some tax accounting."

You wouldn't do that. But, when it comes to leading men, guiding, directing, instructing, and motivating them, that's different isn't it? Or would that be too practical?

PROVING ONESELF

You know what you had to prove over a period of years? You had to prove to your employer that you were honest and loyal and industrious and intelligent and cooperative. You had to prove you had wonderful qualities, but you never had to prove that you knew how to manage men. It seems to me no good man should ever be put in the position where having to prove himself to be a good man and having been up-graded to the position of supervisor, he has to be taken away from the job and a finger pointed at him for the rest of his life as a failure. He couldn't make it. That is no way to treat good men. There ought to be a far more intelligent and practical way to select supervisors than trial and error.

You think you are practical? I have never seen a supervisor who didn't think of himself as practical. You want cooperation?—What do you mean?

When you ask some supervisors what they mean by cooperation some say, "Well, when I ask a man to do something I expect him to do it." That is their definition of cooperativeness. The difference between obedience and co-operation is something they haven't yet heard of.

Here is another example to think about—Suppose I am here at the end of a row of machines and over here is the freight elevator and I am working and I am considered a fairly good workman and so on, co-operative and genial.

Then along comes Joe and he is a friend of mine and he says, "Hi, Bill," and comes by me with the hand truck, goes to the elevator, pushes the button, and there are two doors, one goes up and one goes down. He tries to push the load on and the wheel gets stuck in the space between the shop and elevator floors. Joe says, "Give me a hand will you?"

I shut off the machine and go over and help him get it on. It happens once a day or twice a week. It has been happening for a couple of years.

Then one day along comes the boss and he lays me out. He really gives me the dickens for something I had nothing to do with. Later on I am standing at my machine telling him exactly what he can do with my stinking job.

Then along comes Joe. He pushes the truck over to the elevator, pushes the buttons. Tries to get the truck on. And then calls "Hey, give me a hand."

My reply is, "Nuts to you."

Joe says, "O.K. Don't get hepped up. I don't know what's eating you but, take it easy." And he goes to the foreman.

"Mr. Smith, can you get somebody to give me a hand?, I can't get the stuff on the elevator."

"Ask Bill. He always helped you."

"I did ask him. He told me he wasn't going to do it."

"What do you mean?"

"He said, 'Nuts to you.'"

"Well, is that so? I have already had trouble with him today."

Mr. Smith comes along all steamed up.

"Why don't you give Joe a hand?"

"I don't want to."

"What do you mean, you don't want to? That is being insubordinate, uneo-operative."

"I don't think so. I'm no truck pusher. My card says, 'machinist,' and I'm not go-

ing to rupture myself for you or anybody else. That is not part of my job."

Is be unco-operative? I think we ought to stop and think. A couple of months ago, I went to the Blue Ridge Assembly of the Southern Industrial Relations Conference. We had a whole program devoted to discipline, and you know, we spent the greater part of the program just trying to find out what we were talking about. I don't think we know what we are talking about when we talk about co-operation either. I am not going to try and tell you. I don't know. Discipline and cooperation are just words somebody made up.

Are you practical? You want loyalty? Do you think you are capable of being loyal? Do you think you are capable of being loyal to me if I were your employer? Could you be loyal to me if you knew that any time you got into a jam I would kick you around and let you stew there?

Could you be loyal to me if you didn't think I might stick by you and back you up and fight for you and be loyal to you? I should say not. You have always known that loyalty is a reciprocal relationship given only in return for a loyalty you expect. That is true in your life and in the lives of your men. What do you need a new magical formula from some psychologist for? You have always known it and if you don't use it to get loyalty, you are being impractical.

Sure you are co-operative. But could you be co-operative in carrying out some of my programs to a goal far beyond merely what is required, if I were your boss, and could you be loyal to me if you had to keep your back to the wall all of the time so I wouldn't knife you? I should say you couldn't. If you hated my guts, could you be loyal?

If you forget that for even one moment of the eight hours a day you are on the job, you are being impractical.

Do you go around killing off those less fortunate than yourself? I should say not. We devote most of our lives to those less fortunate. Some of us say that we don't even pray. But we offer our prayers in that fashion. In helping those less fortunate than we are, we are saying, "Thank God I can do for someone else. I don't have to have someone else do for me." Even though we don't call it such, it is prayer.

You know, there is no one less than the man who feels that nobody needs him. The world can get along all right without him. You wouldn't dare go home if you didn't think, that over and above the need to provide bread and butter there are other reasons why you are needed at home. They need you emotionally. They need you spiritually. You are needed. That is what gives you stature. The more you are needed, the stronger and finer you feel.

EMPLOYEES MUST FEEL NEEDED

Do you let your people on the job know that you couldn't possibly get your job done without them? You are dependent on them? If you don't, you are impractical because people need to be needed, and you have known that all your life, and they have to be told again and again that they are needed by you.

You work for money like every one else. Is there anything you wouldn't do for money? Sure. There are lots of things you wouldn't do for money. You wouldn't give me your child, and say, "Put him up against the wall and shoot him."

You wouldn't do that for ten million or a hundred million or all the money in Fort Knox or anywhere else. There are just some things you wouldn't do for money.

You know as well as I do, there are lots of things you do for money, but there are some things you wouldn't do for any amount of money.

We send our children off to war knowing that they might never return. Is it for money? We hope they will come back. We pray they will come back. But we know some of them will not come back. Do we send them off because there is money in it? We are letting them go voluntarily even though it may be a kind of a reluctant voluntary feeling, after we have exhausted every angle to try to evade sending them. But when they go we let them go in the belief that they are going to fight or die for what we think is a principle, an ideal, and certainly not money.

We will fight for money, but we won't go out and die or kill our loved ones for it. We will do lots of things for money and we won't do some things for money that we will do for people, for our loved ones, friends, people for whom we have a great affection and admiration.

We will do things for money. But we will do more things for people without money. We will fight and die for principle. People and principles are the non-financial incentives, and they are the most important incentives in your lives and the lives of your men.

Do you think money is the most important incentive? That is the way supervisors usually act on the job. As if they believe it is the most important incentive of all when you have always known that people and ideals and principles are the most important incentives on the job.

Sure, I know you are taught that it isn't wise for a supervisor to be soft and gentle on the job because it isn't manly. It is all right if you have time for that kind of stuff around home, but not on the job. Yet, we know that most people who come to psychologists or psychiatrists don't need psychology or psychiatry. They need kindness and affection.

Over in Kansas we have one of the most successful psychiatric clinics in the world. Do you know what their basic principle is? TLC. TLC. That is the way they shorten it, and they laugh about it. TLC—tender, loving care. Give it to them until it runs out of their ears. Slap them down, but give them tender, loving care.

The National Safety Council some years ago did some research and told us women are not as strong as men. Women are smaller than men, and the woman who is pregnant should stay away from some of the jobs that involve toxic substances. That is about the story.

But, they also found that women are not more susceptible to dermatitis or more likely to have accidents; and women are not more subject to fatigue; and women do not lack mechanical ability; and women do not have greater dexterity than men; and women are not especially better than men at monotonous work; and women do not only work for luxuries; and women do work out well in industrial situations, and women are just as good supervisors as men.

If you don't know it, there were as of a year ago, 29,000 female executives in the United States, 29,000 earning $35,000 or more per year.

Let's be practical. Do you think your company is practical? If I were to go to your personnel men—how much would they pay me to reduce absenteeism 25 per cent? Reduce accidents 35 per cent? Would that be worth a lot of money to you? Don't hesitate, because I do know. And you should know.

What could be more impractical than a man who says, "I know how to reduce accidents 35 per cent, but I will be darned if I am going to do anything about it."

Well, let me tell you something you already know or should have known. Back in 1951 the National Association of Manufacturers published a study of a survey of 3,500 plants in the United States, from small to many thousands of employees, a cross-section of all the industry and employers in the United States—3,500 plants. That was in 1951, six years ago. This report to the members of the National Association of Manufacturers indicated that the average savings from a medical care program was as follows: A 44 per cent drop in accident frequency; a 46 per cent drop in occupational diseases; a 29 per cent reduction in labor turnover; a 39 per cent drop in absenteeism; and 30 per cent drop in compensation insurance premiums.

That is direct dollars and cents. Do you have a good medical program in your plant? If not, what do you mean by being practical? This was published six years ago.

SOME DAY DREAMING

You know, I do a lot of day-dreaming. I think there is more fun in day-dreaming. I get all my problems solved in day-dreaming. Every once in a while I have said or you have said, "Oh, boy, if I were God, what I would do." You know that business. "Boy, if I were only running this outfit—." So, let's day-dream.

We are all managers of men, supervisors, leaders. We are supposed to do things for management, as part of management. Management always selects its supervisors. But wouldn't it be wonderful if a man could select his supervisor? If I were a workman and day-dreaming that I could pick my boss, what would I look for? Boy, if I could take a hunk of clay and model it, what qualifications or attributes or specifications would I build into it? I'll bet that you could think of a thousand specifications.

I would like to tell you about a few of those I would look for. First of all, I would

look for a man who could be described in one word. You could tell me that he is a rock-head, a rough cookie with a sharp and nasty tongue, a tough temper, and hard to get along with, who would push you around and slam you around and make you feel antagonistic at every opportunity, and I would not be too happy about having to work for that man.

But, if in addition to that you would say but one thing about him. If you say that he is a man of integrity, then I might forget everything else. I don't mean a man who is honest because it is good policy to be honest. That kind of honesty is not honesty—that is hypocrisy. But, a man who is honest because it is the only way he knows, who does not have to stick his wet finger in the executive wind to see which way it is blowing before he knows what is the right way and what is the wrong way, who fights for that which is right regardless of who else thinks differently—that man has real honesty.

I would want a man of integrity. That is the first thing I'd be looking for.

Of course, if I had a chance to pick my own boss, I would try to find me a *professional*. I would hate to have him learn his job while he was working out on me.

I would try to find a man who would be concerned with how he could help me instead of himself, who would give me loyalty instead of demanding of me, who would think of himself as my assistant, instead of my boss, who would think it was his job to help me do my job better.

I would pick a man whose pride was peculiar because his pride was in his men. A man who could walk around the shop and say, "Yes, it was well done but not by me. I just happen to be lucky enough to have the best bunch of men in the whole plant." That is where his pride lies. Anything worth while that comes out of the shop, his men did. If something goes wrong, he feels that maybe he was not on the ball. Maybe he had not directed or guided or taught or led the men properly. He will take the blame for anything that goes wrong.

Sure, I would pick a man who never made a promise he didn't intend to keep, merely to slough me off. I would pick a man, who might say, "Gee, I'm so busy, Bill, I just don't know if I'll ever get done. But let's not wait until tomorrow when it is more convenient for me. Let's sit down right now and go at it. Now is the time."

Oh, if I could pick my man, I would pick a man who knew that I was not a genius. If I come to him with an idea, I don't want him to give me that objective stuff. I don't want him to say, "You have a suggestion. Here is the form. Stick it here. Stick it in the box and three months later if it is any good we will give you an award for it."

I want him to get excited about my brain child. I want him to treat my brain child carefully, because it is the most wonderful idea in the world at the moment. I gave birth to this child of mine. I want him to treat it tenderly. Especially tenderly if it is a feeble-minded brain child. The man who is going to get an award, doesn't have to worry. It is I. If I don't get one, I will feel low. I want my boss to pick me up and encourage me.

If I could pick any man, I would try to find a man, who would handle every grievance right now, not like the fellow who has a 40-room mansion, but no garbage pails, and who says, "We just kick it around until it gets lost."

Finally, I would pick a man who in many ways reminded me of my father whom I loved dearly. But who had the knack if I stepped out of line, of lowering the boom so fast I didn't know what struck me until too late. But who if he thought I had been pushed around, would fight for me every step of the way up the line even to the president of the company and the chairman of the board if necessary to see that I got a fair shake and a square break.

I bet you could add other specifications, but these are a few I would look for. I bet you would look for the same ones, and I bet your men would look for the same ones, too.

Well, if we are all agreed—then these qualities are worth working for and developing—so why not take the time?



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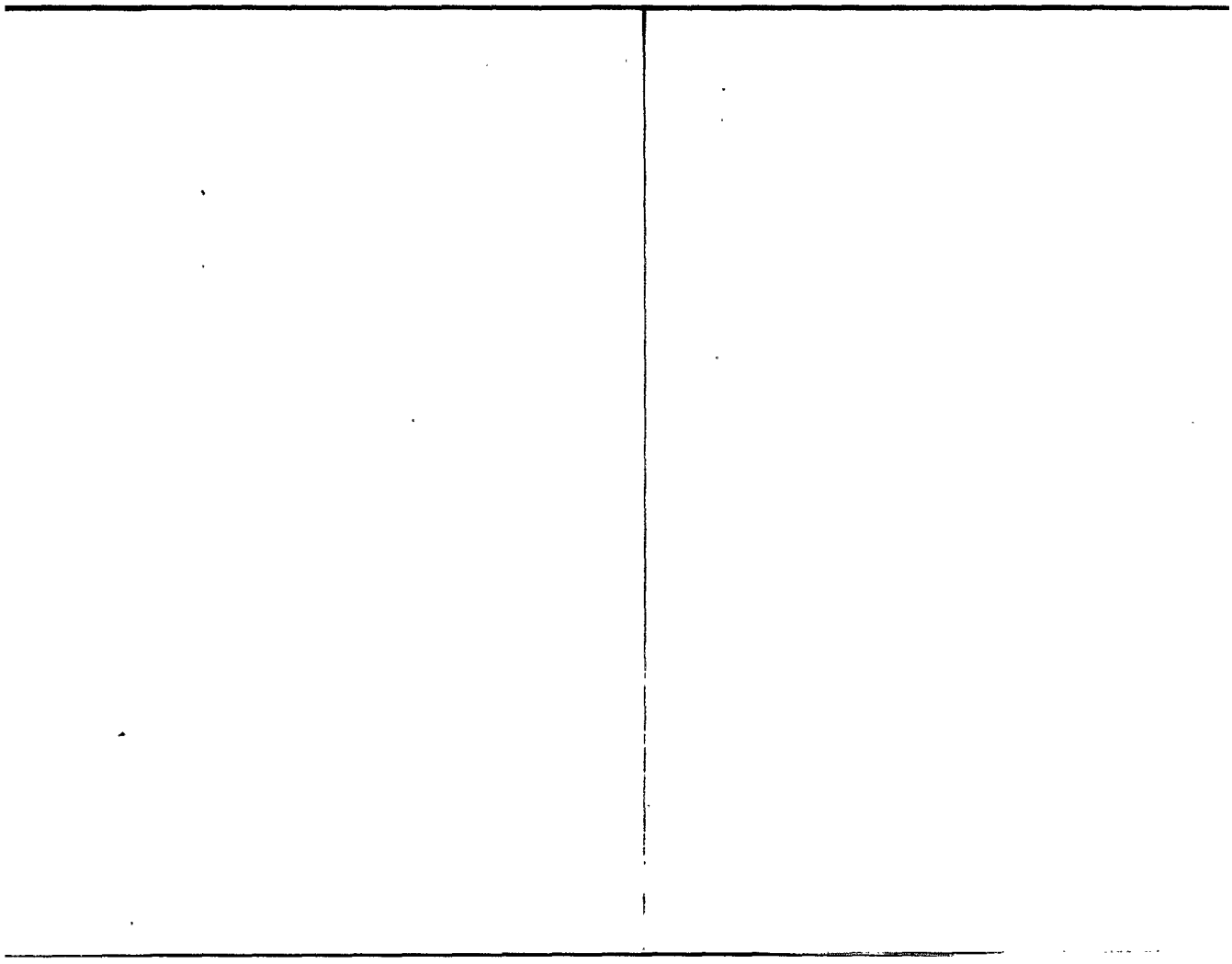
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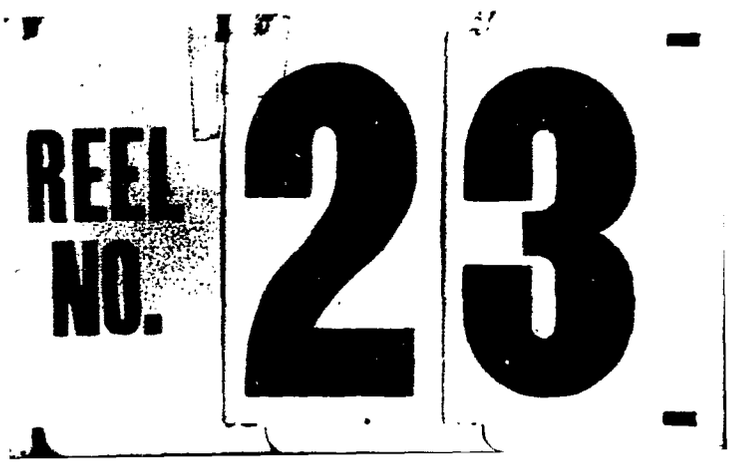
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