1963

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Transactions

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GENERAL SESSIONS

ANNUAL MEETING OF MEMBERS

CONGRESS BANQUET

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NATIONAL SAFETY COUNCIL

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VOLUME 1 OF THE TRANSACTIONS

of the

51st NATIONAL SAFETY CONGRESS

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Motivation

MOTIVATION STRATEGY IN IND BEHAVIOR

By WILLARD A. KERR
Prof. of Psychology, Illinois Institute of Techn

Among motionless bodies there tend to be no accidents—but there tends also to be little life, health, or productivity. Generally it is a body in motion which suffers an accident, and usually even a body engaged in more or less purposeful motion, even constructive motion. An accident victim is a casualty of production much like a soldier may be a casualty of war. Accidents tends to follow the power load in a plant; the more production turned out, the more accidents. So, it is apparent that accidents are related to striving, ambitious, constructive behavior. Yet, somehow, we all know that they don't rightly belong either—that all are somehow avoidable and may be largely eliminated if we persist in our attacks upon the problem. Let us quickly review the three major psychological theories of accident causation and safe behavior.

1. The accident proneness theory, so long over-emphasized, has now been shown to account for less then ten per cent of variance in the accident rate. This is fortunate, for it is a defeatist theory anyway.

2. The adjustment stress theory is well documented as a major explanation; adjustment stress accounts for approximately 55 per cent of the variance in the accident rates of industrial workers. The dramatic reduction in accident rates since 1912 is largely the result of persistent attack upon this problem, the reduction of extreme stress upon the individual; back-breaking drudgery is disappearing and the safety engineer has had tremendous impact on reducing the stress and threat of the workplace. Disturbed biochemical equilibrium due to fatigue, illness, disease, toxic conditions, alochol, etc., remains always as a potential stimulant to increased accidents.

3. The individual-goals-opportunity-freedom-alertness theory is the one to which

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was rewarding—in fact, it preserved his sanity. By staying just above the sleep level in his work, he avoided too much thinking about his plight and the whereabouts and welfare of his loved ones, and obtained some animal pleasure out of surviving, eating, and sleeping. We, the descendants of those ancient slaves and serfs, sometimes find ourselves maneuvered into retreating from alertness too in order to preserve our emotional energies and sanity.

But a new psychology is struggling for dominance in the modern world, one which places reward squarely upon the results of alert, creative behavior. Let us look at some of the probable ways in which these new outlooks and research results may be applied to induce safer and higher quality behavior.

1. We must put renewed emphasis upon monetary incentives, providing optimal combinations of piece rate and group incentives for best over-all results. Research shows that incentives increase productivity per man-hour. Theoretically, under this increased production the accident frequency rate should increase along with the rise in the power load, but, dramatically, the accident rate does not rise. This is in such defiance of expectation as to constitute evidence that monetary incentives do increase alertness enough to improve the quality of behavior, including safety. Pay for time expanded into monetary incentives gives the employee a new interest in the work and in production units achieved during each period of the day, including a sense of competition with himself and with others.

2. Encourage inter-departmental transfer mobility. Because a high rate of transfers of personnel among departments implies a substantial number of inexperienced persons on jobs, one would expect such a condition to be associated with a high accident rate. But it is not in fact, departments with the higher transfer mobility rates that have lower accident rates, apparently because the possibility of transfer to other departments suggests *opportunity* to employees and they become more alert in order to become qualified and aware of the specific opportunities. An additional dividend from this policy is likely to be an actual reduction in the more expensive labor turnover.

3. Emphasize the right of appeal without reprisals. The employee needs to be reminded periodically, and emphatically, that he has the right of appeal up the line organization, over the heads of immediate supervision, if injustices are not corrected—and that top management will be ruthless in punishing reprisals for exercise of this basic moral right. Whether or not there is a union, this should be done. The employee is not an optimally free and alert human being unless he feels that he is in a reasonably permissive and just environment.

4. Tolerate and even encourage reasonable nonconformity. Conformists cannot invent or attain new heights of creative behavior. Rigid conformity lowers the quality of behavior, invites the mental dullness which invariably is accompanied by rising accident frequency. Perhaps God is the greatest nonconformist of all, because no two celestial days in the history of the universe have been alike, old celestial bodies growing cold, new ones being born, and the universe expanding. Mutational genetics teaches us the same lesson. Medieval philosophy which saw nature as all order and system simply was ignorant of nature. To be a harmonious part of nature, of the cosmos, man must be creative and free. His social, religious, and educational philosophies should contribute to this. So should his political and economic processes and philosophies. Out of this can come daring and undreamed of enterprises which will be undertaken in almost total safety.

Maximal emancipation of Americans from back-breaking, high-accident labor has come not because they are any more intelligent than other peoples, but because their psychological climate traditionally encourages them to question, criticise, disagree, argue, debate, and "prove a point." Proving a point often results in constructive invention and pushing forward the safety frontier.

5. Put the codified rules of the game in the hands of all participants. A management which does not provide for each employee a handbook of personnel policies is, inevitably, in the mind of the employee, to some degree a lawless management. Ultimately people in a free society refuse to work for a lawless management, write their own rule book, call it a collective bargaining contract, and compel the incompetent management to sign it. This is poetic justice, but the stockholder and consumer may be injured in this

process. Whether or not there is a union, every management has this handbook responsibility; it is a stable constitution of the workplace; it protects the emotional security of the worker so that he can put his alertness toward constructive opportunities where the rewards are real, not in looking over his shoulder to make certain that he will not be the victim of arbitrariness. We fought the American Revolution to get a government of law, not of men. Industry management contains the same problem in miniature, and safe behavior comes out of the emotional security of law.

6. Delegate authority generously and in proportion to responsibility. Whatever is accomplished properly in an organization ultimately must be accomplished through people; therefore, authority must not be hoarded. Delegation of responsibility without delegation of appropriate authority encourages "passing the buck" and irresponsibility at higher levels, so that personnel at lower levels become demoralized or suffer in drive and alertness. When a man is not "running under his own steam," he usually is not running at all—merely "walking" or, likely, "stumbling."

7. Management must maintain a valid image of manifest good intent. Management in the low-accident plant works to build, maintain, and reserve an employee, stockholder, and public image of itself that is ethically good. It is "ahead of the law" in reasonable provisions for the welfare of subordinates, without sacrificing obligations to stockholders and consumers. This requires high intelligence, high ethics, and high statesmanship, but the result can be high quality team performance, safe and creative.

8. Individualism must be actively encouraged. We come utterly insecure from the womb, and at all later ages we retain the primitive impulse to run for some kind of "collectivistic" cover at the first "clap of thunder." To be a true, free individual is difficult, perhaps the greatest challenge is being human; but God made the individual in his own image, not in that of a mob, and it is the individual who ultimately must conduct himself with safety in high quality behavior, on his own and "under his own steam." Research has shown that small groups have higher morals than large groups, and, more recently, that highest productivity comes

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a new man: (1) over-emphasize rather than under-emphasize the difficulty and challenge of the job or task; and, (2) structure his initial experience so that he is very likely to succeed and earn a confident appetite toward the activity; the intrinsic rewards of the activity so competently performed then usually are strong automatic rewards towards sustaining alertness and safe behavior in the activity. Surprisingly, a few such experiences in a new job cause a man to build and fixate a high aspiration level which rarely yields to later adversity and hard knocks on the job.

10. Insightful attention must be given to morale maintenance. Low morale people have more accidents and more low quality behavior in general than high morale people. Morale is essentially the product of euphoria level times individual-goals-organizational-adequacy-achievement. Euphoria is one's feeling of well-being which is a totality feeling resulting from adequate sleep, food, health, comfort, etc. Probably the highest correlation ever obtained in safety research was that between the average rated comfort of work and accident frequency rates of factory departments.

Euphoria unquestionably is of prime importance for safe behavior. And so is the other component—an adequate and reasonable pattern of ambitions held with some sense of progress being made. Management can contribute to many positive euphoria factors such as a host of cold drinking fountains, good physical working conditions, adequate interim snacking and eating opportunities, pleasant rest rooms, etc., as all of these constitute alerting short-term goal fulfillments, sustaining safe behavior and holding off frustrative, trigger-happy behaviors.

Management, too, can enrich the constellation of other short and long-term goals that employees at all levels can strive for. They want opportunity. It is management's job and the safety directors' job to help develop and publicize these opportunities. Opportunities cause us to raise our eyes to the future and to do that very unprimitive thing —to *think*, the basis of safe and high quality behavior.

INJURY REDUCTION THROUGH FOREMEN COUNSELING

By DR. K. T. JOHNSTONE

Medical Dir., Central Foundry Div., General Motors Corp., Saginaw, Mich.

The incidence of injuries can be reduced by effective counseling of employees by foremen. The procedure can be made effective if a few rules are observed. These can be easily recalled by the use of four W's and one H. The foreman must know Whom to counsel. He must know Why that man was chosen. He must know Where the injuries occur. He wants to learn What circumstances contributed to the occurrences. He needs to have some ideas as to How to get the information from the worker.

Whom

Injuries are not evenly distributed among all workers. We talk about the "accident prone" man. Webster says that proneness is a propensity for something that approaches the inevitable. I am in thorough agreement with this concept. If injuries are to be reduced we can do more by correcting one injury prone man than by trying to improve any number of already safe men.

Quite a bit has been found out about the accident prone man. We know for instance that all of them together comprise a rather small percentage of the work force. We know that they contribute the majority of all injuries. We know that while the group is quite constant in size, the men that make it up are continually shifting in and out of it.

Up to now we have been able to single out the excessively accident prone man, one that gets two to three injuries of various types each week. How about the fellow that gets hurt once a week or once a month, or once a year? The last one certainly is not a

hazard. The difficulty has been in determining where to draw the line. This can be answered now.

Why

By Why is meant why a certain man is chosen for counseling. Since these men have a propensity for injury, they are reporting injuries with a greater frequency than the average. The logical starting point, then, is the average frequency. This is easily determined. For example, 100 injuries may occur in a certain plant during a week, and during this same week there are 50,000 man-hours of labor used. There have been two injuries for every 1,000 hours of work. The working man will contribute 2,000 man-hours a year (40 hrs. x 50 wks.). This mythical average worker, therefore, has four injuries per year. The accident prone man, by exceeding the average, will have more than four injuries per year and the more he exceeds this, the more accident prone he is.

The determination of the individual's injury rate is an easy procedure. The foreman needs a pocket notebook with a page for each man. When he sends the man to the medical department with an injury, he notes on this page the date and a sentence or two regarding the circumstances of the injury. As these notes accumulate, they will contain a wealth of information ready at hand. There will be occasion to refer to this notebook as the program develops. It is from this notebook that the foreman selects the men he will talk to the most.

Where

The foreman must know where the injuries occur. As the entries accumulate, it will be noted that they tend to cluster about certain groups of men doing a particular operation. A department in the plant is a group of men performing related jobs. It is well to determine the injury rates of departments in the same way it was done for the plant as a whole. Suppose that in the plant mentioned above, one of the departments experienced 16 of the 100 injuries and utilized 4,000 man hours. Their rate is four against the plant rate of two. There is a reason for this. Just as some men are accident prone, so too are some jobs.

As a matter of fact, whenever too many injuries occur, it is due to one or both of two reasons. There may be an unrecognized job hazard or th
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There are many factors in the human element of injuries. These may be physical in nature or they may relate to attitude. The man's injury history and his job performance may clearly indicate that the assignment is beyond his physical capacity. Occasionally it may be necessary to obtain from the medical department, or, in the case of a small plant, from the personal physician, an evaluation of the man's capabilities.

As the program continues and the job hazards are corrected and the physical misfits are placed to the best advantage, there will remain a few individuals who persist in demonstrating a high injury rate. As a rule these will comprise about five per cent of the plant population. These workers are the men who cause problems in other respects. The accounting department knows them as being associated with garnishees; the personnel section has had repeated contacts with them in the grievance procedure; the insurance department is convinced that these are the cases which cause the benefits for injury and illness to exceed the premiums collected. The department supervisor associates their names with absenteeism which too often is of questionable validity. The nurse in the medical department has become too well acquainted with them and their repeated complaints of headache, nausea, and associated ailments. Situations of this type indicate something basically wrong with the man's ability to conform with accepted standards. The inability may be an apparently integral part of his make-up or it may be a new development in a previously well-performing individual. These are the true problem cases that form my subject.

The development of this syndrome in a previously well adjusted worker should arouse the interested concern of supervision. Plants utilize machines and men to make a finished product. Of the two, machines or men, men are the most complex and expensive. Men are also the most difficult to replace.

The supervisor cannot know all the ramifications of psychology, but there are some general ground rules which he can profitably apply. All of us have certain basic needs. When these are reasonably well satisfied we get along quite well. When one or more of these is disturbed, we will respond with aberrant behavior in one way or another. As individuals we may or may not realize this relationship.

The three basic needs are security (a reasonably stable job); shelter (a home); and affection and recognition (a family). Let us suppose that the worker is fearful of a lay-off, or that a mortgage is about to be foreclosed, or that there is a wife or child seriously ill and recovery is doubtful. Situations of this type can be a very real threat to his stability. These are the types of worries that the man will bring on the job with him. Can we be surprised if he thinks about these when he is running a machine? I don't think so.

In cases where the records indicate that the man is doing well and recently has slipped and there has been no new job assignment in the picture, it should awaken a suspicion on the part of the supervisor that something else has happened. A few tactful questions by a sincerely interested foreman may uncover the source of the trouble. If the man can be led to talk about it, he will get relief. It is not necessary or even advisable that the foreman attempt to offer any suggestions. How many times have you and I found the answer to a vexing problem by talking it out with a friend even though he was in no position to offer any assistance?

The long-term problem cases evidence this type of behavior almost from the time of hiring. I say almost, since they usually conform fairly well to the accepted standards during the probationary period. Once the magical cloak of seniority is acquired, they feel free to act just about as they wish. This disposition may stem from childhood training, school experience, or family attitude. A great deal has been written about how these things arise and become ingrained in the person. Regardless of how it came about, we in industry are faced with the end result, in a worker who is not even meeting the average standard of performance, let alone a superior one.

These are the workers who spend the day anticipating the partying expected that night and return to work the next day carrying with them an alcoholic hangover coupled with exhaustion. It is really a wonder they don't get injured more severely than they do.

These are the workers who take a child-like delight in the startle reflex of others who are the butt of their practical jokes. They seem about the mental age of the four-year-old girl who suddenly clapped her hands over the eyes of her mother who was driving the family car and said, "Guess who, Mummy?"

In this group also is the brash know-it-all. We had one a few years ago who started to repair a fork truck with the fork elevated. As he loosened a bolt the fork dropped. He promptly did a combination ballet split and full forward bend at the time. After it was over, his chief reaction, believe it or not, was pride in his flexibility.

With this type of individual, it seems to me that the foreman must assume the role of a just and stable parent who says this sort of thing must cease now. The fact that the problem did not occur until after probation is a tip off that it can be controlled.

The individuals who comprise this group are immature because something somewhere interfered with their development. It is likely that they never had the good fortune to grow up in a family where rewards and punishments were determined by their actions and behavior. Since it was not done at home, the next place to try is the plant. Supervision says, in effect, show me you can handle responsibility and I'll see that you stay on the job, but if you don't show improvement in the next month, there will be a transfer to a lower paying job or a layoff if one isn't available. He isn't telling the man he has to
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Industrial Hygiene

(CO-SPONSORED BY AMERICAN INDUSTRIAL HYGIENE ASSN. AND N.S.C.)

THE SIGNIFICANCE AND APPLICATION OF THRESHOLD LIMIT DATA

By V. K. ROWE

Biochemical Research Laboratory, The Dow Chemical Company, Midland, Mich.

I was asked to talk to you today about the significance and application of industrial hygiene standards such as threshold limit values and maximal allowable, acceptable or permissible concentrations, commonly referred to as MAC values.

Since accepting this assignment, I had the privilege of spending a month as a member of a team of six that visited the Soviet Union under the auspices of the U.S. Public Health Service. Our purpose was to study Soviet methods used in industrial toxicology and to learn how they applied the results in their industrial work. I think that this experience will enable me to give you a better discussion of some of the problems associated with the interpretation of threshold limit and MAC values as we see them and as they are viewed by the Soviet scientists.

In the first place, what are these figures commonly referred to as threshold limit values and MAC values? In general, I interpret these values as guides to be used in controlling the degree of exposure to certain airborne contaminants in the environment of workmen exposed seven to eight hours per day, five days per week for an indefinite period of time. They definitely do not represent a fine line between safe and hazardous concentrations.

Even though some persons consider threshold limit values and MAC values to be the same, I do not. This is a difference in philosophy which I believe to be fundamental.

The threshold limit values as published by the Conference of Governmental Industrial Hygienists, in essence, refer to values obtained by time-weighting the exposure over a seven- to eight-hour day. Maximal acceptable, allowable, or permissible values are in my thinking, just what the name implies—maximal values below which normal fluctuation should occur.

Excursions above the maximum should be limited. The degree to which such excursions are permissible is contingent upon the normal baseline of average exposure intensity and upon the consequences of exceeding the maximum.

It is noteworthy that the ACGIH Threshold Limit Committee is now cautioning in their directions for using the threshold limit values, that care must be taken to avoid exceeding certain of the values because of the possibility of acute effects. This approach is to be commended and it is my hope that the trend will continue, even to the extent that the ACGIH tabulation or some other tabulation eventually will include not only levels acceptable on a time-weighted basis but also will include maximal values and other information pertinent to the intelligent use of such figures.

Back in the late '40's and early '50's the laboratory with which I am associated did a great deal of toxicological work on several of the common chlorinated solvents. This work convinced us that the toxicological properties of these materials were vastly different and that we could not express in a single figure the essential information we felt the industrial hygienist needed to properly assess the hazards of a given situation.

In an attempt to improve communication, we proposed a two-value hygienic standard

consisting of a maximum figure and a time-weighted average figure. The maximum was defined as the concentration below which there was little likelihood of any significant acute or chronic effect. The maximum figure was fairly easy to determine from the results of animal experiments and observations on human subjects but the time-weighted average figure was more difficult because in reality, it was an expression of opinion as to how much below the maximum the average should be.

This opinion must be based on several factors. First, such an average concentration should be one which in all probability will not cause significant adverse effects even though exposure be for a prolonged period of time. Secondly, it should include some appropriate margin of safety and this should be based on the consequences of overexposure. A material which causes injury to the central nervous system, the eyes, bone marrow, gonads, or other vital organs should be accorded a wider margin than one which causes slight inebriation or reversible functional changes in the central nervous system or other organs.

It should be noted that there are a number of values in the table of threshold limit values which are based, not upon toxicity, but upon objectionable odor or simple reversible eye or upper respiratory irritation. To me, a value based upon such consequences of overexposure must be used in a manner quite different than one which is based on frank toxic injury. I have no objection to establishing permissible levels in the workroom on the basis of objectionable odor or irritation, but I do believe that when such is done, it should be so designated.

I feel, from practical experience, that there are times when a little unpleasantness can be tolerated, and even permitted, if it is known that no hazard to health is involved in such exposure. True hazard to health cannot be compromised or negotiated, whereas discomfort is, in my opinion, a negotiable item.

Furthermore, it should be remembered that hygienic standards are being used by design engineers and safety engineers in designing plants. The degree to which the engineer must make certain that normal operation can be carried on within generally recognized hygienic standards will depend upon the severity of the consequences of overexposure. Over-designing is expensive and unnecessary.

It is for these reasons that I am critically opposed to a one-value system of hygienic standards. I believe that whenever possible, values should be given indicating: (1) concentrations dangerous to life when exposures are for short periods (perhaps up to 30 minutes); (2) values (MAC values) which cannot be exceeded for more than short periods without causing an adverse effect; and (3) time-weighted average (TLV) values which should not be exceeded for a seven to eight hour day.

In addition, the tabulations should give the approximate odor threshold, the consequences of overexposure from both acute and chronic exposure, not in detail, but in simple language so that the practicing industrial hygienist or industrial physician will know what to expect.

I know this is a departure from our present day concept of such control standards, but we need this information badly now, and we will need it more in the future. I do not go along with those who say that we must keep these tables of industrial hygiene standards one-value tables for the sake of simplicity.

I say the one-value tables are far too complicated. The ordinary person doing safety work looks at such figures as law. He cannot be expected to know the basis upon which they were derived. Therefore he cannot be expected to make judgments, nor should he.

Even some of us who are practicing industrial toxicology and hygiene every day cannot keep up on all the values or the reasons for them. They need so much interpretation that opinions formed one week may be changed next week when new information becomes available. This is the avowed responsibility of the industrial toxicologist and industrial hygienist.

There are those who say that the data to make multiple entry tables are not available and hence there would be a preponderance of empty spaces. That simply means that there is more work to be done. It is no reason why the information available should not be given. Furthermore, I see no reason for not making educated guesses, calling them just that, and then revise the

tables each year, adding, changing, deleting as new information becomes available—as the Conference of Governmental Hygienists is now doing with their tabulation of threshold limit values.

It must be recognized in industrial hygiene work, however, that a limit or standard is not a sacred value, but is a guide to good operating conditions. Every practicing industrial hygienist knows that the concentration of atmospheric contaminants fluctuates as a process cycles, as leaks develop, as misoperation occurs, thus giving rise to "peak" concentrations. If these "peaks" go above the accepted maximum, it is important to know how high they go and how frequently they can be expected to occur.

Once this information is available, it is the job of the toxicologist and/or the hygienist to evaluate the significance to the overall conditions and act accordingly. This is by no means a simple assignment. It is quite possible for a single "peak" exposure to occur during a shift and last for but a few minutes and yet provide a total intensity of exposure in excess of what can be tolerated for the entire shift. If this sort of situation occurs very infrequently, it may not be too serious, but if it happens regularly, then it may present a condition which needs correcting.

If "peaks" are superimposed upon an exposure level which is already crowding the safe level, then they become very significant and may be expected to have an adverse effect. If they are superimposed upon a basic level which is well below the accepted limit, then they may have little significance.

It is not uncommon among industrial hygienists to average or to time-weight the values they obtain in a plant survey and to draw conclusions as to the safety of such conditions from the resultant figure. This is not a valid procedure.

Time-weighting assumes that concentration-time (CT) values are constant and this is true only if the slope of the response curve is one; it assumes that CT = K for all ranges of concentration and this is not true because of variations and/or differences in factors such as rates of absorption and elimination and the nature of effects produced.

It also does not take into consideration the chronological order in which these peaks may occur. The response from two or three peaks occurring within a short time can be expected to be much more serious than if these peaks occur at widely separated intervals.

I think it is most important to emphasize the importance of sampling procedures. Spot sampling is a poor way to assess total exposure; it is too easy to miss "peak" exposures, and in the hands of the untrained investigator, it may be too easy to sample only obvious "peak" exposures. Samples taken over a long period may be adequate for estimating total exposure, but they only give the average concentration over the sampling period and this may be inadequate. Only when one employs continuous sampling procedures which record the concentration at successive short intervals of time over a prolonged period of time, can one get a true picture of the actual exposure.

Now perhaps I should say a few words about what we saw in the Soviet Union. As many of you know, the maximum allowable concentrations in the U.S.S.R. are almost all considerably below ours and lower than those employed by most other countries.

The reason is that they attach a great deal of significance to any change, whether functional, biochemical, or pathological that can be detected in exposed animals or human beings. By this I mean that if they can detect any change they consider this to be a detrimental effect even if the change is readily reversible or if acclimation readily occurs.

We saw electroencephalograms taken from animals which showed changes for a few days after the start of a repeated exposure and then the charts were entirely normal even though exposure continued. Even such changes were considered adverse and the limits promulgated were below those causing such effects. I have considerable difficulty justifying such low levels on the basis of such observations.

In another instance, we saw curves representing the effect upon certain conditioned reflexes which indicated quite conclusively that prolonged daily exposure caused a progressive change which could only be considered adverse. This was at a stated concentration below that considered to be with-

out effect in the U.S.A. If this change was actually caused by the stated concentration, then they are right and we are wrong. The only question in my mind in this case is whether their analytical method is reliable and this I have no way of knowing.

There is no doubt that the criteria they are using to measure neurological change are more sensitive than those which have been routinely employed in this country in industrial toxicology. On the other hand, I saw very little analytical equipment which was comparable to ours. They are doing little, if any, continuous analysis of their industrial environments or of their experimental inhalation chambers. They are using spot sampling but even here, I was not impressed by the reliability of their sampling or methods of analysis.

I also have the impression that in many instances where they believe they have observed adverse effects in human beings as a result of exposure at levels similar to our standards, they really don't know what the exposure has been—because of inadequate sampling and analytical procedures.

Insofar as industrial hygiene practice in industry is concerned, I can only say that those plants which we were permitted to see were clean insofar as environmental exposure is concerned. They have used various methods of achieving these goals. We saw plants in which every pump was ventilated—and ventilated well. They have employed methods of fabricating which avoid the use of solvents, or other materials which might create a toxic hazard. How widely the excellent practices which I saw are actually in use can only be surmised.

In spite of their avowed objective of preventing all exposure to hazardous chemicals, they seem to pay little attention to safety. The steps in their factories are broken, there are low overhead pipes and beams, there is unguarded fast moving equipment, there are few barriers at ditches, and rarely did I see safety glasses or eye protection. This apparent lack of attention to such mechanical hazards is indeed hard to rationalize.

In closing I should like to return to my subject—the significance and application of industrial hygiene standards.

The values, regardless of what they are called, are not fine demarcations between safe and unsafe exposures, they cannot be used to compare the toxicity of one material with another, they are not toxicity ratings nor are they hazard ratings, and they should not be made a part of laws where interpretation is not possible.

They are figures which represent an over simplification of an attempt to interpret a very complex collection of information. To use them properly, one must know not only the facts upon which they are based, but also the details of the conditions under which they are to be used. The knowledge which enables one to do this, comes only from years of training and experience in the field of industrial hygiene.

SAFETY EXPOSITION EXHIBITORS—1963

Acme Protection Equipment Co., 1201 Kalamazoo St., South Haven, Mich.
Industrial gas masks and accessories.

Adolf and Company, Loveline Industries, 4915 N. Avers Ave., Chicago 25
Industrial clothing.

Advance Glove Mfg. Co., 901 W. Lafayette Ave., Detroit 26
Industrial work gloves and clothing.

Aetna Life Affiliated Companies, 151 Farmington Ave., Hartford 15, Conn.
Safety films and safety pamphlets.

Air Space Devices, Inc., 5428 Vineland Ave., N. Hollywood, Calif.
A safety device for protection from falling when climbing.

Akron Brass Co., 1450 Spruce St., Wooster, Ohio
Fire fighting equipment and accessories.

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

American Allsafe Co., Inc., 1245 Niagara St., Buffalo, N. Y. 14213
Drybrow sweatbands, nylon fan guards and related products.

American Biltrite Rubber, 22 Willow St., Chelsea 50, Mass.
A complete line of safety soles and heels.

American Chain and Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn.
Sling chains and sling chain assemblies, wire rope slings and assemble-your-own wire rope slings.

American Industrial Safety Equipment Co., 3500 Lakeside Ave., Cleveland 14
Welding and cutting goggles, spectacles, welders' lenses, hard hats, visitors' spectacles, and goggle clips.

American Jet Spray Industries, 1240 Harlan St., Denver, Colo. 80214
Sign making equipment.

American LaFrance, 100 E. LaFrance St., Elmira, N. Y.
Fire apparatus and fire fighting equipment.

American Optical Co., 14 Mechanic St., Southbridge, Mass.
Head, eye, respiratory, protective devices; safety clothing; safety specialty products.

American Safety Equipment Co., 261 Madison Ave., New York 16
Automobile seat belts.

American Society of Safety Engineers, 5 N. Wabash Ave., Chicago 2
Professional society.

American Viscose Div., FMC Corp., 1617 Pennsylvania Blvd., Philadelphia 3
Rayon cord strapping.

Ampco Metal, Inc., 1791 S. 38th St., Milwaukee 1
Hand tools of spark-resistant alloys for use in explosive or flammable conditions.

Antrex Corp. 1, 2001 W. Willow St., Chicago, Ill. 60647
Safety Talker Message Repeater, portable public address systems.

Apex Safety Products, Washington and Elm Sts., Cleveland 13
Safety hats and caps.

Sheffield, Div. Armco Steel Corp., 7100 Roberts, Kansas City, Mo. 64125
Wire rope and slings.

Atlas Safety Equipment Co., Inc., 175-179 N. 10th St., Brooklyn 11, N. Y.
Industrial safety belts, harnesses, and straps. Ladder climber's safety device. Sky Genie descent control.

Aurora Plastics Corp., 44 Cherry Valley Road, West Hempstead, L. I., N. Y.
Table-top layout of visual aid for traffic safety education in the school classroom.

Avon Sole Co., Avon, Mass.
Soles of various compounds and designs for use on safety shoes and work shoes.

B & K Instruments Inc., 3044 W. 106th St., Cleveland 11
Portable audiometer calibrators.

W. M. Bashlin Co., 119 W. Pine St., Grove City, Penn.
Linemen's and industrial safety belts, slings, high voltage rubber gloves, sleeves.

Bausch & Lomb Inc., 635 St. Paul St., Rochester 2, N. Y.
Vision and audio testing equipment.

Beam's Mfg. Co., 1327 N. Robinson, Oklahoma City
Automobile seat belts and shoulder straps.

Best's Safety Publications, A. M. Best Co., Inc., 75 Fulton St., New York 38
Safety publications.

Bethlehem Steel Co., 701 E. Third St., Bethlehem, Pa.
Wire rope, sling and boom pendants, beam guard rail, and anchor safety nets.

V. Bibicoff Tool Co., Box 1204, Ann Arbor, Mich.
Safety band cutter.

H. L. Bouton Co., Inc., 320 Main St., St. Buzzards Bay, Mass.
Industrial eye protection, goggles, and spectacles.

Breath-O-Life Oxygen, 419 High Ave., Cleveland 44115
Emergency oxygen administration set.

Lester L. Brossard Co., 540 N. Michigan Ave., Chicago 11
Safety mirrors for industrial use. Liquid hand cleaner.

Stewart R. Browne Mfg. Co., 258 Broadway, New York
Portable explosionproof inspection lights.

R. H. Buhrke Co., 1403 W. Congress Pkwy., Chicago 7
Occupational safety equipment—safety belts, straps, strap assemblies, harnesses, and allied products.

E. D. Bullard Co., 2680 Bridgeway, Sausalito, Calif.
Safety hats, caps, and accessories, industrial first aid kits, safety hoist hooks, vehicle alarms, air purifiers, and ear plugs.

Cah Industries, 10245 Pacific Ave., Franklin Park, Ill.
Self-extinguishing waste receptacle.

Campbell Chain Co., P. O. Box 1667, York, Pa.
Sling chains.

Canrad Precision Industries, Inc., 2834 W. Lake St., Chicago 12
Phosphorescent tape and fluorescent tape for vehicle and personnel markers.

Casco Products Corp., 512 Hancock Ave., Bridgeport 2, Conn.
Hand-portable pressurized dry chemical fire extinguishers.

A. B. Chance Co., 210 N. Allen St., Centralia, Mo. 65240
Hot line maintenance and line construction tools. Hot line tools.

Charleston Rubber Co., 16 Stark Industrial Park, Charleston, S. C.
Rubber, plastics, and rubber coated gloves, aprons and sleeves.

The Chemical Corp., 54 Waltham Ave., Springfield 9, Mass.
Protective creams, skin conditioners, and hand cleaners.

Chicago Eye Shield Co., 2727 W. Roscoe St., Chicago 18
Head, eye and respiratory protection equipment.

Chrysler Corp., 341 Massachusetts Ave., Detroit
Safety features in 1964 line of automobiles and trucks.

David Clark Co., Inc., 360 Franklin St., Worcester 2, Mass.
Muff-type ear protection.

The Coca-Cola Co., P. O. Drawer 1734, Atlanta 1
Coca-Cola served through the courtesy and cooperation of the Coca-Cola Bottling Company of Chicago.

Columbus McKinnon Chain Div., Columbus McKinnon Corp., Tonawanda, N. Y.
Sling chains, hooks, and coupling links.

Cramer Posture Chair Co., Inc., 625 Adams St., Kansas City 5, Kans.
Aluminum safety ladders and safety stools.

Custom Materials Inc., 279 Billerica Road, Chelmsford 1, Mass.
Static-free and permanently conductive polyolefin.

Davis Emergency Equipment Co., Inc., 55 Halleck St., Newark 4, N. J.
First aid kits, gas masks and breathing equipment, combustible and toxic gas analyzers, and protective hats.

Demp-Nock Co., 21433 Mound Road, Warren, Mich.
Pressure sensitive plastic film lettering kit.

Detex Watchlock Corp., 76 Varick St., New York 13
Watchmen's clocks.

R. E. Dietz Co., 225 Wilkinson St., Syracuse 1, N. Y.
Lanterns, torches, flashers, barricades, and safety equipment.

Dockson Corp., 3839 Wabash Ave., Detroit 8
Spectacles, goggles, face shields, helmets, hats, and respirators.

Dow Corning Corp., Box 7038, Greensboro, N. C. 24707
Sight Savers, lens cleaning stations.

Dymo Industries, Inc., Box 1030, Berkeley 1, Calif.
Labeling device for use in office or shop.

Eagle Mfg. Co., 24th and Charles Sts., Wellsburg, W. Va.
Safety cans, cigarette-cigar butt cans, drain cans, drip cans, brass dilers.

Edmont, Inc., 1205 Walnut St., Coshocton, Ohio
Coated and impregnated work gloves.

Electro-Beam Corp., Box 375, St. Joseph, Mich.
Warning lights, barricades, and accessories.

Electronic Specialties Co., Island Ave., Batavia, Ill.
Warning lights, barricades, and accessories.

Elkhart Brass Mfg. Co., Inc., 1302 W. Beardsley Ave., Elkhart, Ind.
Nozzles and other fire department supplies and fire fighting equipment.

J. H. Emerson Co., 22 Cottage Park Ave., Cambridge 40, Mass.
Resuscitation equipment.

Erdco Engineering Corp., 136 Official Road, Addison, Ill.
Gas vapor alarm systems.

John Evans' Sons, Inc., 500 N. Thirteenth St., Philadelphia, Pa. 19123
Collapsible, portable, traffic cone.

Falcon Alarm Co., Inc., 20 Stern Ave., Springfield, N. J.
Fire alarms, sirens, horns, bells and other signaling devices.

Federal Sign and Signal Corp., 13625 S. Western Ave., Blue Island, Ill. 60406
Sirens, horns, bells, and warning lights for visual and audible signaling.

Fendall Co., 2222 Diversey Pky., Chicago 47
Spectacles, face shields, and cup-type and cover goggles.

Ferno-Washington, Inc., 6th and Pine Sts., Greenfield, Ohio
Emergency patient handling equipment and accessories for the first aid room.

Fibre-Metal Products Co., 5th and Tilghman Sts., Chester, Pa.
Safety hats and caps, face shields, safety masks, welding helmets, headrest and combination goggles.

Fine Organics, Inc., 205 Main St., Lodi, N. J.
Solvents, carbon removers, emulsion cleaners, polishers, and disinfectants.

Ford Division—Ford Motor Co., Box 658, Dearborn, Mich.
Ford passenger car with safety features.

Franklin Metal Products, 213-215 N. Des Plaines, Chicago 6, Illinois
Waste cans and drum covers.

Frommelt Industries, Inc., 465 Huff St., Dubuque, Iowa
Wrap-around portable safety welding shield; portable welding screen.

Fyrepel Products, Inc., 160 S. Williams St., Newark, Ohio
High heat protective clothing and equipment for industry, space-military, and fire fighting agencies.

The Fyr-Fyter Co., 221 Crane St., Dayton 1, Ohio
Fire extinguisher, automatic sprinkler systems, electronic alarm systems.

General Fire Extinguisher Corp., 4444 W. Irving Park Rd., Chicago 41
Fire extinguishers.

Gentex Corp., Carbondale, Pa.
Safety helmets, life vests, sound reducers.

Glendale Optical Co., Inc., 600 W. Merrick Rd., Valley Stream, N. Y.
Eye and face protective equipment.

The Globe Co., 4000 So. Princeton Ave., Chicago 9
Safety grating, cable tray, channel and fittings, slotted angles.

Globe Safety Products, 125 Sunrise Place, Dayton 6, Ohio
Resuscitators.

Gojer Inc., Box 991, Akron 9, Ohio
Protective skin coat, skin cleaner, anti-seize and gasket compound.

Golden State Signs, 1260 San Fernando Rd., Los Angeles 65
Safety signs, danger and caution tags, badges.

B. F. Goodrich, Industrial Products Co., 36 Nichols Ave., Watertown 72, Mass.
Industrial rubber safety footwear, and protective clothing.

The Granet Corp., 25 Loring Drive, Framingham, Mass.
Coated fabric work glove.

A. E. Halperin Co., Inc., 20 Thorndike St., Boston 18
Stretchers, first aid kits, and accessories.

Hanover Aeronautical Engineering Corp., 107 Washington St., Hanover, Ill.
Safety cans for flammable liquids, oily towel bins, and excelsior storage bins.

Hawkins-Hawkins Co., Inc., 1255 Eastshore Highway, Berkeley, Calif. 94710
Traffic safety signs and devices. High level warning scope.

Haws Drinking Faucet Co., 4th and Page Sts., Berkeley, Calif.
Emergency eyewash and showers.

Hazard Controls, Inc., 8100 Holman Ave., Delair, N. J. 08110
Warning lights, barricades, signs, reflectors, cylinder clamps, lockouts, ladder shoes, can carriers, flags, and barrier rope.

Warren Heim Corp., 222 N. 5th Ave., Mt. Vernon, N. Y.
Canvas buckets, bags, and protective covers.

Hild Floor Machine Co., Inc., 1217 W. Washington Blvd., Chicago 7
Explosionproof vacuum cleaners and floor scrubbing and polishing machines.

Hilti Fastening Systems, 360 Fairfield Ave., Stamford, Conn.
Power-assisted drive tools that fasten pins and threaded studs into concrete masonry and steel.

HIMCO (Hopfeld Industrial Mfg. Co.), 745 A St., San Rafael, Calif.
Safety ladders, and fiberglass safety diving boards.

Holland-Racine Shoes, Inc., 386 W. 15th St., Holland, Mich.
Horsehide and cowhide safety shoes in work and dress styles.

Hygiene Research, Inc., 684 Broadway, New York 12
Hand protective ointments and fogproofing cloth.

Hy-Test Safety Shoes, Div. of International Shoe Co., 1509 Washington Ave., St. Louis 66
Safety shoes and conductive and nonconductive footwear.

Industrial Gloves Co., 700 Garfield St., Danville, Ill.
Industrial clothing and accessories.

Industrial Incentives, Inc., 253 Freeman Pkwy., Providence 6, R. I.
Employee safety education program.

Industrial Products Co., 2820 N. Fourth St., Philadelphia 33
Lightweight rainwear, fluorescent vests, hat covers, barrier rope, flags.

Institute of Industrial Launderers, 1025 Connecticut Ave. N.W., Washington 6, D. C.
Rental service for uniforms, wiping towels, etc.

Insto-Gas Corp., 998 W. Woodbridge Ave., Detroit 7
UL-approved LPG plumbers' torches and furnaces, LPG hand cylinders and torches, LPG salamanders, blower and infrared heaters, and electric infrared heaters.

International Film Bureau, Inc., 332 S. Michigan Ave., Chicago 4
Safety films available on a sales and rental basis.

Interstate Rubber Products Corp., 908 Avila St., Los Angeles 12
Traffic cone system for traffic control.

Iron Age Shoe Co., 1205 Madison Ave., Pittsburgh, Pa. 15212
Work and dress-style safety shoes and safety rubber footwear.

Jackson Products, 5523 E. Nine Mile Rd., Warren, Mich.
Goggles, welding helmets, face shields, safety hats and caps.

Johnson-Williams, Inc., 2300 Leghorn St., Mountain View, Calif.
Portable instruments for detection of toxic combustible gases.

Jomac-North, Inc., 6128 Woodstock St., Philadelphia 38
Chemical and protective vinyl clothing and gloves, and terry cloth gloves and products.

Jones and Co., 861 Broad St., Providence 7, R. I.
Full-vision visor goggles and replaceable lenses.

Junkin Safety Appliance Co., Inc., 3121 Millers Lane, Louisville, Ky. 40216
Interlocking barrier gate guard for power presses; safety shields for grinders; stretcher cases and stretchers.

Justrite Mfg. Co., 2061 N. Southport Ave., Chicago
Safety cans, bench cans, plunger cans. Oily waste cans. Electric lanterns and flashlights for use in hazardous areas.

K & H Industries, Inc., Box 86, Angola, N. Y.
Safety lamp.

Karel First Aid Supply Co., 4342 Ogden Ave., Chicago 23
Medical equipment for industrial hospitals and first aid rooms.

Kelmore, Inc., 599 Springfield Ave., Newark 3, N. J.
Explosion proof refrigerators and freezers.

Kennedy-Ingalls, Inc., 3735 N. 35th St., Milwaukee 16
Protective clothing.

Keystone View Co., Market and Center St., Meadville, Pa.
Occupational visual service, driver vision test service, and gas sensing and recording instruments.

Walter Kidde and Co., Inc., 675 Main St., Belleville 9, N. J.
Portable fire extinguishers, and accessories. Automatic carbon dioxide fire extinguishing systems.

Kimball Safety Products Co., 9310 Wade Park Ave., Cleveland 6
Personal protection devices for employees in industrial plants.

Mathias Klein and Sons, Inc., 7200 McCormick Road, Chicago 45
Linemen's and electricians' hand tools, linemen's safety equipment, wire-pulling tools.

Knapp Brothers Shoe Mfg. Corp., 173 Spark St., Brockton, Mass.
Safety shoes.

J. Kunz Glove Co., 2141 W. North Ave., Chicago 47
Leather and rubber work gloves.

Lapstrap Inc., 443 N. St. Francis, Wichita, Kan.
Automobile safety belts. Rear view mirrors.

Lectron Corp. of America, 9929 W. Silver Spring Rd., Milwaukee 18
Audio-visual training equipment.

Walter G. Legge Co., Inc., 101 Park Ave., New York 17
Safety floor maintenance materials. Personnel and equipment grounding devices.

Lehigh Safety Shoe Co., First and Minor Sts., Emmaus, Pa.
Leather and rubber safety footwear including conductive and electrical hazard shoes.

Lineman Protector Co., 1081 Eton Rd., Birmingham, Mich.
Rubber protective equipment.

Logan Emergency Showers, Box 111, Glendale, Calif.
Emergency eyewash and showers.

Lyn Products, Inc., 44 Industrial Road, Crystal Lake, Ill.
Magnetic safety switch.

Lynrus Finishing Co., Inc., South Water at Union St., Poughkeepsie, N. Y.
Flame retardant process for safety clothing.

Thom McAn Shoe Co., 25 W. 43rd St., New York 36
Safety Shoes.

Julian A. McDermott Corp., 1639 Stephen St., Ridgewood, Brooklyn 27, N. Y. 11227
Warning and safety lighting for municipal, industrial and utility use.

McQuarrie Enterprises, 6029 Washington Blvd., Culver City, Calif.
Automobile safety belts.

Machinery Center, Inc., 1201 S. 6th West, Box 964, Salt Lake City 10
Sala Safety Block.

Madigan Electronic Corp., 520 Mineola Ave., Carle Place, L.I., N.Y.
Self powered glow belt, exit sign, pylon street sign.

Martindale Electric Co., 1375 Hird Ave., Cleveland 7
Protective masks and refills, protective eyeshields, and electrical testing instruments.

Medical Supply Co., 1027 W. State St., Rockford, Ill.
First aid kits and accessories. Resuscitation training aids, stretchers.

Metropolitan Life Insurance Co., One Madison Ave., New York 10
Materials for use in community and off-the-job safety programs.

Meyer Machine Inc., Box 114, Red Wing, Minn.
Safety products for the protection of person while climbing.

Micro Switch, A Division of Honeywell, 11 W. Spring St., Freeport, Ill.
Safety interlock switches and electric controls for power machines.

Milburn Co., 3246 E. Woodbridge, Detroit 7
Protective skin creams. Acid-caustic resistant and clean room work clothes.

Miller Allied Corp., 2425 Santa Clara Ave., Alameda, Calif.
Material handling slings and adjustable lifting safety beams.

Miller Equipment Co., Inc., 13th and New Sts., Franklin, Pa.
Linemen's safety equipment and accessories.

Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8
Complete line of safety equipment for industry and mining.

Minnesota Mining and Mfg. Co., 2501 Hudson Road, St. Paul 19
Filter mask, heat reflective fabric, abrasive flooring, safety masking tape.

Mott Corp., 500 Shawmut Ave., LaGrange, Ill.
Safety mowers.

National Chemsearch Corp., Box 10087, Dallas, Texas
Safety solvent; cleaners; degreaser; disinfectants; weed killers detergents; insecticides; and water treatments for industry.

National Medical Supply Co., 6121 W. Belmont Ave., Chicago 34
Medical supplies, instruments, equipment, and drugs for industrial medical departments.

Newco Mfg. Co., Inc., 3636 Main St., Kansas City, Mo. 64111
Wire rope fittings, minature slings, and a minature crane demonstrating various lifts.

Norman Industries, Inc., 814 Diversey Pkwy., Chicago 14
Complete line of traffic control mirrors and security devices.

Occupational Hazards, 812 Huron Road, Cleveland 15
Occupational Hazards Magazine.

E and J Resuscitators—Ohio Chemical and Surgical Equipment Co., 1400 E. Washington Ave., Madison 10, Wis.
Resuscitation and oxygen breathing apparatus.

Onox, Inc., 121 Second St., San Francisco 5
Skin-toughener solution for the treatment of athlete's foot.

Osborn Mfg. Co., Box 271, Warsaw, Ind.
Safety pliers, lockout devices, mufflers, and stretcher cases.

Oxygen Equipment and Service Co., 8335 S. Halsted St., Chicago
Resuscitator, inhalator, and aspirator.

Pac-Kit Safety Equipment Co., Inc., 1 Seneca Pl., Greenwich, Conn.
Industrial and vehicle first aid kits.

G. H. Packwood Mfg. Co., 1545 Tower Grove Ave., St. Louis
Hand cleaners, waterless cleaners, germicidal cleaners, sanitizing compounds, and maintenance cleaners.

Patent Scaffolding Co., Inc., 38-21 Twelfth St., Long Island City 1, N. Y.
Wood and light metal ladders and stages, steel and aluminum scaffolds.

Pfizer Laboratories, 235 E. 42nd St., New York 17
Hand-operated apparatus for applying artificial respiration.

Pinkerton's National Detective Agency, Inc., 100 Church St., New York 7
Applicant investigations, uniformed guards, surveillance, security surveys, sign service, and investigations.

The Pioneer Rubber Co., 1939 Tiffin Road, Willard, Ohio
Industrial gloves.

Portable Light Co., Inc., 65 Passaic Ave., Kearny, N. J.
Portable searchlights, warning lights, and vehicular sirens.

Porto-Clinic Industries, Inc., 298 Broadway, New York 7
Complete portable driver testing and training unit.

The Positive Safety Mfg. Co., 4403 Perkins Ave., Cleveland
Power press safety devices.

Prairie State Products Co., 3822 Lawrence Ave., Chicago
Industrial safety signs.

Protectseal Co., 1920 S. Western Ave., Chicago
Safety containers for the handling, storing, and dispensing of flammable liquids.

Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn, N. Y. 11217
Respirators, eye protection, helmets, protective clothing, asbestos and leather gloves, safety glasses, first aid kits, and face shields.

Quabang Rubber Co., 17 School St., North Brookfield, Mass.
Safety tread soles and heels.

RMC Canvas & Rope Co., 428 Atlantic Ave., Brooklyn 17, N. Y.
Safety nets and rope ladders.

Racine Glove Co., Inc., Box 38, Rio, Wis.
Safety gloves and apparel for industry and fire protection, safety specialty products.

Radiant Color Co., 461 W. Erie St., Chicago 10
Daylight fluorescent colors in paints, pressure-sensitive vinyl sheeting and papers.

Radiant Mfg. Co., 8220 N. Austin Ave., Morton Grove, Ill. 60053
Automotive highway warning sign installed in metal case for permanent mounting on under lid of auto trunk.

Radiator Specialty Co., 1400 W. Independence Blvd., Charlotte 8, N. C.
Traffic guides; cones, lights, flags.

Rainfair, Inc., 1501 Albert St., Racine, Wis.
Wet weather and safety clothing.

Randolph Laboratories, Inc., 1450 Frontage Rd., Northbrook, Ill.
Fire extinguishers and automatic fire extinguishing systems.

Record Industrial Co., 3301 Arch St., Philadelphia 4
Industrial safety shoes, work clothing and work gloves.

Red Wing Shoe Co., 119 Main St., Red Wing, Minn.
Safety workshoes, oxfords, and boots.

J. C. Renfroe and Sons, Inc., 1926 Spearing St., Jacksonville, Fla.
Safety clamps for lifting steel.

Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa.
Aetna Drivotrainer.

Rockwell Sprinkler Co., 38 Harlow St., Worcester 5, Mass. 01605
Fire fighting and extinguishing devices.

Rose Mfg. Co., 2700 W. Barberry Pl., Denver
Automotive seat belts. Industrial safety belts, lanyards, nets, and ladder safety devices.

Rubber Fabricators, Inc., Grantsville, W. Va.
Life preservers, life rafts, and protective rubber clothing.

Safeguard Mfg. Co., Pomperaug Ave., Woodbury, Conn.
Guards for power presses.

Safety Box Toe Co., 812 Statler Office Bldg., Boston 16
Steel toes for dress, semi-dress, and work shoes.

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Safety clothing and equipment for industrial workers.

Safety First Products Corp., 175 Saw Mill Road, Elmsford, N. Y.
Portable stored pressure dry chemical fire extinguishers.

Safety First Shoes, Inc., 9th and Greenleaf Sts., Allentown, Pa. 18105
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Rubber safety blade for rotary power lawn mowers.

Saf-T-Boom, Corp., 1513 Main St., Little Rock, Ark.
Dielectric shields for crane booms.

Salescaster Displays Corp., 1010 E. Elizabeth Ave., Linden, N. J.
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W. H. Salisbury and Co., 401 N. Morgan St., Chicago
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Sawyer-Tower Products, Inc., 76 Stanley Ave., Watertown 72, Mass.
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Gloves, portable welding screens.

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Stephen-William Co., 2014 W. Wabansia Ave., Chicago 47
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Sterling Equipment Manufacturers, 2630 Cherry Street, Erie, Pa.
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Stonehouse Signs, Inc., 842 Larimer St., Denver 4
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Stop-Fire, Inc., New Brunswick, N. J.
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Synchro-Mat Equipment Corp., 714 Byrant St., Jackson, Mich.
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S. G. Taylor Chain Co., Inc., 3-141st St., Box 509, Hammond, Ind.
Alloy steel chain and fittings.

Tirri Distributors, 8016 W. Marion St., Milwaukee, Wisc.
Safety glass accessories.

Timms Optical Co., Inc., 1015 Commerce St., Petersburg, Va. 23804
Safety frames, safety lenses and vision tester.

Tri-Tix, Inc., 100 N. Lake St., Port Washington, Wis.
Safety cones and traffic posts.

Tulareloft, Inc., 300 E. San Joaquin St., Box 248, Tulare, Cal.
Seat belts and harnesses.

Turner Halsey Co., Inc., 40 Worth St., New York
Textiles for safety garments and work clothing.

Union Steel Products Co., 640 N. Berrien St., Albion, Mich.
Wire mesh "Palletainers" for storage, transporting, and handling of finished or in-process material.

United States Rubber Co., 1230 Avenue of the Americas, New York 20
Safety footwear.

United States Safety Service Co., 1535 Walnut St., Kansas City, Mo. 64108
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Vogt Mfg. Corp., 100 Fernwood Ave., Rochester 21, N. Y.
Fluorescent safety clothing and equipment.

Wagner Sign Service, Inc., 218 S. Hoyne Ave., Chicago 12
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Flame retardant fabrics.

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Welsh Mfg. Co., 9 Magnolia St., Providence 9, R. I.
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Industrial safety apparel.

Whelen Engineering Co., Inc., 42 Kirtland St., Deep River, Con.
Emergency and warning lights, flashers, and beacons.

Williams Jewelry and Mfg. Co., 10 S. Wabash Ave., Chicago 3
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Personal protective equipment for industry.

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Daniel Woodhead Co, 15 N. Jefferson St., Chicago
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Workion, Inc., 63 New York Ave., Huntington, N. Y.
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American Industrial Hygiene Association, 14125 Prevost, Detroit 27
Educational material on industrial hygiene.

American Optometric Association, 4030 Chouteau Ave., St. Louis 10
Educational material on vision and highway safety, and industrial safety techniques.

American Seat Belt Council, 271 North Ave., New Rochelle, N. Y.
An association of independent manufacturers of seat belt assemblies and component parts formed to maintain industry standards.

Chicago Fire Department
Information on the work of the Fire Prevention Bureau.

Chicago Police Dept., Traffic Div.
Traffic safety.

Inter-American Safety Council, 2 Rector Street, New York
Safety publications, visual aids, and films, in Spanish for industrial, highway, and home.

National Medical Foundation for Eye Care, Washington, D. C.

Prevention of Blindness Inc., National Society for the, 16 E. 40th St., New York, N. Y. 10016
Literature and information on industrial and vocational school eye health and safety programs.

President's Committee on Employment of the Handicapped, Washington 25, D. C.
Information on Hire-the-Handicapped Program.

U. S. Department of Commerce, Coast and Geodetic Survey, Washington, D. C.
Small craft safety.

U. S. Department of the Interior, 18th and C. Streets N.W., Washington, D. C. 20240
The exhibit directed to Public Safety in national parks.

U. S. Public Health Service, 4th and C St., S.W., Washington 25, D. C.
Information on the dangers of glass doors.

Veterans of Foreign Wars of the United States, Broadway at 34th St., Kansas City, Mo. 64111
The Veterans of Foreign Wars youth activities.

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National Safety Congress Transactions

AUTOMOTIVE and MACHINE SHOP; POWER PRESS and FORGING

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CEMENT, QUARRY and MINERAL AGGREGATES

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CHEMICAL and FERTILIZER INDUSTRIES

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Chemical Publishing Company, Inc., New York 10, N. Y.

Toxicity of Industrial Organic Compounds. Ethel Browning.

National Association of Mutual Casualty Companies, Chicago 6, Ill.

Handbook of Organic Industrial Solvents, 2nd edition (1961).

Respiratory Protective Devices

Dusts, Fumes, vapors and gases arising from chemical operations can be controlled for the most part by engineering methods. In some situations, however, the engineering control measures cannot be used or may not be sufficient by themselves or in combinations. Respiratory protective devices may then be used.

For information refer to:

Respiratory Protective Devices Manual. Published by American Industrial Hygiene Association and American Conference of Governmental Industrial Hygienists (1963). Available from Braun and Brumfield, Inc., Box 1203, Ann Arbor, Mich.

Lists of respiratory protective devices approved by the U. S. Bureau of Mines are published periodically and may be obtained from that Bureau, 4800 Forbes Street, Pittsburgh, Penn.

American Standard Safety Code for Head, Eye, and Respiratory Protection, Z2.1 (1959). Published by American Standards Association, Inc., 10 East 40th Street, New York 10, N. Y.

Periodicals:

National Safety News—Published by National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill.

Chemical Week—Published by McGraw-Hill Publishing Co., McGraw-Hill Building, 330 W. 42nd Street, New York 36, N. Y.

Industrial and Engineering Chemistry—Published by American Chemical Society, 1155 Sixteenth Street, N. W., Washington, D. C.

American Industrial Hygiene Association Journal—Published by the American Industrial Hygiene Association, 14125 Prevost, Detroit 27, Mich.

Archives of Environmental Health—Published by American Medical Association, 535 North Dearborn Street, Chicago 10, Ill.

Journal of Occupational Medicine—Official Publication of the Industrial Medical Association, 55 East Washington Street, Chicago 2, Ill.

Industrial Medicine and Surgery—Published by Industrial Medicine Publishing Company, Miami, Fla.

THEORY, APPLICABILITY AND DESIGN OF AN EXPLOSION SUPPRESSION SYSTEM

By R. J. KEATS
Mgr., Manufacturing Engineering, Chemical & Metallurgical Div.,
General Electric Co., Pittsfield, Mass.

The only system of its kind in operation within the General Electric Company and known to be the only installation of its kind on phenolic molding compound in the United States, the Fenwal explosion suppression system, now installed and operating in Pittsfield, Mass., is a welcome addition to the field of explosion protection.

Description

The system consists of three basic components—the sensors, the control unit, and the inerting or quenching devices. In the design of the protecting system, the first action to be taken was selection of the most probable locations for a potential explosion. Two areas in the phenolic manufacturing process stream were selected, namely, points where grinding was to take place. Here the combustible source, the dust generated in grinding, is present. There is sufficient oxygen present to bring the dust to oxygen ration within the explosive range. Here also, and the basic reason for select-

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FERTILIZER SECTION

SAFETY IN HANDLING AMMONIUM NITRATE

By RALPH D. MILLER
Technical Dir., Agricultural Chemicals Div., Spencer Chemical Co., Kansas City, Mo.

I have been asked to speak on the subject of safe storage and handling of ammonium nitrate, both in bulk and in bags. This happens to be a subject that I am always happy to speak about, as ammonium nitrate has been one of the main interests of my work for the last 20 years.

Much has been said about ammonium nitrate which is both true and untrue. I will attempt to sort out the facts of the information given out and attempt to give you the straight story as it is best known to us today.

The first thing, I suppose, that anyone thinks about in regard to ammonium nitrate is the disaster at Texas City. This certainly was a terrible catastrophe which caused a tremendous wave of fear of ammonium nitrate to sweep over the entire country. As a result of this disaster, many organizations and technical groups pooled their abilities to study the facts which evolved from the information found.

Let us study some of the facts and see what are the characteristics of ammonium nitrate itself before I attempt to talk about the storage of bulk or bagged material.

The ammonium nitrate which was involved in the Texas City catastrophe was a product coated with a combustible substance known as PRP. This was applied to prevent the ammonium nitrate, which is a very hygroscopic material, from picking up moisture and becoming caked. PRP consist of one-third petrolatum, one-third rosin, and one-third paraffin. This was applied to the ammonium nitrate at the rate of 1 per cent, which was the ordnance department's specification for material which was being shipped to the ravaged countries overseas as a result of World War II. The same composition was used in fertilizer grade ammonium nitrate used domestically.

Ammonium nitrate itself is a very stable material, but it is known for its ability to supply oxygen upon decomposition. It is, therefore, referred to as an oxidizing agent, which means that it will increase the intensity of a fire when involved in a fire with combustible materials. Pure ammonium nitrate itself is almost noncombustible. You should try this sometime to acquaint yourself with ammonium nitrate. Get a bag of fertilizer grade ammonium nitrate and dump it out in a pile and then attempt to burn it. It just simply is almost impossible — even try a blow torch on it.

Knowing the burning characteristics of ammonium nitrate and the characteristics of the product which was used at Texas City, let us examine the mechanisms of this characteristic. An example is air—something we have around us and breathe every day—which is definitely an oxidizing agent because it contains oxygen. It is perfectly safe but it causes things to burn. Mix it in a confined container with a combustible such as atomized oil or coal dust or flour or anything of that nature. Ignite it and you have a real explosion. Ammonium nitrate, being a solid—which has the same characteristics when mixed intimately with a combustible such as oil, coal dust, carbon black, and so forth—is then at that time considered a blasting agent.

After this information, you may realize that the Texas City ammonium nitrate had one per cent combustible coating on it; this material is known to be sensitive if sufficiently initiated and could explode if a sufficient booster is set off in its midst. This type of material will burn completely if placed in a pile and ignited.

Now, let us see what has been done today to change this situation. After the Texas City disaster and the inter-agency reports which were made as a result of the studies of that accident, the manufacturers have discontinued the use of a combustible as a coat-

ing agent and have replaced it with either kaolin clay or diatomaceous earth. Both of these materials, as you know, are quite inert, and, of course, absolutely noncombustible. Since this change has been made in the manufacture of fertilizer-grade ammonium nitrate to include the inert parting agents, there has never been an explosion of this material as such. Contrary to many newspaper reports, the material has been handled safely and has been involved in dozens of fires with no difficulty whatsoever. As a matter of fact, there are well over a million tons of this material shipped, handled, and stored every year.

Let me attempt to straighten out some of the confusion as has been produced in the past, by such as the incident at Roseburg, Oregon, which was immediately reported by the press as being fertilizer ammonium nitrate. The report was absolutely false, as the material involved in this cargo contained 3,000 pounds of dynamite and 9,000 pounds of the nitro-carbo-nitrate. Nitro-carbo-nitrate is a compound which consists of an oxidizing agent and a combustible, usually ammonium nitrate and diesel fuel. With 3,000 pounds of dynamite and 9,000 pounds of the blasting agent, it was expected that this material would explode, as it was manufactured for that specific purpose. The truck containing this material was properly marked and identified. It simply was left standing in the city, which was in a most unfortunate position, as a fire started in a warehouse adjoining it. Leaving the truck in a congested area in the first place was contrary to regulations.

The explosion at Norton, Virginia, was reported to have involved ammonium nitrate fertilizer. Again, this was nitro-carbo-nitrate at a mixing plant for a mining area. The plant mixed ammonium nitrate with diesel fuel and supplied it to the people using it for blasting purposes. A fire developed in the plant as a result of welding. In the fire were acetylene cylinders and oxygen cylinders. Although no explosives were reported to be present in the building, it did involve nitro-carbo-nitrate, a blasting agent.

Shipping Port, Pennsylvania, was another incident in which a fire developed involving nitro-carbo-nitrate and not fertilizer ammonium nitrate.

Traskwood, Arkansas, was the site of a train wreck that resulted in an explosion. This, although not officially explained, probably was caused by the mixing of ammonium nitrate with oil which was part of the shipment. This train wreck involved many cars of petroleum products—tank cars and box cars containing drums. There were two cars of ammonium nitrate involved in this wreck and, I believe, there were 21 cars piled up in this accident. The accident was caused by a hot box on one of the tank cars containing petroleum. This condition resulted in a sheared axle, causing the wreck and the pile-up of the cars. The pile-up of the cars resulted in a mixture of many of the products, of course. The investigation of the accident indicated that one car of ammonium nitrate actually blew up. The other car was blown to bits, but it, itself, did not blow up, and ammonium nitrate was scattered over the entire area. Of course, it is believed that the one car which was broken open must have gotten well mixed with oil which was flowing in the ditches in the area and burning with a tremendous fire. The big problem was this: it had never been definitely proven that a mixture of ammonium nitrate and oil would explode by fire alone. As a result of this particular accident, the industry commissioned the Bureau of Mines to investigate the accident. This investigation has been financed by the ammonium nitrate manufacturers.

One thing that did not immediately come to the attention of the investigators was the fact that in this accident, there was a tank car containing fuming nitric acid, or 100% nitric acid. As a result of the investigation, it was found that when fuming nitric acid is mixed with oil, an immediate explosion results. The instant the nitric acid is added to burning petroleum, a detonation results with high speed velocity. This has been proven, since this investigation started, completely, and has been confirmed by many other laboratories.

Here, then, was the possible booster for the material, and it could have been the cause of the initial explosion which occurred at Traskwood, Arkansas.

The National Fire Protection Association has prepared a code for storage of ammonium nitrate, but it is still in a tentative state. I think the code is very good, and, I might say, is the result of much work by a

committee consisting of representatives of various groups, including insurance companies, fire marshals, industry representatives, and transportation people, as well as several expert consultants. I personally feel that it is too restrictive, but it is certainly a good model code for use by all regulatory groups.

I have strayed from the subject, but I feel that a background and a better understanding of the material is necessary before we discuss proper storing methods of bulk ammonium nitrate fertilizer. I think you will agree from this information that the storage of ammonium nitrate is reasonably safe provided it is handled according to MCA or NFPA recommendations and is not intimately mixed with a combustible, such as oil or particulated metals or powdered combustibles such as carbon black, coal, and so forth.

Actually, the bulk material is easier to store from a fire standpoint than is the bagged material because the paper bags are easily ignited, and the bulk product simply is not easy to ignite.

Let me go through the procedure as specified by the model code of the National Fire Protection Association. I will not attempt to read this entire code to you because I think much of it would not be of value at this meeting. I will start with this part:

"The code shall apply to all persons, firms, corporations, co-partnerships, and associations storing, having, or keeping ammonium nitrate; and to the owner or lessee of any building, premise, or structure in which ammonium nitrate is stored.

"Not more than 50 tons of ammonium nitrate shall be stored within any building or structure, unless the location and storage facility has been approved. Storage location shall be subject to approval by the authority having jurisdiction with respect to nearness of residential occupancies, places of public assembly, schools, hospitals, railroads, and public highways. Limitations on storage quantities shall be considered with regard to the proximity of these exposures and congested commercial or industrial districts. Approval of large quantity storage shall be subject to due consideration of possible vapors from burning ammonium nitrate."

The main consideration in this type of storage is the burning vapors, because when ammonium nitrate does burn or is involved in a fire, it can decompose into two compounds—mainly into nitrous oxide or laughing gas, and into nitric acid vapors which are very toxic and dangerous to personnel. I will go on with the code:

"Storage buildings shall not be over one story in height or have basements unless approved for such use and shall be equipped with lightning-rod protection if located in an area where lightning storms are prevalent. Storage buildings shall be adequately ventilated or be of a construction that will be self-ventilating in the event of fire. The walls of storage buildings shall be of fire-resistive construction, if located adjacent to other buildings.

"Piles of combustible materials and similar exposure hazards.—The roof covering shall be fire retardant. All flooring in storage and handling areas shall be a noncombustible material or protected against impregnation by ammonium nitrate and shall be without open drains, traps, pits, or pockets in which any molten nitrate could flow and be confined in the event of fire.

"The continued use of existing storage buildings or structures not in strict conformity with this code may be approved in cases where such continued use will not constitute a hazard to life or adjoining property.

"Buildings and structures shall be dry and free from water seepage through the roof, walls, floors."

Now, I will take up the section on bulk storage:

"Compartments.—Bins shall be clear and free of material which may contaminate the ammonium nitrate. Due to the corrosive and reactive properties of ammonium nitrate and to avoid contamination, galvanized iron, copper, lead, and zinc shall not be used in bin construction, unless suitably protected. Aluminum bins and wooden bins protected against impregnation by ammonium nitrate are permissible. Steel and wood can be protected with two or more coats of paint which is resistant to ammonium nitrate, such as an epoxy or polyvinyl chloride base paint. The warehouse may be subdivided by partition walls into any desired number of ammonium nitrate storage compartments or bins. Piles or bins shall be so sized and arranged that

all material in the pile is moved out periodically. Height or depth of pile shall be limited by the pressure-setting tendency of the product. Ammonium nitrate shall not be accepted for storage when the temperature of the product exceeds 130°F.

"Dynamite, other explosives, and blasting agents shall not be used to break up or loosen caked ammonium nitrate.

"Ammonium nitrate shall be separated by approved-type walls of not less than one-hour fire resistive rating from storage of organic chemicals, acids, or corrosive liquids, compressed flammable gases, flammable and combustible materials, or other contaminating substances, including but not limited to animal fats, baled cotton, baled rags, baled scrap paper, bleaching powder, burlap, or cotton bags, caustic soda, chloride of lime, coal, coke, charcoal, cork, camphor, excelsior, fiber of any kind, fish oils, fish meal, hay, lubricating oil, linseed oil, or other oxidizable or drying oils, naphthalene, calcium, oiled clothing, oil paper, oil textiles, paint, quicklime, straw, sawdust, wood shavings, or vegetable oils.

"Walls referred to in this section need only extend to the underside of the roof covering.

"In lieu of separation walls, ammonium nitrate may be separated from the materials referred to in this section by a space of at least 30 feet or more, as required by the authority having jurisdiction; and if necessary, sills or curbs shall be provided to prevent mixing during fire conditions.

"Prohibited Articles. — Flammable liquids such as gasoline, kerosene, solvents, and light fuel shall not be stored on the premises, except as provided by the Flammable Liquids Code, NFPA No. 30. LP Gas shall not be stored on the premises, except as provided in the Standard for Storage and Handling of Liquefied Petroleum Gases, NFPA Bulletin No. 58. Sulphur and finely divided metals shall not be stored in the same building with ammonium nitrate. Explosives and blasting agents shall not be stored in the same building or on the premises with ammonium nitrate unless proper distances are maintained in accordance with the American Table of Distances for Total Quantity of Explosives, Blasting Agents, and Ammonium Nitrate. See the Code for the Manufacture, Transportation, and Storage and Uses of Explosives and Blasting Agents, NFPA Bulletin No. 495.

"Automatic Sprinklers. — [This is under the chapter on fire protection.] Unless the storage of a greater quantity is approved by the authority having jurisdiction, not more than 2,500 tons of ammonium nitrate shall be stored in a building or structure not equipped with an automatic sprinkler system. When determining whether greater quantities shall be permitted, the authority having jurisdiction shall take into consideration exposure of the storage building to built-up areas, possible presence of contaminants in the storage building and the availability of water supplies. Sprinkler systems shall be of the approved type and installed in accordance with the Standard for the Installation of Sprinkler Systems, National Fire Protection Association's Bulletin No. 13. Silo-type storage structures need not comply with provisions above.

"Extinguishing Devices. — Suitable fire-control devices, such as small hose or portable extinguishers shall be provided throughout the warehouse and in loading and unloading areas. Water supplies and fire hydrants shall be available in accordance with recognized good practices and as required by the authority having jurisdiction. The requirements for automatic sprinklers, water supplies and fire hydrants set forth in this section may be waived by the authority having jurisdiction when storage facilities are located in remote areas."

This code is quite lengthy, and I will not attempt to go into the legal provisions that are supplied for suggested provisions for municipal regulations. But I have given you the basic facts as to the contents of the code for the storage of bulk ammonium nitrate.

Some of you may wonder about the critical mass of ammonium nitrate as it was reported in the Inter-Agency report. I would like to clarify that issue for you by stating that the critical mass of 126.8 tons—as stated in the Inter-Agency report following Texas City—was in regard to a problem, purely theoretical, as calculated for a mass consisting of, I presume, a sphere in which, of course, the center would be equidistant to all sides in which ammonium nitrate was heated to the point at which the heat could not be conducted out-

ward; and at such a point, self-heating could start and continue. This calculation was based, I understand, on the mass being solid, which would apply to a mass of stored, pelletized or granulated ammonium nitrate. Some of the outstanding scientists today have made some calculations in regard to critical mass of granulated or pelletized ammonium nitrate, and the amount is 2.22×10^{8} tons. It certainly cannot apply to any of the quantities which we have discussed here today, or would ever be considered as storage quantities.

The Manufacturing Chemists's Association's Bulletin A-10 and Supplement for Bulk is the best known reference for handling ammonium nitrate, and I recommend the reading of the National Fire Protection Association's bulletin on the Behavior of Ammonium Nitrate in Fires.

LIQUID NITROGEN—MIXING, STORING AND APPLICATION

By ELMER C. PERRINE
Dir., Technical Service, Nitrogen Div., Allied Chemical Corp., New York City

Short and sweet could be the subject if it were confined to the safe handling of nitrogen solutions alone.

It would be short because operators could be advised to use properly designed and safeguarded equipment made of corrosion resistant materials. Corrosion is at the base of many serious accidents, for much of the welding and cutting is performed on equipment which has suffered destructive corrosion. The subject could be shortened by advising the operator to handle his present nitrogen solution in a manner to avoid salting out of the nitrogen salts or to choose a solution which would minimize those prospects. Many accidents in cold weather are associated with attempts to free blocked lines with high heats.

The responsibilities for many accidents could be placed on acids, pressures, heats or equipment failures where many accidents do develop.

Unusual in a safety subject, the talks could also be sweet if the influence of personalities on accidents were not discussed. The subject could then be closed by advising close supervision of the operations and inspection of the equipment.

But such a subject, if short and sweet, would be useless.

For we do have some materials, designs and techniques which leave much to be desired. We do have many other ingredients which are inseparable from the process.

The above short, sweet, and useless approach to safety could be adopted for each of the ingredients without solving any problems.

Today's marvelous fertilizer is not only nitrogen solutions, phosphates, and potash. It is what can be made with ammonia, ammonium nitrate, urea, sufuric acid and phosphoric acid, potassium chloride, steam, water, hot air, cold air and all the potentials for good and evil when they are handled with skill and without skill.

We also have human beings and much of safety is in protecting people from themselves.

An honest treatment of any one of several factors in the safe manufacture of fertilizer cannot be short nor sweet if it is to be useful.

The chemical industry has progressed partly because it has found ways of safely handling any material and by realizing that precautions must be used in the handlings.

The results of combining nitrogen solution with other ingredients as well as the properties of all of the ingredients and the nature of the finished product have their influences on the handling of nitrogen solutions.

For nearly 30 years nitrogen solutions have been handled in large quantities with a good safety record in nearly every mixed

fertilizer plant in this country. For about the first 15 years, there were very few serious accidents of any nature. As practically no attention was given publicly to safety, the good early record must have resulted from the amounts used being small. The nitrogen solution was tossed unceremoniously into crude equipment. The pipe which delivered the solution into the mixer was not even referred to as a distributor until the rates of ammoniation were about doubled in the late '40's, by the same means of good distribution throughout the mass. The use of acid as such was practically unheard of and heat was something to be avoided as a plague, which it was in those days. Blasting was common and quite safe because the amount of nitrogen salt was far below a critical point even if the pile temperature was high.

The ammoniating nitrogen solution can be handled safely if a few basic facts are respected.

In nitrogen solutions, vapor pressure results from the contained ammonia. The gas which may escape from the liquid is ammonia gas. It will usually not be released in such large amounts and as rapidly as will the same gas from anhydrous ammonia, which is about 99.5 per cent ammonia.

Ammonia gas is flammable or explosive in mixtures with air. The range of about 11 per cent to 29 per cent in air by volume is the widest range which appears in print for ammonia. For safety, it must be assumed that explosive mixtures can exist in any vessel where ammonia and air can exist together. It would require from about 20 to 60 times as much ammonia in air for an explosion or burning than can be endured by an unprotected man. It is unlikely that an explosion or a fire from ammonia would occur in the immediate vicinity of a person but the vagaries of ventilation could make this possible. Ammonia gas is lighter than air.

Concentrations as low as ½ of one per cent or one per cent ammonia in air can be fatal in a short time and it requires very little ammonia to create uncomfortable working conditions. The full-view cartridge type ammonia gas mask with speaking diaphragm is suitable for atmospheres which contain no more than three per cent ammonia. The compressed air tank and the hose-supplied types are suitable for much higher concentrations. There is, however, danger to the skin in high concentrations of ammonia in the air.

Any vapor pressures above that of the atmosphere must be taken into account, for it alone can cause a large flow of nitrogen solution at breaks such as gauge glasses, hoses, piping, leaks in tanks, and broken or faulty valves.

Some accidents occur when operators are uncertain whether a tank has been emptied of nitrogen solution during operations. The use of enough air pressure on the supply tank to avoid volatilization, or bubbling, at every point in the entire system will practically eliminate the uncertainties. This adequate air pressure is necessary whether the solution is moved by air pressure or by pumps. Accurate outrun and inventory records made constantly available to the operator will give a check on measuring devices and on the process at a time when the records can be of some service.

The contained nitrogen salts, ammonium nitrate and urea, as they exist in the solutions, are not serious safety hazards as shown by the fact that many thousands of tons of the dry material is handled annually. But they may be a serious factor in some equipment failures and where formulation practices crowd other safety factors very much.

Too many serious and fatal accidents result from applying heats beyond that of low pressure steam to equipment which has any nitrogen salt deposits in or on it. The high heats are applied knowingly to bring back into solution the salts which have precipitated out of the solution and blocked some passage, or in altering, repairing, scrapping, or salvaging equipment. The choice of the correct material of construction and the correct nitrogen solutions should greatly reduce these dangerous acts. Insulation of pipe lines should also contribute to safety.

All surfaces should be cleaned, as clean as when they were new, with water, wire brushed, and more water, before any high heat is applied near the area of the deposits. Deposits from spillage should be flushed away with generous amounts of water.

One type of accident occurs in the presence of nitrogen solution but the cause or causes are from other sources, for the nitrogen solution is almost always being used

exactly as before the accident. The variations are in other factors in most of these cases. When materials such as nitrogen solutions, sulfuric acid and potassium chloride are being mixed in large quantities at 230° F. with only five per cent or less of water, there is not much room for error. Sometimes, through the corrosion in meters, faulty metering of sulfuric acid, or local concentrations through faulty distributor pipes, enough sulfuric acid may be delivered to cause flash fires or explosions in the mixer. When the mass fails to mix but merely rocks or slides in the mixer, there may be a direct contact between nitrogen solutions and sulfuric acid without much buffering effect of the other materials.

Nitrogen solutions and acids are safely and successfully mixed directly in the prereactor where the good, controlling influence of water is effective.

Nearly all formulae as determined by management are theoretically safe for the equipment as it was originally designed. But operators may add more acid as an easy way to control ammonia fumes rather than determine the cause and correct it, which is usually easily done. Faulty meters, plugged or corroded distributor pipes for acid, nitrogen solutions and water, interrupted recycle, and failure of mixing for any reason may cause dangerous local or general concentrations or shortage of materials with a formula that is, overall, well-balanced.

If the safety margin is thinned in a process in efforts to meet competition, there must be some offsetting influence. Increased understanding of the potentials and alertness seem to be needed. Here is where human nature enters; the nature of management, supervision, and labor as well as equipment and material suppliers.

It isn't enough to know the properties and potentials of one material such as nitrogen solution. Where is the gain in supplying the fine equipment and techniques for handling one material when dangerous amounts of another material may be added through the use of improper equipment or techniques?

All along the industrial front, processes are being stepped up or scrapped if they cannot be stepped up. This pressure, like all pressures, is spreading in all directions to include materials, designs, and above all, people.

Remember—the handling of any material requires some precautions. Also remember that every material can be handled safely.

Many things which are being done now can be done almost equally well in some other way with some other material. When a thing is performed safely and economically by a large number of people, a man marks himself by doing less well.

Francis Bacon once said, "That which man altereth not for the better nature altereth for the worse." From experience we have learned that there is no end point in safety work; in learning this we have learned humility.

HUMAN RELATIONS AND SAFETY GO HAND-IN-HAND

By H. H. VAN BOCKEL
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No matter what your title, no matter what the size of your organization, if you have become the administrator of the safety program, it is up to you to get things going, it is up to you to employ your skills and facilities to keep it going. Working out a successful safety program is a man-sized job. But you have to get at it!

This speech is directed to safety people who are removed from the actual operations and those directors who have the time, but not the inclination, to enhance their program by getting out of the office and into the field. They are those safety people who think only of gimmicks to enliven some interest in safety without being seen working at safety by supervisors and employees.

If you are a safety director responsible for several representatives, this will be of interest to you. It will also be of value to you if you are a safety man whose program needs something besides gimmicks and contests; if your program needs good, honest and sincere representation with line supervisors and employees; and if it needs full cooperation from management, supervisory staff and hourly employees. You will recognize that safety is selling and that you must be a top-notch salesman. You have a product to sell; one of the best ways of selling safety is through human relations.

People responsible for maintaining a successful safety program must maintain the interest and safety consciousness and cooperation of (1) top management; (2) the supervisory staff; and (3) the employees. In dealing with all these people, remember this point: you can be the best of safety engineers and have great technical knowledge, but if the before-mentioned persons do not respond to you, cooperate with you, your department will accomplish very little.

I believe that many safety people forget the one important facet of their being, that they must accomplish through others. You must enlist their sincere cooperation, interest, and concern for a conscientious well-established safety program. I don't mean being subservient. I don't advocate vacillation. You must have everyone's support. You must be a human relations expert. A good safety engineer who has technical knowledge to solve and anticipate safety hazards but who is held in dislike, who is scoffed at, and has no one pulling for him, soon will be seeing a program fail.

The safety man does not have to be a "good time Charlie." He need not make apologies for pushing safety. This I do not advocate. But he does have to get with key men in the organization to get his work done. A safety man's work is not done primarily in his office; his best work is done in the field. He has to make his personnel contacts while the people are on the job.

Successful safety comes about when you recognize your basic safety problems, and spend time in the plants discussing these pertinent problems and mutually seeking answers to them.

This presentation will be three-fold.

I. Dealing With Top Management

There is nothing more desirable for good management thoughts regarding safety than that it is being directed by a person who has a keen sense of the importance of safety coordinated with production. Indoctrinating a change that hinders production can do serious harm, not only to you but to the safety program. When you are instituting changes, do them as cheaply as possible, so long as they are effective.

Keep your boss or bosses informed about the savings realized from the program—the savings *he* has made by having a safety program.

Persuade your management to attend and co-chair every supervisors' safety meeting. This is vital. Fortunately, we have a manager who does this regularly. We hold a regular supervisor safety meeting each month and he speaks at each meeting. There are occasions when other pressing business may lure him away, but get with him and ask that he show his fervor for the program. A few choice words to any manager about the necessity for his sponsorship spurs him.

No manager today who is aware that his branch or division or corporation is enjoying a good safety record will consciously let it regress. Make him aware that his attendance is necessary to keep the supervisors interested. Don't mince words, be frank: tell him he is needed, and that by his helping here, you, in turn, can do a much better job. Also, keep in mind that his attendance helps to keep him interested.

A very successful role is played by our manager also during visits to the plant. I am always reminding him that a few choice remarks or comments from him to supervisors and employees about safety during every plant tour does more to promote safety than anything else I know. And he has been tactfully direct.

Therefore, our supervisors know as well as our employees that the top people of the company are interested in the safety program. Recently, the manager came to me and said that he had seen a couple of our mechanics working in a bucket elevator. Not only did he ask the men if they had locked out the switches or pulled the fuses, but he personally checked to see. He didn't have to tell me this, because earlier in the

day members of the maintenance crew and an operating supervisor had already informed me, although I was pleased the boss did tell me. Believe me, this word got around. A safety program can't help but succeed with such backing. You know this as well as I. How many of you have managers who will do such a thing besides just giving lip service? Your first move is to enlist or frankly insist that your top people or managers express the same interest.

How do you get such backing? Frankly, I just plain asked him and I got it. You will have to decide for yourself how to enlist management support. You should make them realize their importance in showing support of safety. Be insistent, but be tactful. A safety man has to use all his wiles to win support. But, the most important aspect of all is to make your top people realize that your safety program is tempered with practicality and that you are enthusiastic and sincere in promoting successful safety.

Once you tell your boss that the safety program is saving money for the firm, and you can prove this, keep reminding him that it is due to *his* efforts that we are on top of the heap. We have a good safety reputation, but without his continued support, there is only one way we can go. No manager relishes such a thought. Many times I have heard our manager say, "We have a good safety record. We work hard at it, and we are going to do our best to keep it that way." Personally, I hate the thought of working without such support. I need it, you need it, every safety man needs it, and you have to enlist this support—do it openly! Don't beat around the bush. Make your intentions and desires known.

II. Dealing With Supervisors

As safety people, we believe the supervisor is also the key to a good program. He is required to investigate every accident. He is required to participate in the training of his men, to maintain good housekeeping, to perform various safety functions. He is also responsible for *production*.

Without a doubt, building a good, sound safety program through the cooperation of supervision is easier with management backing. A superintendent or supervisor realizes more and more that safety runs a close race with production if management openly states it is *policy*. Much of what I said about top management applies to supervision regarding participation in safety meetings, etc.

What about your dealings as a safety representative with line supervision? How do you effectively use your management skills to coordinate a successful program through the supervisors? Supervisors must take active part in safety decisions so that there is no loss of production. It is common practice for many plants to let the line supervisors carry out the safety inspections, accident investigations, and all safety functions by themselves. This is very good up to a point. We believe that is as effective and stimulating for supervisors to team up with safety representatives in periodic plant investigations. I don't mean for line supervisors to lean on the safety personnel like a crutch; however, as you both double-man a department, you not only gain a closer working knowledge of each other, but a mutual respect for the department's hazards. Further, it is psychologically sound for supervisors and safety people to be seen by the employees openly working toward a common goal: *their safety*.

We ask our supervisors for ideas and suggestions to help us do a better job. I myself lean heavily on several key supervisors as to what we should do and when. I present the issues and they come up with the answers. They then realize fully that safety is also their program and more often than not, their suggestions and ideas will be superior to your original thinking.

Many times I felt like stomping down to the plant and shutting down some equipment until certain safeguards were installed. Instead, I reconsidered and approached the department head and explained the situation to him. Invariably he was already aware of it and had made plans to alleviate it as soon as practicable. If it is of a serious nature and it is imperative that it be fixed immediately, he and you both realize this, and by discussing the problem the situation is then taken care of immediately.

Of course, we have those cases where it is difficult to get some supervisors to consider safety and production simultaneously. The temporary set-ups with their hazards in the respective departments run on and on. I am not advocating a soft touch policy for those supervisors. However, you should use

all the management skills you know to first bring them into your camp. Use only as a last resort your authority either by yourself or with management backing to see that safety takes its proper place in their departments' scheme of things. Once you sway the hard ones, they invariably become your staunchest supporters.

Your job is to hold each supervisor responsible for maintaining a climate of safety in the area under his supervision. You can only do so by being man on the spot. It is quite obvious that the supervisor who is in direct contact with the workers will be the person needing most of your attention. The safety man who counsels foremen and who spends most of his time working and helping tactfully with safety problems is making headway.

You must get along with the supervisors pushing safety with you; your ability to get the job done through them is imperative. Each supervisor brought into the camp of the safety representative is one more salesman for safety and it behooves the safety man to work with him untiringly. Don't let him feel he is carrying it alone. Get with him. Supervisors are the spokesmen for the safety program. We must understand them and respect them for the job they do.

III. The Employees

As for maintaining the interest and safety consciousness of the employees, here again, as with management and supervisors, we ask *our* employees to help us through their ideas and suggestions. We have an employee safety suggestion program that has reaped benefits for our entire organization.

The most important element in dealing with employees is *recognition* and giving it to them as often as possible. Recognition for safety costs you nothing. We feel we do an effective job on employee education training, etc. Our training is very similar in most aspects to that used by others.

Any successful program must have at its very core a sincere, genuine, personal interest in the welfare and well-being of the individual employee by each echelon of plant management, particularly interest by the employee's immediate supervisor and by the safety director. Any indication of non-sincerity or lackadaisical interest in the program by any supervisor, by you, a safety director, or any member of management, will do irreparable harm to the program. It can throw years of hard work right out the window.

We openly give recognition to our employees for performing jobs safely. It is done without reservation. What you must do is get people to participate in any kind of safety activity. By participation, they get sold on the benefits and become involved, so much so, that they then sell others on safety's value.

We achieve the participation and involvement of our employees in safety through a suggestion program, a very successful one. Don't scoff—I know some of you have tried such programs to get employee participation without much success. Why yours was not successful, I couldn't begin to tell you. All I know is that ours is the best thing that ever happened to keep our program progressing. We need employee participation. We sorely need the suggestions. We get an average of 15 suggestions per month. These suggestions get our people involved in thinking safety and do a tremendous amount of accident hazard ferreting that you and supervisors may not even see in your inspections.

First of all, if you have to double "in brass," as in my case, wherein you are responsible for personnel and labor functions in addition to safety, you simply cannot devote more than 30 to 50 per cent of your time to safety, and even if you could devote all of your time, someone else has got to help carry the load. Your supervisors—yes. But thats not enough!

Summary

The person responsible for safety is usually most successful when he does not rely solely on his own technical knowledge, but makes use of the technical knowledge and skills of others in his organization in meeting safety problems. He is most effective as a coordinator. He must have the ability to get people to do things for him, the safe way. He must be the man on the spot.

Persons responsible for safety must have these ingredients: enthusiasm, sincerity, patience, and persuasiveness.

Caring or not caring can spell the difference between success and failure in safety—in fact, in every human relationship. "Nothing great was ever achieved without

enthusiasm," said Emerson. And what is enthusiasm but passionate caring?

I have told you nothing that you didn't already know, but perhaps you have been made aware of some aspect of human relations in safety that you may feel should be highlighted in your organization or that has been neglected lately.

A WORKABLE SMALL PLANT SAFETY PROGRAM

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I am very happy to be talking about a small plant safety program because if you have the right kind of safety program or, putting it another way, if you are correctly and soundly organized for safety, your organization, whether it be one small plant or many small plants, can effectively cope with production changes such as producing fertilizers by granulation, the bulk blending of fertilizers, the addition of the sale of nitrogen products and pesticides, and new ways of producing plant foods that haven't been dreamed of yet.

With a sound safety activity, your organization or plant can expand from 20,000 tons a year to 60,000 or 80,000 tons a year and still control work injuries. With a sound safety activity, you can take full advantage of new information or ideas which become available in the safety field whether it be new ways to guard machinery or new ways to guard the mind. Many breakthroughs seem to be on the horizon in the area of understanding, anticipating, and controlling human behavior.

With a sound organization, you will be able to take full advantage of all of these changes. Many locations are experiencing two to three times as many injuries away from the job as they are on the job. With a sound safety activity, your organization will be able to begin to control this kind of injury, too.

Before we discuss the mechanics of organization, I think it is important that we make perfectly clear what we are trying to do. What is our objective? In some organizations the objective may be to keep your boss happy. In some organizations the objective may be to keep the insurance company inspector who visits your plant from time to time off your back. This organization would greet him at the door, shown him as little of the plant as possible, and get rid of him as soon as they could. Maybe what you are trying to do is keep your home office management group or home office safety man off your back. You may greet that man at the door when he visits your plant, show him around, and when he leaves say, "O.K., now that man is gone; we can relax and do things the way we like to do them and were doing them before he visited."

Perhaps your objective is to achieve a low injury frequency rate. Or, your objective might be to make your product efficiently. Currently the product is mixed fertilizers of various grades. In the future, the product might be more bulk blended fertilizers, greater emphasis on nitrogen solutions, or new ways to fertilize soil that we haven't even thought of. If this would be your objective, you would be making your products safely; because if your people are away from work in hospitals due to work injuries, you can't produce plant foods with maximum efficiency.

If you are making your products efficiently, you undoubtedly will be doing all you can do to make your product as profitably as possible. I maintain that the objective we should set before ourselves in the plant food industry is to make our product efficiently. If we do this, we will then make our products safely, we will reduce the cost of work injuries as much as possible, and we will allow our hard earned money to go to the owners of our

business rather than be eroded away by payments to people who are hurt or to doctors for things that do not in any way contribute to what we are trying to do.

If we agree that this is our objective, we should first write this objective down and should communicate it to our people. In larger organizations the objective can be prepared by formulating a policy. The policy could be: "This company insists on safe operations because it believes that every employee is entitled to a safe place to work and because it realizes that safe operations are efficient operations. The company will make every reasonable effort to maintain safe operations and it expects the active cooperation of all employees in the achievement of this goal."

Or, the objective could be: "Responsibility for safe operations extends from top management of the company to the newest employee in the plant. Safety is an every day, all-the-time job for everyone." In a very small plant, the objective could be prepared much more informally. It could be written in the manager's own words, typed up, and put on the bulletin board.

If this objective is going to be meaningful, it has to truly reflect the attitude of the plant manager or of the management of the company. If management has a high and noble objective of eliminating all accidents and then won't spend a nickel for a guard, that management group would have done better setting no objective at all. If management is being hypocritical, people will soon see through this and will know that management is trying to kid them. The best objective is an honest statement of the attitudes of management on this subject.

To be meaningful this objective has to be communicated to all of the people in the plant down to the newest employee. It should tell what the company expects from its people so that shortly after they enter the door of the plant or go through the gate they will soon understand what is expected of them. If this approach is taken, you will find that your people are working with you to achieve the objective, and not against you. With this communication the objective becomes almost a condition of employment in your operation.

Some locations say that their company insists upon safe operations and that unsafe employees will not be retained. What you do at your location should be dependent upon how you normally deal with your people on other matters. It is foolish to fire people for working unsafely if they are retained when they are alcoholics or have very high absentee rates. What you do in this area should be consistent with how you deal with your people on other matters.

How can you reach your objective? How it can be attained will vary from plant to plant depending on the size of the company or plant but primarily in the way that the company or plant normally do business. At a small plant of five or six people, you can have a very informal organization, while at large plants, plants of 100 or more employees, you have to organize along more formal lines to be able to do anything, whether it be to carry out a safety function, to manufacture a product, or to maintain quality controls.

Secondly, the right spirit is necessary if you are to reach your objective. If management is truly sincere, and if the people engaged in the mechanics of carrying out the desires of management are truly sincere and have a great deal of enthusiasm and high morale, this attitude can overcome flaws or details which are wrong in the safety activity itself. A location can be organized along the soundest lines, have a theoretically perfect safety activity, and yet have a poor safety record if this essential spirit is missing.

If management has its mind on things other than the safety activity, the safety performance can go as sour as last month's milk. The reason that spirit and sincerity of purpose is so important is because you must change the behavior of your people to achieve success. You are not filling out reports or doing a simple mechanical job. With our still very incomplete knowledge and skills, you and I are trying to bring behavior changes in fellow human beings. And believe me, this is challenging work.

Now that we have determined what our objective is, let's discuss those things which are necessary to achieve this goal.

First, management must accept responsibility for controlling injuries. The purpose

of this portion of our safety activities is to determine who will be held accountable for performance. This item is being mentioned first because it is the most important. In our company we define management responsibility as follows: "Responsibility for the control of injuries rests with operating management from plant manager to each foreman as a part of the regular management duties. Management must take active leadership in and support safety activities by their participation in the control of accidents for injuries to be prevented."

If management is going to behave responsibly, it must take the lead and must always set the example. The situation is the same as it can be when you are at home with your children. If you tell your children to eat their spinach but you yourself won't touch the stuff, you undoubtedly are going to find that not much spinach is being eaten at your house.

At a plant one of the supervisors actually tried this. He stood in front of a group of his men and said, "I insist that all of you wear hard hats." But he didn't wear one himself because he didn't believe they were necessary. Can you possibly guess what the attitude of the people in his group was toward hard hats? The answer is obvious. His people didn't wear hard hats when he was out of sight. So management must set the example and take the lead before employees will follow them.

I was talking the other day to the safety director of a large company and he said, "Thank God management wants safety where I work. If they didn't, my efforts would just fall flat and we would have a horrible safety record. Then I would start looking for a job where I was wanted." With management support, a location has a fighting chance to prevent injuries. This is a make-or-break item.

Without management responsibility, you are not going to prevent injuries. With it, you have the possibility of doing so. If there are any unsatisfactory or weak links in an organization, the safety effectiveness of that organization is going to be weakened. By weak link I mean a person who has not fully accepted the responsibility for preventing injuries. If that weak link is high enough up in an organization, the efforts of many people down the line and of many dedicated safety people will go for nothing. So it is important that management, from top to bottom, clearly accept responsibility for the control of injuries and show this acceptance by actively participating in the control of accidents and by insisting upon this control.

The second aspect of organizing for safety is the appointment of a safety supervisor or safety engineer, whatever title he may go by. At a plant of five or six employees, this man would be the man who gets all the production out, does the hiring, and does everything else that gets done in the plant. He would be the one and only member of management in the plant.

In a plant of 50 or 60 employees, this duty might be delegated to a general foreman or to one of the key foremen at the plant. At larger plants this person might be the personnel manager who would do this work part time. In a very large plant a full-time employee might carry out the duties of safety supervisor.

It is important to remember that this person is not responsible for preventing injuries. As we have discussed, that responsibility rests with line management. But this man does have very important responsibilities. This person is responsible for the quality of the advice he gives management, or, in other words, the way in which he counsels management. If safety people give management good advice, counsel them correctly, and tell them about the things that should be done, they carry out one of their responsibilities. To the degree that they do not give management sound advice, they behave irresponsibly.

The second responsibility of safety people is the responsibility to fully carry out their duties to the last detail and with enthusiasm and spirit. Many people who have worked in the area of safety will remember that there are three basic "E"'s in safety activities. They are Engineering, Education, and Enforcement. I have always felt that there should be a fourth "E". The fourth "E" would stand for Enthusiasm, because if a safety person is enthusiastic when he carries out his delegated duties, that enthusiasm may well be catching and will, therefore, help instill management with that same spirit.

One of the plant managers in our own company recently told me that he thought

of the safety man at his location as his conscience. He said that he had his own built-in conscience that told him what to do and what not to do in his personal life, but at the plant he sometimes got so busy that didn't have time for that built-in human conscience of his to operate. Therefore, he had a man on his staff, whom he asked to act as his conscience and to tell him what he should do in safety and when to do it. The appointment of a competent employee to carry out the duties of safety supervisor is very important. However, this is not nearly so important as management acceptance of responsibility in the first place, because if management has accepted responsibility, it will see that a competent person is appointed.

The third aspect I would like to review is the instruction and training of employees. The purpose of this portion of a sound plan for safety is to show what behavior you expect and to show your people how to achieve this expected behavior. Because there are few mind readers in the population, the plant superintendent, the foreman, and the safety supervisor must work together to make sure all employees are told what is expected of them.

One idea that I picked up in this area recently is the sponsor system or the buddy system which a plant with an outstanding safety record recently created. The plant appoints an experienced employee who knows all the ropes to act as sponsor to help orient new employees. This sponsor shows new people around the plant, helps explain the plant safety activities, and undoubtedly tells them many things about the plant which their foremen or another member of management never would tell them. This person tells them as one employee to another how they are expected to behave at the plant.

Safety rules are a very useful tool to explain expected behavior. These rules or work practices may be told to all new or transferred employees. At larger plants there can be a set of safety rules for all employees for the work done in different parts of the plant. It may be necessary to prepare a different set of safety rules for each different part of the operation. In very large plants these rules may be presented in a booklet or a pamphlet. If there is any choice, it usually is best to write down your safety rules so that there can be no question about them.

If these safety rules or required practices are going to be an effective part of your safety activities, they must be communicated to every employee, down to the newest one. And every person must understand and accept these rules. This will require more than the posting of rules on a bulletin board or reading them at breakneck speed in a safety meeting. This will require conscientious explanation and enough time for questions.

For your efforts in explaining the required behavior to pay off, you must then impartially enforce safety rules. At a plant about which I read about recently, one of the employees said, "The company drums safety into your head. They tell you what you have to do, and as long as you do this you're O.K." At the same plant the manager said, "We don't dare be soft with anyone who doesn't wear safety glasses or who violates safety rules. The people know where we stand, and they respect us for it." To show expected behavior and how to reach it, you must set down the rules of the game and make everyone play it that way.

The fourth key part of a sound safety activity is safety inspections. Safety inspections are necessary to find and correct unsafe conditions before those conditions catch up with one of your people. Probably the best way to locate unsafe conditions in a plant is to talk to the people who are exposed to the hazards in the plant every day—the person who almost got caught in a machine or who almost got splashed with acid.

Probably the man in the second-best spot to find physical hazards is the foreman of the group or crew. He spends most of his time in the department, and he should know pretty well what is wrong in it. Other help is available from the plant safety supervisor who should have the specialized vision necessary to find hazards.

You can also get help from insurance company people and from state agencies. These people would have the advantage of being able to compare the plant being inspected with many other plants that they have seen, but the disadvantage here is unfamiliarity with the plant being seen.

The best way to find unsafe conditions, then, is to ask a wide variety of people to try to locate them.

When you ask your people to help find unsafe conditions, you get another benefit from this beyond finding out which guards are off or which stairways are slippery. If you get your people involved in safety inspections, they start thinking about safety generally and their own safety specifically. This reporting of hazards increases the safety awareness. If your people report hazards and then see them get corrected, they will feel that the *company truly wants them to* behave safely because the company is willing to provide them with a safe place in which to work.

In some cases the condition which your employees report will be very dangerous. This will, of course, be helpful to you. In other cases the item reported will take a great deal of time and significant amount of money to correct. If you are sincere about providing safe working conditions, you should prepare a plan of organized approach to the correction of this hazard —and you should tell your people what you are doing.

In a number of cases they may point out things which just aren't a hazard. In these cases you should thank the person for the idea and tell him why the idea is not practical. By telling your people what you have done about each recommendation, you will avoid the attitude of an employee I talked to recently. He said, "I used to tell them about the unsafe things around here, but when I found out they didn't care, I finally gave up. It took me two years to give up, but finally did give up."

The next subject is safety communications. The purpose of this part of the safety plan is to establish good two-way communications between all people in your plant. At many plants management has little idea of what is in the minds of the people working in the plant, and the people have no clear idea of what management wants.

It is very hard to effectively and accurately communicate with people. Most of us do a great deal of sending without paying much attention to whether or not we are received. I read about a study made recently which indicated that only between 15 and 20 per cent of the things which top management said got down to the people for whom the message was intended.

There are many reasons for this failure to communicate which I only intend to touch upon. Often the top management in a company uses words in one way, plant superintendents understand these same words in another way, and the hourly people in a plant interpret these same words in still a third way. When a person has a preconceived opinion of the individual talking, the message may fall on deaf ears. I do not mean to try to analyze fully the reasons for this failure to communicate now. I only mean to make you aware of how hard it is to really communicate.

The best way I have found to communicate the safety message is a program called "Do It Today." An operation which has achieved an excellent safety record requires each foreman to talk to each employee each day about safety. I can't think of a better way to get the word down to your people than to "do it today."

Another way to get the word about safety to your people, and one which requires quite a bit less time, is to have regular safety meetings. At a plant of 20 or fewer people, this can be a meeting of all employees. In larger plants each foreman can talk to his crew. These meetings should be held monthly or more often if there is a special problem. They should be informal and should last only 10 or 15 minutes. Many plants schedule these meetings on a Monday morning so that, after a big weekend, people will get their minds back on their work.

At the larger plants a regular meeting of all supervisors to discuss safety may be necessary. This meeting can be run by the safety supervisor or by various foremen in turn. At these meetings material can be presented which your foremen can then use in their own safety meetings.

Another approach to safety communications is to establish safety committees. This is a poorer approach than holding safety meetings of all employees because the message only gets to five or six people who usually are already very interested in safety rather than to those people whom the message should get through if you are going to prevent accidents at your location. Safety committees also have another serious

disadvantage. Management normally handles production problems, maintenance problems, and personnel problems by individual conversations, by memorandums, or by conferences called to discuss a special problem. It is going to seem awkward to a plant superintendent to try to solve his safety problems by working through a safety committee. Safety problems should be solved in the same way that management solves other types of problems, and management should communicate with its employees about safety essentially the same way that it communicates with them on other problems.

A plant can also establish a joint safety committee which would consist of some members of management and some hourly employees. These committees can be a poor way to communicate the safety message to your employees for the same reasons that tend to make a safety committee inefficient. In addition to these reasons, employees can by-pass their own foreman in their comments about safety and thereby undermine the authority and position of the foreman. Employees should have the opportunity to discuss problems with people other than their foreman, but they should discuss problems with the foreman first.

Of all the approaches to safety communications, the best is between a foreman and each of his people separately, today and every day. If time does not permit this approach, then this communication should be between each foreman and his people in a group on a regular basis.

When you have done the things I have mentioned—assumed responsibility, appointed a safety supervisor, trained employees, inspected the plant, and communicated the message down to all employees regularly—the problem of keeping the activity going still remains. In other words, the problem of keeping or maintaining interest in safety must now be considered.

There are many things available to help you keep your people interested in safety. You can buy and put up posters. You can announce safety weeks or months and run pictures and cartoons. You can participate in National Safety Council contests or set up your own safety contests.

Do all of these things really help prevent injuries? I honestly don't know. I don't think that posters prevent accidents. There is a poster just outside my home town which says "drive safely." I don't drive a bit differently after I see that poster than I did before I saw it. But somehow this combination of posters, contests, gimmicks, and publicity does seem to contribute to the prevention of injuries—not by taking the place of the meat and potatoes items of management, responsibility and safety communications, but by keeping interest in these fundamentals at a high level.

The next part of a sound safety activity is the maintenance of records. The purpose of this is primarily to allow you to spot and head off unfavorable injury trends. If you keep some sort of a record of the number of cases which require only first aid, and when possible, near misses, as well as a record of all cases which require a doctor's attention, you will have a record which should be very helpful in your efforts to head off a serious accident.

According to a study made many years ago, there are 300 near misses and 29 cases requiring first aid or a doctor's attention for every injury in which the employee is forced to miss time from work because of the injury. There usually is quite a bit of notice or warning before a serious injury occurs in a plant. If there is one serious injury at your plant, there probably were about 300 cases in which your people almost were seriously hurt. The real advantage of keeping a good record of your safety experience, therefore, is to allow you to spot and head off serious injuries.

The area of medical and first aid should be considered. The purpose of this portion of a safety program is to get people into jobs for which they are physically qualified and to make sure that people who do get hurt get prompt treatment. I know of no reason why all employees who regularly work in a plant or who are regularly called back to work during a peak season should not get a physical examination. These physical exams certainly are much less expensive than one serious back injury.

All plants should make some sort of provision to take care of people if they get hurt. At a smaller plant, this can consist of a clean area where those who get hurt

can lie until an ambulance arrives and a few first aid supplies to treat minor injuries. Most important of all, at least one person should be trained so that he can give first aid in an emergency. The American Red Cross and the U. S. Bureau of Mines give this first aid training at no charge. The doctor who gives physical exams and who treats your people who get hurt would undoubtedly be happy to work with you to help you in this area.

The last thing I would like to discuss is the safety of your people while they are away from work. Studies have been made which show that for every injury occurring on the job, two to three happen while workers are away from work or are off the job. If a person gets seriously hurt while he is away from work, the company has to train a replacement or get along without him, and there are often company group insurance expenses. You can reduce the number of these injuries by keeping a record of these injuries and then by talking about off-the-job safety as a part of your regular safety activities.

To summarize my comments, I would like to again mention two things which really are make-or-break items. With them your efforts to control injuries will undoubtedly be successful. Without these two things, your efforts will never be successful. First, management must insist upon good safety performance in the same way that it insists upon good sales performance and low manufacturing costs. Second, this message must be communicated down to all employees in such a way that they accept the responsibility of doing their very important part in preventing accidents.

To put it another way, a safety program *will be successful if three things are done.* First, management must be willing to spend money to allow all people to participate in the safety activities. Second, there must be good two-way communication between management and all employees. And third, there must be teeth in the safety program.

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1963

Volume 7

National Safety Congress Transactions

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1963

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ELECTRICAL EQUIPMENT

NATIONAL SAFETY COUNCIL
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mean response time and variability both decrease as stress is applied. At some point the operator becomes disorganized, as evidenced by the variance of the response time increasing rapidly. This large variability is an obvious key to production errors and unsafe acts and subsequent accidents. It has long been believed that quality of performance and safety are highly correlated. Thus, we have an example of an indirect measure of safety since quality of output is much easier to obtain and describe than an unsafe act. Variability in output falls into this same category. An operator who loses control of his task is very likely to lose safety control. If this relationship can be demonstrated, those of us in safety will have arrived at a communication with management that they truly understand. We will have built a bridge between safety and production. Too long we have suffered under the unfair criticism of being opposed in some sense to production.

This stress-variability-unsafe act linkage is one which is particularly appealing to those of us who labor for safety in the dungeons of research. The critical question is whether there exists a basis for this in the industrial setting. It is certainly true that we cannot measure safety performance exclusive of product on performance, as we have attempted to do in the past.

We need to focus our concern more on safety measurement at the microscopic or individual level as suggested by unsafe acts or response variability. Microscopic or plant-wide measures are less instructive in pointing out what must be done. There is no panacea for the safety measurement problem. Our present measures leave much to be desired and there are alternative approaches which may permit better description. Perhaps research of this kind may lead us to greater insights into the true nature of the accident phenomenon and ways of measuring and controlling it.

OBSERVATION—PERCEPTION

By A. TIMOTHY WAAD
Special Services Asst., E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

An old-fashioned word for supervisor is overseer—one who inspects, examines, and observes. Though the title may be outdated, the idea holds true: A supervisor spends much of his time looking over the job. Whether he's checking progress against plan on a scheduled operation, or sizing up personnel, or looking for methods improvement, he's making observations on which he will probably base some action. The effectiveness as a supervisor—depend to a large extent on his capacity for sharp and thorough observation.

"Just looking" sounds easy, but good observation is an art. To test the truth of this statement, take two or three untrained observers, of different occupations, on a quick tour of your department. At the end, ask each one to write down what he saw. You'll probably find their impressions quite different—and also different from your own. A machinery salesman may note the makes and models of machines, and may already be planning to talk to you about replacements; a painter may see the machinery only as a blur, but chances are he'll know whether or not your walls need painting; a personnel man may estimate the number of employees engaged in various tasks, and he may form some impression of their morale. Each person sees the same department, but each pays attention to only a segment.

Though we see with our eyes, we observe with our minds. The factors that make the difference are perception and attention.

Sight is like a door; through it passes everything in front of our eyes. *Perception* is what the mind makes of these sights coming through the door; because people differ, their perceptions of the same sights will also differ. *Attention* represents the opening or closing of the door; and *observation* is the welcoming in through the door of the particular sights that interest us.

How well we see is determined by the physical condition of the eyes, but how well we observe is determined by interest and training. Helen Keller, without sight or hearing, has learned to observe better than many people with all their senses.

Certainly, anyone with normal physical equipment can train himself to become a better observer.

At Du Pont, an observation-perception training program is offered for supervisors. As a part of the training session, the men go out on a field trip into a section of a plant. They divide themselves into groups—one group looking for safety factors, another for cost-reduction ideas, a third for conditions affecting quality, and so on. Invariably, even in the best-run plants, they are able to spot a number of conditions that could stand improvement.

In one plant, the central safety committee, which had received training, made a tour to check on such matters as condition of fire extinguishers, handling of flammable materials, housekeeping, and condition of tools. Despite the fact that this was considered a "clean" plant, the committee found 69 conditions that needed attention. The tour paid off not only in safety, but in recognition, since the plant received top rating in the next plant audit by the safety and fire inspectors.

Spotting problems is not, however, the only goal of observation. An observer looks also for new ideas to improve an operation, a process, or a product. There are few, if any, plants or offices where observation won't yield suggestions for money-saving and money-making improvements.

Ideas can be found off the job as well as on it. Clarence Birdseye got the idea for frozen-foods processing by watching Eskimos quick-freeze their food supply. Dr. Max O. Kramer was on an ocean trip when he noticed porpoises moving faster than he thought any creature that size and shape could move in the water. He surmised that they must have some sort of device to reduce surface drag. When he got ashore, Dr. Kramer hurried to get himself a live porpoise for observation. As a result, he has now developed a rubber skin for submarines, patterned on porpoise skin, which is expected to reduce drag on the submarines, and double their speed under water.

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What does management in your company expect of you: Production? Safety? Morale? Cost control? Quality? The better you understand your job, the better you can choose what to look for in any given situation.

A seemingly small finding can be tremendously important—if it indicates something wrong in a process or product. In one plant, a scale was only slightly off zero. Because the scale was used to mix a product, the off-zero position spoiled the proportions of the mix. For some products, such as dyes, the consequences of even a slight off-zero position could be expensive.

3. Practice observing

The oftener you look with the conscious intention to observe, the more you will see at each fresh trial. Like all skills, observation improves with practice.

You'll get even better results if you check from time to time on the accuracy of your impressions. At Du Pont, a supervisor of an area being observed walks around with the observers. He learns many things he hadn't noticed about his own area of responsibility—and he is also able to correct false impressions or interpretations. On one trip, an observer mentioned that three men were working on a job that should normally have been done by two. The supervisor explained that the third man was a trainee receiving on-the-job instruction.

Don't define observation to your own job or your own department. Any new experience, like a field trip to another plant or department, or a visit to a new area, offers a chance for exciting new impressions. Needless to say, good observation is also an asset in conducting one's personal affairs. In driving, especially, the habit of noticing the important factors may some day save your life.

4. Keep an open mind

"Keep an open mind" sounds like simple advice; actually it's the most difficult to follow. We are all, without exception, biased to some extent by our own experiences, interests, and desires. We have all developed the ability to see what we want to see and to blot out unwanted impressions. Fortunately for man's survival, we also have interests that urge us to learn more and more about the world.

It might be worth while to examine some of the forces within us that tend to keep our minds either open or closed.

The strongest emotional barrier to information is *resistance to change*—the desire to retain the status quo. Everyone resists change to some extent, and some people are either so fearful or so smug that they can't imagine any change as an improvement. Fear of change blocks recognition of all but the most inescapable facts that might threaten the familiar and accepted situation.

Some desires are ambivalent. The desire to have friends, *to belong to a group*, will increase a person's awareness of anything that will help the group. But at the same time, it may close his eyes to facts that might reflect on, or might be resented by, other members of the group.

The *desire to think well of oneself* also cuts both ways. A situation that can be used for personal advancement will command plenty of attention; at such a time, observation may be keen. But the same feeling may cause a person to shut his eyes to any facts indicating that he's not quite as smart, as able, or as powerful as he would like to believe.

The *need for action* usually spurs observation. Have you ever noticed how fast you can find suitable Christmas presents on Christmas Eve? Or take another example: If a man learned that his company would have to go out of business unless it could reduce its costs, how do you think this would affect his ability to find cost-reduction opportunities?

Along with resistance to change, *desire for change* is built into most people's personalities. This is the greatest gate opener of all. Some fortunate people have tremendous curiousity. They are always looking for ways to change things—and they frequently succeed. The person who desires change is usually open-minded, and he can usually recognize the importance of his observations.

One way to increase open-mindedness is not to judge facts in advance. Don't deny the fact, no matter what conclusion it may seem to lead to. Keep your mind open, at least until you have all the facts.

5. Don't be satisfied with general impressions

There's more to most situations than meets the eye. A trick drawing is designed to fool

you—but a "clean" shop or a careful routine can fool you, too. An example of this occurred in a laboratory where a technician was running titrations—testing the strength of a chemical solution by dropping it into a graduated glass tube to find the smallest amount needed to bring about a reaction with another substance. He made three tests of the same chemical and got the same answer each time—yet according to the specification sheet, his answer was wrong. He and his foreman took the procedure apart step by step without finding an answer. Then the foreman happened to pick up the graduated glass tube, newly issued from the stockroom, that the technician had used for the readings Incredible as it may seem there were two number 27's printed on the scale.

One of our teams walked through a spic-and-span plant area. Everything seemed in order until they looked up and saw a conveyor moving on a monorail system without catch pans, directly over a bin where chemicals were stored. Grease from the rail could drop directly into the bin and contaminate the cehmicals.

6. *Guard against habit and familiarity*

You've probably heard the story about the middle-aged man who bought his wife a size 12 dress for their twenty-fifth wedding anniversary—because that was the size she wore when they were married! In the story, she enjoyed his mistake. In real life, she might wonder whether he'd taken a single good look at her in the past 10 years.

Habit and familiarity can blind you. It is well said that you can walk by a leaky pump in your own territory and not see it. Most supervisors spot an emergency fast enough—but little troubles pile up unobserved because the supervisor's general impression of the department, based on years of experience, blots out details. What we think we see—both in people and in things—is often only an assumption based on habit.

There's no easy cure for distortions based on familitarity, but you've won part of the battle when you recognize, and constantly remind yourself, that these distortions exist. Further remedies: As you walk around your department, imagine for the moment that you're somebody else: the plant manager, the safety inspector, the quality-control man, or a visitor. Let yourself wonder about what

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Too many people try to communicate with words alone. Your next interview, meeting, or training session will be more fruitful if you *observe* the person you're talking to. Respond not only to his words, but to his facial expression or lack of it, and to the subtle clues given by hand movements, foot movements, and posture. Remember that he's watching you, too. You're not going to get many suggestions from a subordinate on reorganizing a work method, for example, if your expression tells him that you resent every idea he offers or if your restlessness reveals that you're itching to get away.

It's important to remember also that few people are objective observers. Many a grievance stems from the fact that the supervisor and his subordinates see a situation differently, and that neither allows for the other's point of view.

In such misunderstandings, both sides are usually sure they're right.

Dr. Hadley Cantril, director of Princeton University's famous Perception Demonstration Center, performed an experiment after a Princeton-Dartmouth football game. The game was rough—so rough that Princeton's star player, Dick Kazmaier, and a Dartmouth player were badly hurt.

One week later Dr. Cantril and a Dartmouth colleague showed a movie of the game to groups of students at Princeton and Dartmouth. Each group was asked to add up the number of times each team broke the rules, and also to comment on the game.

Princeton students "saw" Dartmouth break twice as many rules at the Princeton team. But Dartmouth students saw only half as many violations by their own team.

Most Princeton students blamed Dartmouth for starting the trouble. Most Dartmouth students thought both teams were equally at fault.

Fifty-five per cent of the Princeton men said that Dartmouth had tried to "get" Kazmaier. But most of the Dartmouth students felt this charge was unjustified.

"It seems clear," Dr. Cantril concluded, "that 'the game' was actually many different games, and that each version of the event . . . was just as 'real' to one person as other versions were to other people."

In industry as in football, the participants' emotions and loyalties determine how they see the game.

It should be clear by now that nobody ever becomes a perfectly impartial observer. Perhaps, though, it's equally clear that everyone can improve his observation skills.

This improvement can't, however, be achieved by reading articles about observation—not even this one. Reading at best will provide some guidance for effective practice. By knowing the pitfalls, a reader can overcome them to the point where he will more often be able to recognize conditions as they actually exist.

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Transactions

INDUSTRIAL SAFETY—ASSOCIATIONS

NATIONAL SAFETY COUNCIL
425 N. Michigan Avenue
Chicago, Illinois 60611

Evaluation of a Safety

A SAFETY CONTROL PI
IN A CHEMICAL PI

By J. L. RICHMOND
General Supt., Miscellaneous Manufac
E. I. du Pont de Nemours & Co., Inc., D

The elevation of a safety program can employ many approaches. It may be based on injury statistics, special inspections, or even individual contacts. These approaches are all valuable in maintaining a feel for the safety effectiveness and morale of a group. They have certain weaknesses in that they lack continuity and, when based on injury statistics, are after the fact and do not serve to anticipate or predict unfavorable trends in safety performance.

The approach which I wish to discuss this morning, while using some of these techniques, is based primarily upon injury causes and includes the feature of control in addition to evaluation. We believe that this method of evaluation can predict trends in safety performance and thus, by anticipating injuries, assist in preventing them. We have called the program the Safety Control Program, or more simply, S.C.P.

The S.C.P. program was developed several years ago by one department of the Chambers works as an attempt to establish a quantitative evaluation of safety performance and safety effectiveness. This program is an adaptation of typical quality control technique used in production and makes liberal use of statistical quality control methods. The program was established on the major premise that every unsafe act or condition represents a potential injury. We then went on to make these assumptions:

1. Safety is one product of the production effort.

2. Each potential injury is a defect in the safety product.

3. The number of safety defects found in a sample of the work area is a measure of the effectiveness of the safety effort.

Based upon these assumptions, a statistically based method of sampling, inspecting, and analyzing was established.

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The most significant part of the program now follows, and that is the second phase or "what is done in response to the signals from the control chart." There are many actions to be taken:

1. The specific conditions noted in any weekly inspection are promptly reported to the section head and immediately corrected.

2. Conditions which are indicative of the area trend should receive full publicity and over-all area correction.

3. Indications of lessening of good safety morale should be faced promptly and a number of actions are possible, such as:

a. Safety pledges to be signed by workmen.

b. Written publicity of one type or another.

c. Meetings with department heads or group supervisors to develop action through line organization.

d. Special training courses in safety communication.

e. Special safety programs and safety bulletins.

The solutions used are familiar to all of you. The chief function of the SCP program is to signal the need for the special action.

There is one ground rule with respect to the S.C.P. inspection team that is important. This team, after making its inspections, reviews its results, and at that time makes its decisions concerning questionable observations — in other words, those that may or may not be a safety statistic. The team makes its decision then and there. It is also important that a bias is not introduced into the inspection team as a result of a local area drive or some particular condition. This can be checked by reviewing the specific observations reported by the inspection team.

It is equally important, as in any control program, to run a check on the effectiveness of the method — in this case, the effectiveness of the team as observers. This is done by periodically sending out a specially selected group of persons who are known to be careful and thorough observers to run a check on the regularly selected inspection team. At times, this uncovers a defect in the observations technique and corrective action is required.

There are a number of cautions to be considered in the use of such a safety control program:

1. It is not a substitute for the traditional safety or housekeeping inspection.

2. The rules must be faithfully followed in order that the results are statistically significant.

3. The S.C.P. program will not of itself improve safety morale or performance or eliminate injury unless the results are studied and promptly acted upon.

4. It does not take the place of many of the well known safety techniques — it is merely an analytical tool which can shed some light on the effectiveness of the traditional programs or any other program.

The strength in the S.C.P. approach is due to several factors:

1. It is based on "in the field inspections."

2. It provides numbers and graphs which make for good publicity, are easy to follow, and generate interest in the wage-roll people.

3. In the course of the S.C.P. inspection, a certain number of safety contacts are possible.

4. Since it must be done on schedule, a slackening of interest or activity is quickly apparent.

5. It is an excellent administrative tool which gives the plant manager a simple summary of the performance of his unit.

In setting up such a control program the following points may serve as a guide:

1. Initially, work out thoroughly your mechanics as to just how the program is to function.

2. Include a statistician or quality control person on your task force.

3. Adequately explain the basic fundamentals of quality control, random sampling, and simple control charts to all those who will take part.

4. In advance and as a part of your regular safety work, describe this program to all personnel in the department. Stress the fact that the inspections are designed to yield only a numerical rating of the safety health of a department.

5. Allow at least an 8-13 week period for "break in" before establishing control

limits. As in any new quality control program employing "c" charts, drastic changes will occur — probably during this initial phase.

6. Establish control limits and modify the limits only on a statistical basis.

7. Publicize widely the results of each inspection.

8. Take immediate action when the program begins to get out of control or an undesirable trend becomes apparent.

9. Retain as a management tool only for a lengthy period.

10. Avoid politics and bias on the inspec-

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SAFETY PROGRAMMING IS MY

By F. A. DUDDERAR
General Supt., U.S. Steel Corp., G

My task is to report a method of evaluating our safety program so that I can assure myself, as general superintendent of a steel plant, as well as demonstrate to my superiors, that we have an effective safety program.

First, I would like to give the background. In United States Steel, safety is a line responsibility. Using the safety department as technical advisor, I must accept, implement and audit the safety program to make sure it is effective. United States Steel has had for many years a unified approach to the safety program, and as such, all steel plants in the corporation are operating under the same general plan. The particular plant that I represent has, as a matter of record, operated more man-hours without a disabling injury than any other plant in the steel industry and we proudly call ourselves, at Gary steel works, the "safety champions of the world of steel." This record is in excess of 17 million man-hours. While we made this record in 1960 and have not yet exceeded it, we have in slightly less than three years exceeded eight million man-hours at least five times.

When I talk about evaluating a safety program, what do I mean? Basically this is an audit of our safety activities and perform-

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425 N. Michigan Avenue
Chicago, Illinois 60611

UNDERSTANDING THE VISUAL P
EMPLOYEES OVER FO

By JACK C. COPELAND
Visual Consultant, Bausch & Lomb, Inc.,

The statement "your eyes are failing" sounds catastrophic, but it isn't necessarily so. All eyes begin to lose some of their near focusing ability as early as age eight. Focusing your eyes for near objects is called accommodation. This faculty decreases progressively until an advanced age.

We first notice our loss of accommodation when small print 9 in. to 10 in. from the eyes is difficult to read, causing us to move it further away. This occurs for most people between the ages of 40 to 46. A few are spared this inconvenience until 49.

When we begin to need stronger glasses for reading after 40, we call the condition presbyopia. Most near-sighted people in their forties can see close by removing their glasses. Far-sighted people in this age group cannot and are more handicapped. Also, the near sighted usually show a slower onset of presbyopia than do the far sighted.

Visual loss at the near point in people past forty demands immediate attention. The cause can be two fold: (a) pathological or (b) physiological. The pathological causes represent diseases such as cataract, glaucoma, infection and the like and can lead to blindness. The physiological causes are usually presbyopia, far-sightedness, and astigmatism. These never lead to blindness. They are normal conditions which most people acquire and are correctable with glasses.

No one living to middle age escapes presbyopia. Some old timers frequently brag about not needing glasses for reading. The truth is they are usually near sighted and cannot see clearly at a distance without glasses. A few oldsters notice a phase called "second sight" which permits them to read without spectacles. This condition usually precedes the development of cataract and is a pathologic (disease) process.

When the eye is called upon to read or see small objects at near distances, its internal crystalline lens must accommodate. A mechanism within the eye changes the curves of the lens so they are steeper and more convex. Before
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unique in that it does not need to be focused. It is always in focus for different distances and the pin-hole acts as a "universal" lens.

If a pin-hole were placed before your eyes you would literally have a substitute for bifocals for both far and near. Unfortunately pin-holes lose 99 per cent of the light; therefore, they make poor substitutes for regular lenses. The reason for describing the action of a pin-hole was to emphasize this fact: there is no "universal" lens which works like a pin-hole. Multifocal lenses such as bifocals and trifocals are the only means for correcting vision for far and near.

Here is a tip: If you wish to read a phone book and are without your glasses, use a pin-hole temporarily.

So far, we have discussed the loss of elasticity of the crystalline lens which reduces the amount of our accommodation. This process is not precisely the same for all individuals and doctors have observed that even some people younger than forty suffer from sub-normal accommodation. There are five basic categories of this condition.

1. Insufficiency of accommodation for a given age.
2. Ill-sustained accommodation in which there is sufficient quantity but poor quality of the function.
3. Inertia of the accommodation which manifests itself as a sluggish or slow acting ability to focus near objects.
4. Inequality of accommodation between the two eyes.
5. Excessive accommodation possibly due to some systemic or local disorder.

Frequently, the muscles which rotate and converge the eyes cause near point difficulties if their action is disturbed. Only a careful eye examination can differentiate accommodation and convergence difficulties. Employees should be encouraged to seek professional advice if any visual disturbances are noticed in near viewing.

Questions and Answers

Q. Are plastic lens being used in regular safety prescription glasses, and if so, are their optical qualities as good as those of glass?

A. Yes, they are being used extensively. They are optically perfect and can be interchanged with glass. Plastics are lighter than glass; however, they are from 30 to 900 times softer than glass, and, therefore, they scratch very easily. Hot particles coming from a grinding wheel which adhere to glass, do not stick to a plastic lens. Plastic lenses are advantageous where weight is a factor, such as cataract bifocals.

Q. Does close work ruin eyes?

A. The answer is no. However, real close work, such as eight inches from the eyes, should require special optical aids such as sphero-prismatic spectacles.

Q. What effect would a plastic face shield have on the optical qualities of my prescription glasses? Would the face shield make my prescription glasses worse from an optical sense?

A. No, the amount of optical change the face shield would make would be negligible.

Q. Will plano safety glasses ruin a person's eyes?

A. No, the only change the plano lens produces is to magnify objects by a small fraction of one per cent. If plano safety glasses give a person a headache or other unpleasant symptoms, he probably needs a professional eye examination.

Q. Can poor depth perception be corrected with lenses?

A. Not always, but faulty depth perception can be improved by special training techniques.

Q. How can I tell what my proper reading distance is?

A. Close your eyes and let your arms "feel out" the comfortable working distance for near. This is about as accurate a method for determining your correct reading distance as any other. (This was tried by the audience with amazing results substantiating the above advice).

Q. What causes astigmatism?

A. Astigmatism is caused by malformation of the crystalline lens or the cornea. This distorts and blurs objects and can be corrected with cylindrical or compound spectacle lenses.

Q. Why do we see some colors sharper than others?

A. The eye has a defect called chromatic aberration. You have probably noticed different colors around images produced by a magnifying lens. The eye has this too. We

are nearsighted for blue and farsighted for red. The theatrical world takes advantage of this and uses blue light to produce soft-focus effects on the stage.

Q. Why isn't the eye able to detect optical illusions?

A. It is not the eye but the brain that is involved here. The deception occurs in what the brain does with the image it receives.

Q. What happens to accommodation when you look through a microscope?

A. Accommodation should be relaxed. It is difficult to accommodate through a microscope or telescope.

Q. We have a worker who lost an eye several years ago and now has trouble on jobs where he has to judge distance or depth or whether something is level. Is that because of the loss of the eye?

A. One-eyed people should not be allowed to do certain jobs such as driving trucks, crane operation, or piloting. Their depth perception and judgment can be seriously affected.

Q. Can the wrong prescription harm the eys?

A. It can cause discomfort, but not permanent damage. The person wearing the wrong prescription may have many uncomfortable symptoms, but it will not cause permanent damage.

[*Two interesting films were shown which vividly portrayed the symptoms and treatments of the two most common eye diseases —cataracts and glaucoma.*]

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BEGIN AT THE BEGINNING—STA

By A. D. HATTON
Supvr. of Safety, Fisher Body Div., General Motors C

It has long been established that whenever new employees begin a new job, an effort to get them started right should be made. In a plant such as ours, this formerly consisted of a series of talks by representatives of the employment department, safety department, and also by the superintendent, general foreman, and departmental foremen.

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Cataracts

Opacity of the lens of the eye
or both.

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ons over 50 to 60 years of age.

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Glasses are then used to sub-
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Glaucoma

Excessive intraocular pressure
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Corp., Mansfield, Ohio

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since August of 1960. We, in the safety department, have used this program for all sizes of groups, from one man to 30 men.

Since these instructions are only the beginning of a new employee's safety education, we felt that it was important for our supervisors to know what we covered, or, in other words, where we left off and and where they should begin. For this reason, all of our supervision have seen and heard this same presentation.

Basically, we have tried to cover two main points. First, to acquaint the new man with the physical layout of the plant or just plain "how to get around." And second to cover all general and some of the specific safety rules and practices that he must follow.

Our purpose here today is to give you a typical presentation just as if it were being given to a group of new employees. It starts with this message from our plant manager.

Welcome to Fisher Body

"You are joining the company that has grown to become the largest manufacturer of automobile bodies in the world. We believe that you, too, will soon develop the high degree of pride that we know comes from working to build a 'Body by Fisher.' That respected trademark symbolizes the continued growth and success of our company which has meant long-term job security for our employees.

"In this modern plant you will find *good working conditions, good pay,* and *opportunities* for advancement. You will also find a determination to make your hours here the *safest* part of your day.

"In the following slide presentation, we will tell you something about our plant and give you some very important safety instructions.

"It is my sincere wish that today is the beginning of a mutually satisfactory relationship between *you* and Fisher Body—Mansfield."

Signed—E. H. Goebel
Plant Manager

This is our new and modern plant. It was completed in 1956. This building covers 32½ acres. People who drive by out on the highway probably wonder what we do here. Perhaps you have too. I'm sure you already know this plant is part of the widespread system of plants which builds General Motors cars. Actually, we make no complete bodies here. It may interest you to know, however, that we *do* fabricate some part for every line of General Motors cars.

First of all, we need steel to make the parts. It is delivered by rail and truck to the steel stores area shown here. It contains thousands of tons of steel in both coils and flat stock. In the blank and shear section of this area, the majority of the coil stock is cut into blanks of the proper size. These blanks, as well as the purchased flat stock you see in the foreground, are then delivered to the press department where they are formed by dies into parts.

Our sheet metal stamping press department is made up essentially of two types of presses. The large presses are what we call major stamping presses. The relatively smaller presses are used to form small sheet metal parts. Both the large and small presses employ dies to form the parts.

From the press room parts then flow into metal assembly. This is a welding press where parts are welded into sub-assemblies. Welding presses bring multiple welding tips together to spot weld the parts. It should also be pointed out that the tool and die department builds and maintains dies and welding fixtures for both the press department and the metal assembly department.

Finished sub-assemblies from metal assembly then pass through storage areas into the shipping department.

In the shipping department we have room for 28 box cars into which parts are loaded for shipment to body assembly plants where they combine with other parts to be made into complete bodies.

What we have shown you up to this point is a brief thumbnail sketch of our major departments and their functions. Safety is equally important in all of these departments.

Eye protection is a very important part of our safety program. So important, in fact, that in this plant we insist on 100 per cent eye protection anywhere on the production floor. This means that everyone must wear eye protection at all times in the working areas of the plant.

Each of you has already been given a pair of the conventional safety glasses. There are two other types of eye protection which must be worn in addition to the safety glasses on certain jobs, such as grinding. Here is posi-

tive proof of why eye protection is so important to the employees in our plant.

Every shattered lens you see here saved an eye. Though only 12 are shown, I have actually collected 34 of these since the start of production in 1956. Not one of the 34 men who wore these glasses questions the value of 100 per cent eye protection. But let's be specific. This pair of glasses was being worn by an electrician in our plant. Due to a faulty connection, this 440-volt Buss Bar Box literally blew up in his face. He was burned about the hands and face, but these safety glasses took the brunt of the explosion and his eyes were saved. The terrific heat which partially melted the frames and the molten copper you see splattered on the lens certainly would have cost him the sight of both eyes. This is the way he looks today. If you question eye protection, ask this man.

To serve as a constant reminder that safety glasses must be worn, you will find signs urging their use plainly visible as you enter the manufacturing areas.

Let me make this one point very clear. You either wear *eye protection* or you *don't work here*. It's a *condition* of employment.

This employee works in our press department where he handles sheet metal. Therefore, we require that he wear this type of safety equipment. His clothing is snug fitting; his arms are covered; his shirt is buttoned; his shirt tail is tucked in—no loose ends. You already understand why he's wearing safety glasses. We will talk about his safety shoes later. Notice that this man is wearing canvas sleevelets and leather hand pads. This is our basic type of arm protection. Here is a close-up of our canvas sleevelet. Note the thumb loop. This must be worn around the thumb to prevent the sleevelet from sliding up your arm and exposing the wrist area where tendons and arteries lie near the surface.

Here you see the front and back of our fully-enclosed leather hand pads. They are especially reinforced in the thumb area. We have found that these leather hand pads, along with the canvas sleevelets, give you very good protection from the sharp metal panels with which you will be working.

On other jobs, where finger dexterity is required, we use the canvas-type glove or the terry cloth glove. The type of hand protection you will need on your particular job

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Here's another safeguard for your protection—a pair of two-handed run button controls. This is the control that actually makes the press operate and the dies close. These run buttons are so designed that both of your hands must be on them, insuring that your hands are in the clear, while the dies are closing. What you see here is a typical installation on a large press. You will find that smaller presses are also equipped this way.

Here is a typical set of run buttons installed on a welder. Again, *two* buttons, one for each hand. These are used on any job where a man must be close to the moving parts, or if the danger area is not fully-enclosed with guards.

Since your safety depends on these controls, you must know if they are functioning properly. This requires that you check them out. First, you start the press motor. Then, place both hands on the runbuttons. As the ram of the press starts down, lift one hand as he is doing. If the press stops, you know you have control with that run button.

Then place both hands back on the controls and, after the ram has started to move, lift the other hand. If it stops, you know then that you can control the press with either one of your run buttons.

On some set-ups, there may be two, three, or even four men operating the same press or welder. Each man will have his own set of run buttons. Every set of buttons must be checked out in turn so that each man operating the equipment knows he can depend on his own run button controls. Don't expect to be reminded every time—do this automatically—at the start of your shift, after lunch, or any time you change jobs.

Here you see one of three safety tags used in this plant. This one, "Danger — Man Working," is used by repairmen when they work on equipment. The colored disc tells what department the man works for and his name and clock number are at the lower right. The only man who is to place this tag on equipment, or take it off, is that man whose name and clock number appear on the tag. If several repairmen are working on the job, each one hangs his own tag and each removes his own tag after he has completed his part of the repair. If you should be assigned to work on equipment and find a tag like this hanging on the control panel, leave it absolutely alone and notify your foreman. You will find these tags hanging over the main start-stop button so that anyone coming up to start the equipment could not fail to see them.

The enormous size of much of our equipment creates a hazard for the men who do repair work. A repairman could be out of sight overhead, around in back, or down below the floor level. Whenever he has to work in a hazardous position, or out of sight, he uses the lock-out device you see pictured here. First, he turns the main control panel to the "Off" position; the lock-out device is then inserted through the hole, and the padlock snapped shut, making it physically impossible for anyone to turn on the switch. He attaches his "Danger—Man Working" tag as an additional precaution.

Another tag you may see is the "Caution" tag. Here you see the front and back of it. This tag is used to protect the equipment itself, when, for some reason, the machine should not be operated. Many times it is used by a person on the first shift to tell a second shift employee what has to be done to complete the repair. Also, any production worker about to start up the equipment will be alerted that this machine should not be operated. If you're assigned to work on equipment and find a tag like this hanging on the control panel, remember, leave it alone and notify your foreman.

Here again you see the front and back of still another tag. This one, "Unsafe, Do Not Use," is placed on equipment by one of us in the safety department when we find a condition that we consider unsafe and we write what the unsafe condition is on the tag. *No one* is to remove this tag or use the equipment until this condition has been corrected. When the safety man is satisfied that this has been done, he removes the tag—no one else. If you find this warning on equipment you're supposed to use, remember again, leave it alone and notify your foreman.

In a few moments we will give each of you a copy of the Safety Tag Procedure. After you have read it, you will be asked to sign this statement:

"I have received and read the Safety Tag Procedure. I understand it and agree to abide by it in the interest of my own and my fellow-workers' safety."

Print your name carefully at the top; your clock number is the same number that appears on your badge; sign your regular signature and write in today's date.

A serious word of caution at this point—your signature on this statement means you have read, understand and agree to abide by the Safety Tag Procedure. We can and will hold you strictly accountable. If you have any questions, if there is any point still not clear after you have read the Safety Tag Procedure, ask whatever questions are necessary to help you understand. Then, and only then, sign the statement.

Normally, at this point with a group of new employees, the lights are turned on and copies of the procedure and this statement are passed around.

Sufficient time is allowed for them to read the Procedure, ask questions, and sign the statement. While this is going on, the magazine is changed in the slide projector. Then, after each has signed his statement and turned it in, we proceed with the second half of the orientation program.

Here you see our minimum requirements in terms of footwear. A sturdy, all leather oxford-type shoe. You are not permitted to wear loafers, moccasins, sneakers, or other casual footwear. They do not provide enough protection for your feet in a plant such as this. We strongly recommend safety shoes.

In this cutaway view of a safety shoe, you can see the strong steel cap that protects your toes. It also has extra protection around the heel and the arch. If they're fitted properly, you'll find that they are as comfortable as any shoe permitted for wear in the plant.

To help our employees get safety shoes, we have a safety shoe store in our plant. It's located beside our main employee's entrance. Here you can purchase quality safety shoes at a special employees' price. You will be interested to know that last year 1489 of our employees took advantage of our safety shoe program and bought safety shoes at our special employees' price. There is a wide variety of styles to choose from, and a qualified person will help you with the fitting. You pay for these shoes through payroll deduction, either one or two paydays. The store is open Wednesday only, during the afternoon and evening, to service all three shifts.

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you forget your badge someday, you obtain a temporary badge from the patrolman on duty. Also, if you forget your safety glasses, an extra pair may be obtained here.

Next, you ride up a set of escalator steps to the second floor. We have three sets of these in different areas of the plant. From the top of the escalator a passageway leads across to the second floor. As you leave this passageway, the cafeteria is located to your right. Locker rooms to both right and left. If you care to use it, a clothing rental and laundry service is available near the locker areas. This crib is open Wednesday afternoon and Thursday mornings. Here you can arrange for coveralls or two-piece work suits.

Each of you will be assigned to a two-compartment locker similar to these. Both are locked by the same company-furnished locks you see here. You have already been given the key. Adjoining the locker room, there are showers and other facilities for your convenience.

This is the plant cafeteria. Fisher Body provides the space and pays for the heat, lights, and equipment, so that the catering company can provide you with quality food at reasonable prices. You will find this a good place to eat, comparable to any restaurant you would eat in downtown. The capacity of this room is about 800 people. By staggering the lunch periods, the time it takes to serve you has been greatly reduced. Whether you purchase your lunch at the cafeteria, or bring it from home, we would like you to come up here for your lunch period. The cafeteria is clean and air-conditioned; music is playing; it's a good place to relax and eat your lunch.

Here you see two types of all-purpose fire extinguishers. It is important that you know the locations of all emergency equipment, especially in and around your own particular work area. In case of fire, the time you save by knowing where extinguishers are located could mean the difference between a fire getting out of hand or keeping it under control. In addition, any use of fire extinguishers must be reported so that they may be recharged.

The fire alarm box is very similar to the type you see in the city. The columns above each box are banded in red and visible from a distance in all directions. We have an in-plant fire brigade that responds to all fire alarms. So far, prompt action by people in the immediate vicinity has resulted in the fire being out, or nearly so, when the brigade has arrived.

Stretchers, though used only infrequently, are still an important part of our emergency equipment. It is vitally important that we know stretcher box locations. There are 12 of these in the plant, with a green band on the column above each box to make it readily visible from all directions. Look carefully on top of this stretcher box. This is a battery-operated emergency light that comes on automatically if the power should fail. With these, you need never worry about this plant being thrown into total darkness.

Each stretcher box contains an ambulance-type stretchr. How to remove it from the box and set it up will be a matter for detailed instructions later. Here, on the inside of the door, are given the next two closest stretcher locations. This white plastic bag contains a resuscitube, a very effective method of artificial respiration. Although drowning is the most frequent cause of inability to breathe, electrical shock may also be a cause. A word of caution about our electrical equipment. If you're not an electrician, leave it alone. Do not attempt to make electrical repairs or adjustments. Notify your foreman if electrical repairs are needed.

If you should get any kind of injury at all, go promptly to the plant hospital and obtain medical attention. For anything other than a real emergency, you are to take with you a medical pass from your foreman.

When you enter the plant hospital and again when you leave, use the time stamp. The use of the time stamp will help you account for time spent away from the job.

This is a typical departmental office out in the plant. In a few minutes, when we conclude these instructions, you will be taken to your departmental office. On the way, you will be shown the location of your locker and the time clock you will use. In this office you will receive further information from either the superintendent, or a general foreman. Finally, you will be taken to meet your foreman. He will show you around his area and explain how the equipment is operated. When he assigns you to your own job, he will give you detailed instructions.

If at any time you have questions regarding your job, either when you are first instructed or later on, check with your foreman and find out the proper way before you go ahead. We have learned from past experience that new people are usually a little over-anxious to get going on the job and reluctant to ask questions. So, they sometimes go ahead on their own without fully understanding the job, unaware of the risks involved.

Remember — the best safety device is a careful worker. So *again*, if there's any doubt in your mind, *don't hesitate* to ask questions.

In our plant manager's message at the start of this presentation, you were told about our determination to make your hours here the safest part of your day. Since then you've heard so much serious talk about hazards that you may have begun to question our ability to deliver on this promise. We can—and we have.

This Award of Honor presented to General Motors Corporation by the National Safety Council for an outstanding safety performance is a source of pride to us and should be reassuring to you. We have received this annual award on seventeen different occasions. We know how this record has been built. By eliminating as many hazards as possible, by educating our employees to work safely, and by being completely intolerant of unsafe practices and methods. Make no mistake, no employee will be permitted to work long in this plant if he violates our safety practices and procedures.

The public sees this trademark as a symbol of quality. However, to us in the plant, it also means "a safe place to work." To keep it this way, we need your help. Whatever your job may be, learn how to do it the safe way, then do it that way every time. By following this practice, your hours in Fisher Body will always be the safest part of your day.

Now, I would like to point out some of the advantages we have found with this type of orientation program.

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SAFETY ENGINEERING: A CAREER AND A CHALLENGE

By EDWIN D. O'LEARY
Vice Pres., Personnel & Organization, Ford Motor Co., Dearborn, Mich.

Certain kinds of work, or certain aspects of our work, provide more personal satisfaction than others. I should think your continuing concern with human safety should give all of you immense satisfaction. There are not many occupations that have as direct and recognizable an effect on human happiness.

I want to congratulate you who are representing companies that are receiving awards. And I also wish to congratulate the employees of those companies. It is highly appropriate that we honor those who have achieved outstanding results in this important field.

Just how appropriate it is for me to be addressing this meeting is another matter. I sincerely appreciated the invitation you extended to me. But it seems a little odd for a son of Mrs. O'Leary to be addressing a safety meeting—and in Chicago, of all places. For the record, neither my mother nor my grandmother owned a cow.

Even so, my training and experience have not equipped me to discuss with you the technical aspects of safety engineering. Many of you are trained safety engineers. I am not. That leaves me feeling somewhat the way Bob Hope said he felt when President Kennedy presented him a medal for entertaining service personnel overseas. Hope said he felt very humble—but added that he thought he had "the strength of character to overcome it."

One way for me to meet this test of character is to talk about a subject with which I *am* familiar. During the past few years, my primary responsibilities have been personnel management and development. This experience suggests some thoughts that, I hope, will be useful to you in your approach to your work.

Briefly, what I suggest is that a thoroughly *professional approach* enables the safety engineers, first to work effectively for his company's objectives; second, to achieve the best results in safety itself; and, third, to contribute most fully to his own development, stature and progress in his career.

That's a pretty tall order. Perhaps it sounds like the old ads that promised to make a wallflower into the life of the party in ten easy lessons. However, it is possible, in a rather brief span, to outline what is meant by a professional approach, even though developing that approach may be the work of years.

As in other companies, we at Ford have conducted considerable research to determine what qualities are necessary in a man if he is to achieve success. Here I am not talking about specific technical abilities, but rather those general qualities that are required for success in almost any line of endeavor. It isn't easy to isolate them. It is even harder to get people to agree on all of them. But here we have arrived at some conclusions that we believe are valid, even though we do not pretend that our list is exhaustive. Let me tell you about some of these conclusions, especially insofar as they might affect you and your work.

The quality that comes first and underlies all the others is *integrity*. Integrity means that there is a certain wholeness or completeness about a man's character. No matter how narrow his interests are, they must be broad enough to include justice and honor. No matter how selfish his ambition, he must at least have enough rudimentary generosity to recognize the rights of others to truth and fair dealing. There is something monstrous and misshapen about a man who possesses knowledge, executive ability or professional skill but lacks integrity. He's only part of a man, not a whole man. And nothing else can substitute for what he lacks.

What part does integrity play in the professional approach to one's work in industry? That's what we're concerned with here. First of all, I believe I asked the question wrong. Integrity doesn't play a part; it permeates the whole job. It doesn't consist simply in the avoidance of gross dishonesty, deception or double-dealing.

The integrity I'm talking about is a positive quality you can recognize in a man. He

accepts responsibility and discharges it. He refuses to rest satisfied until his performance measures up to his ability. He respects the right of his company and his boss to be kept informed accurately about the operations for which he is responsible. He levels with the people who report to him. And he has sufficient respect for himself not to let shoddy work represent him.

Once Michelangelo was painting a fresco on the ceiling of the Sistine Chapel, many feet above the ground. A friend asked him why he was taking such pains with a part of the work that could scarcely be seen. "Who will know whether all the details are perfect?" asked the friend.

"I will," said the artist.

As you can see, this concept is broader than what we generally call honesty, or moral integrity. It also includes intellectual integrity, or honesty to onself. Based as it is on self-respect, it goes a long way toward gaining the respect of others. And it's evident that respect is essential to leadership, essential to true success in any endeavor.

Now, it's not my intention to become the Billy Graham of safety engineering. My acquaintance with such people as Jim Cullen, who directs the safety program in Ford's engine and foundry division plants, has convinced me that most safety people don't need an evangelist. You *are* evangelists, and all of us in industry take pride in how well you have preached the word.

However, I should like to make one observation here. Each of you represents his company in a particularly sensitive area. Your management must be able not only to trust your judgment and to have confidence in your abilities; they must be able to rely, without reservation, on your integrity. That is one measure of the significance of your responsibilities. And it's a tribute to you that you are the people who have been chosen to handle them.

After integrity, the second essential quality our studies revealed is the ability to apply the *scientific method*. Stated another way, it is the ability to think, to approach any problem in a consistently clear and orderly way.

Very likely your reaction to this is, "So what else is new?" It is scarcely a revelation that success requires the ability to think. It seems as evident as saying that people walk or talk. And yet the continuing development

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A further characteristic of this thought is that it be imaginative. Nothing kills ideas faster than the notion that a thing cannot be changed. If safety engineers had gone along with this notion, the fine records we are honoring today would never have been set. Your profession began when someone said, "Well, why can't we go about preventing accidents and encouraging safety in a systematic, professional way?" By upsetting the old, fatalistic approach to industrial safety, he began the process that has saved hundreds of lives and prevented thousands of injuries. And he may not have been a genius at all. He may only have been a guy who was willing to think a little.

There's one substitute for thinking that must be avoided with a passion. That's the use of averages. Of course, we find useful comparisons in averages. For example, during the first six months of this year, our Ford plants had a frequency of .72 lost-time injuries. We are pleased that this reflects a 51 per cent improvement over the average for the last ten years. The figures, as I say, provide a useful means of measuring progress. But what we then have to do is to think how we can use this information to improve our performance.

Bobby Bragan, the manager of the Milwaukee Braves, pretty well ticked off the foolishness of relying on percentages. He said: "Say you are standing with one foot in the oven and one foot in an ice bucket. According to the percentage people, you should be perfectly comfortable."

With that, we may move on to the third quality.

It is the ability to *plan and organize*, and ties in closely with the ability and willingness to think. In fact, it is thinking directed at a certain objective. Brilliant minds sometimes fail to make their maximum contribution for lack of the ability to plan. Other people seem to wring outstanding results, even from inferior talents, because they use what they have so effectively.

Of course, like other forms of thinking, planning is not always easy. It forces us to look ahead. It requires us to work with variables and uncertainties. Consequently, we tend to shy away from it.

Organization involves directing all the necessary resources at a given objective that planning has set. It means assigning work effectively and, in general, going about our own work assignments in a systematic, efficient and therefore effective way.

Again, there are books and courses that can help us develop this ability. But most of all, we simply have to do it. We have to cut through the hurly-burly of daily distractions to decide our destination and the best way to get there. We have to convince ourselves that this is vital, and that, without it, we stand in danger of proceeding at great speed farther and farther away from our real objectives.

Stephen Leacock once wrote about the man who jumped on his horse and rode madly off in all directions. We may admire that fellow's vigor, but it seems reasonable enough to say that his equestrian activity might have been better directed.

When we start organizing, we have to communicate. So much has been said about the essential role of communication in all forms of human activity that I hesitate to add any more. Actually, communicating also begins with thinking, but thinking from the point of view of the other fellow. First of all, then, we have to take time to understand his point of view. That means listening. It also involves sensing situations so that we know when to express ourselves and what we need to know as background information when we decide to speak.

Then we owe it to others to have a clear understanding of exactly what we want to say. If our own thinking is fuzzy, our audience is not likely to form from it any clear ideas, except, perhaps, that we really don't know what we're talking about.

Finally, it's necessary to make sure that our words conform to what we have in our minds. That's not easy. But it's part of intellectual integrity not to rest until we have reached such conformity.

The sports writer, Red Smith, once told how he writes his wonderful columns. "Turning out a column is easy," he said; "I just sit at my typewriter until beads of blood form on my forehead." The rest of us may not have to go through the same agonies as professional writers. But we do have an obligation to think clearly and then express our thoughts as simply and lucidly as we know how.

Incidentally, there's a little book called *The Elements of Style*, by a former profes-

sor named Strunk. The book is much easier to read than it is to master, but it's well worth the effort, and I recommend it.

The next element in the professional approach to one's work that makes for success is *the ability to influence people.* Each of us deals with other people at all levels at all times, either as our superiors, our associates or subordinates. We want to motivate some of them to work. We want to have others listen to and adopt our ideas. The success or failure of our plans and our efforts, and, eventually, of ourselves, depends significantly on how much we can influence others.

I cannot pretend to tell you how to increase your influence. Integrity has something to do with it. The force of your thinking and your ability to communicate certainly play their part. The degree to which you are in tune with your company's over-all objectives has a bearing. But there's another element present here in addition to these.

I guess you could call it understanding the other man. It involves seeing his problems and the pressures that he faces; trying to realize what his objectives and responsibilities are; broadening your own perspective enough so that your vision isn't limited to your own interests.

A man I know takes issue with the old axiom, "You can lead a horse to water, but you can't make him drink." He maintains that it's the easiest thing in the world to make him drink. But first you have to make him thirsty by putting salt blocks in the pasture. In terms of influencing other people, salt blocks are the evidence you give of your sympathetic understanding of their problems. It's good to have a lot on hand.

The final quality I want to mention is a very general one and has a kind of old-fashioned ring to it. It's *perseverance,* and for the most part consists in plain hard work, unstinted and constant. It's not necessary to go any farther than this room to evaluate the necessity of this quality. Here you have proof that safety is, indeed, no accident. The progress made in industrial safety in the last ten years, for example, is the result of your unremitting efforts. It has come about only because, over those years, you and your companies and the National Safety Council have stayed with the job.

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it would be a rare individual
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balance of them will help an
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d a person reasonably expect
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greater ability to communicate and to influence people. And he could achieve even greater recognition for himself. One of the finest possible means of moving ahead in an organization is the building of a record of having accomplished different jobs and having accomplished them well.

These goals, I think, are attractive to all of us. They are worth the additional effort they require.

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1963

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MINING INDUSTRY

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try, the physician has a special opportunity to guide the safety program through his medical understanding of health principles when the personnel man, working alone, may lack specific training in health and safety problems.

After the conclusion of the three papers, we hope there will be questions. There is in this room an accumulation of skills and know-how in the promulgation of safeguards against industrial injury and disease that should produce a lively discussion. We hope that you will feel free in your questions to be critical and inquisitive. Most of all, we hope that a contribution in this discussion will be made to a broader understanding of how each of us can improve safety practices for industrial workers.

Before introducing our speakers, I would like to make one comment which may possibly improve the understanding of all of us in the consideration of teamwork for safety. I think most of you in this audience have been schooled to look upon safety as a matter of controlling the physical working environment. As safety engineers, many of you are particularly concerned with safety equipment, protective devices, methods of safe operation, ventilation, shielding and prevention of exposure to toxic substances. These are all extremely important aspects of the control of the working environment. All power to you who have learned these physical techniques of control.

However, you are going to find in these papers that our speakers will be talking more about the human being who works in this environment, his emotional problems, his training, his partial disabilities and the hazards to safety produced by his reactions with his fellow workers, and with the environment. I suggest that you keep your ears alert to the *clinical* approach of our speakers toward this human being on the job.

It is largely in this field of the behavior of the human being that the physician and nurse make contributions to your safety programs. The slang phrase has it that it takes two to tango. We in medicine are concerned with the person who gets hurt somewhat more than with the physical environment that hurts him. Both are important. So try to take note of the *employee's* part in the prevention of injury when you listen to our three speakers. You people deal with the engineering of the physical environment. We deal in human engineering. It takes both to make an effective team.

LARGE PLANT MEDICAL AND SAFETY PROGRAM

By DANIEL C. BRAUN, M.D.
Assist. Medical Dir., Divisions and Associated Subsidiaries
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When I first saw the title of the panel discussion, I was surprised and dismayed to note the use of the word "meddle" as applied to the efforts of physicans and nurses in the safety activity. After some weeks of quiet cogitation, however, I am prepared now to admit that in all fairness, you are entitled to list it so—not because I feel that the medical department has any less responsibility for safety, but simply because of the fact that if this were a medical convention, rather than a safety conference, it might well be that a similar panel would be discussing the "meddling" by safety engineers in the medical program.

Certainly we are entitled to our separate viewpoints, if indeed there is any real difference between them. I am sure, however, that the program chairman simply was indulging in a little humor, expressive of the warmth of feeling and mutual respect that has been engendered by the close association which medical and safety personnel enjoy in industry today. I think I might say that we are compatible—and it is well that this is so since in this day and age, both safety and industrial medicine are *team* efforts which can reach their goals only by diligently following the team approach.

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Transactions

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PUBLIC EMPLOYEE SECTION

GETTING THE MESSAGE TO THE EMPLOYEES

By EDWARD J. CREMENS
Safety Advisor, Commonwealth Edison Co., Chicago

If we are to consider the subject of getting the safety message to the employees, it would seem we should begin with an understanding of the dimensions of our playing field. I believe the very title of this subject imples certain things.

It implies that we must be in possession of a safety message; that there are employees who can benefit from this information; and finally, certain methods are required to communicate with our people.

Although each of these considerations could be discussed at great length, every safety organization is faced with the problem as a whole. Commonwealth Edison is no exception and with your permission, I shall attempt to review what we are doing in regard to messages, means, and methods.

The title of this review is "Get Your Product Out on the Street" and has (to quote Dr. Arthur Secord) about as much connection with safety as "bullfighting has to agriculture." But there is a connection and I attempt to explain it in this way.

All of us here today have a product to sell. Safety is a product as much as life insurance, bank accounts or vacation trips are products, and to realize any degree of success, we must get it out on our street. We must get the message to the man on the job. Paradoxically, while safety is quite easy to sell and our clientele is generally receptive, it seems very difficult to get across with a lasting and completely convincing effect. We find it requires repetitive contact, constant advertising and an enthusiastic effort to promote new, fresh ideas by sincere and dedicated safety salesmen.

I believe we are somewhat in the position of the psychiatrist who reported that half of his patients went to him because they weren't married and the other half because they were. We get the attention of our people because about half of them have had an accident and the other half don't want one.

I said we must be sincere and enthusiastic, with a real desire to get our product on the street and this is why we are here today. Perhaps as I tell you what has been done at Commonwealth Edison, an idea may be stimulated in your mind and an entirely new concept of safety salesmanship will be born. We cannot accurately measure the effectiveness of any of the activities we will discuss. However, the overall affect has been a gratifying reduction in frequency rate in the last nine years.

I do *not* mean to imply that we are satisfied and resting. We don't pretend to have all the answers nor propose that you copy our methods. But, perhaps some of the ideas, schemes and gadgets I shall describe will help you in *your* all-important work of preventing accidents, injuries, and fatalities.

First of all, let's look at our problem. Commonwealth Edison generates electricity in 13 generating stations (one of which is the Dresden nuclear power station), and distributes it through 5600 miles of cable and 31,000 miles of overhead lines to 2,000,000 customers located in 11,000 sq. mi. Our territory ranges from the Mississippi River to Lake Michigan, and from the Wisconsin line southward about 115 miles.

To do this job, we have about 13,000 employees; a fourth of them work in our generating stations, about one third are in offices or shops, and the rest are scattered over the system in small crews consisting of one to ten men.

We drive about 30 million miles a year in 1500 passenger cars, 1000 trucks, and 500 trailers, cranes and assorted vehicles. We operate equipment ranging from small calibrating devices on a work bench, to boilers almost as large as our 20-story, quarter

of a block square main office building. These boilers burn 150 tons of coal an hour, and we burn about two per cent of all the coal mined in the United States.

The responsibility for doing this job safely is the responsibility of everyone, from the president on down, but the safety section is charged with the specific job of accident prevention; so let's look at the organization of the safety section, which is part of the industrial relations department.

Reporting to the superintendent are a safety engineer and two safety supervisors. The safety engineer has a safety advisor, a stenographer and a statistician; the two safety supervisors have functional supervision over 11 safety advisors assigned to our seven divisions. This makes a total of 18 people, or about one safety man for every 700 employees in the company, which, I believe, is about average for the industry. Our budget amounts to about $1 per month per employee.

Policies are determined by the safety policy committee, composed of managers in charge of power production, engineering, operating, technical services, and industrial relations; the personnel director; and the superintendent of safety. This high level group meets every three weeks and not only sees that decisions are carried out, but also helps the safety division by providing guidance and leadership. There are eight subcommittees of this main committee which study the details of various proposals and recommended action to be taken.

Our 13 generating stations have a safety council consisting of the superintendent of all stations as chairman, and staff personnel with assistant station chiefs as council members. In addition, every generating station has its own safety committee to handle problems within that station.

In several of the company divisions, where the administration is separate from the stations, each district has a safety committee whose members may be elected or appointed by management. We also have tool committees and other groups who keep safety in mind when making decisions on tools and equipment. And a representative of the safety division is a member of most of the committees mentioned.

But no safety program can succeed with-

t the backing of top management. One the indications of our top management's itude on the importance of accident pre- ntion is the fact that the annual report ailed to all employees as well as to the ckholders) contains a statement of our fety progress.

Each fall, at our all-day management nference, where the president, vice-presi- nts, and other executives discuss past sults and future activities, the subject safety is prominent. One of the high- hts is the presentation of the president's dal to those employees who have saved meone's life, either on or off the job.

Another tradition at this meeting is the arding of prizes for the first, second, d third best suggestions submitted by nployees, and for the most suggestions cepted. As you can see, suggestions on fety lead all other classifications and count for about one-seventh of all those ceived. This completes a rapid survey of e area to be serviced and the people gaged in promoting our safety product.

Now, let's discuss some of the programs, eas and innovations we have initiated have perpetuated to make our employees fety conscious. First, of course, is that l reliable activity; the safety meeting. it is a large meeting, we often increase effectiveness by inviting a top official attend. It is not unusual for a division ce-president to appear and speak. There nothing more effective than for the en to hear, right from a top executive, hat the company's attitude is toward safety.

The program for large groups reflects careful consideration of a subject of gen- al interest or perhaps a local problem interest to all present. Variety is very portant, so we take advantage of avail- le speakers, films, and occasionally audi- ce participation programs. This type of rge meeting, of perhaps 150 to 200 peo- e in a generating station, is held two more times a year and lasts about one ur.

The individual work groups generally meet ce each month to consider safety prob- ms concerning their particular work and offer safety suggestions. In addition, re-minute safety talks are delivered by remen to their respective groups, usually e day each week before starting work.

In work locations outside the generating stations, smaller meetings are held and the program is less formal but no less interesting. We may even make a game out of it. In "Tic Tac Toe—What Do You Know," the men are split into two teams. A man from one team chooses a category, selects one question from a group of 10, and if he answers it correctly within a two-minute period, places his "X" or "O" in the proper space. The other side then gets a turn. The members of the winning team get an inexpensive prize—such as a cigar or candy bar for each man—and the participants, as well as the onlookers (and kibitzers), have learned a safety lesson while enjoying it.

I mentioned earlier that almost half of our people are scattered all over our system in small groups. If it is inconvenient to bring the men into a meeting, we go to them by means of a slide projector, alerted so it can be operated on six volts as well as 120 volts. The leads can be connected to a truck or car battery, and the cover has a built-in screen. With this, we can hold small meetings right in the field; or by changing the six volt bulb to a 120 volt bulb, we can use it in a meeting room and describe accidents, demonstrate the correct or incorrect ways of working, and describe pictorially all the other information which safety people constantly bring to employees. But it just isn't possible to have a safety representative present at every meeting of field crews so, again, assistance goes out to them.

In our construction areas, foremen are furnished material for use in a weekly "tail-board" conference, so called because it takes place at the tailboard of the truck. Some of the topics are discussions or editorials, and serve as a basis for the foremen to analyze the actions, attitudes or habits of people, of the hazards of the job. Other topics are pictorial, and illustrate unsafe practices. In handling the pictorial topics, the foreman gives each member of the crew a copy of a picture, such as one where the lineman has dropped a wrench; then asks leading questions such as, "What is the safe way to raise or lower tools to or from a lineman on a pole? Is there anything in our safety rule book regarding this practice? Why should everyone wear a hard hat?"

We also discuss recent accidents using semi-comical drawings, which, with the descriptive material, explain what happened. These tailboard topics can also be used in a shop area, and can be issued monthly or quarterly, depending on how often you believe they will be most effective.

We place considerable emphasis on the value of a foreman's responsibility for the safety of his men. If an area has an especially poor accident record, we may invite the foremen to a series of dinner meetings. We choose a well-known restaurant, bring in about 50 foremen at a time, and have a company official (such as a vice-president) discuss the company's position and attitude on safety.

At one such meeting we asked the foremen for *their* comments, and no matter what each foreman said, his remarks were listed without any argument or attempt to justify the position of the company. After the series of meetings was concluded, all the comments were summarized, and the ideas and suggestions were analyzed. When the problems most often mentioned were determined, we set out to change or correct these items, with the result that in the areas involved, we had the greatest decrease in the number of accidents in the next few years.

A moment ago, I mentioned a safety rule book. I believe that most large companies have one, and all companies have policies or practices which could be regarded as rules. We have a "general" book which applies to all employees, and special sections (which are added to the "general" book) that contain the rules for a particular type of work, such as stores, meter, shops, underground, generating stations, overhead, etc.

We have also a series of work practice manuals. These show the approved ways or methods of doing the work and differ from the safety rules in that they go into detail as to *how* a particular job should be done. For example, a safety rule might state that a transformer must be tested before it is connected, but how it should be tested is described in these manuals.

However, no matter how many rules or rule books we have, no matter how many work practices have been tried and approved, no matter how many tools have

been safely designed, we still must *sell* every employee, for until he is fully sold on safety, he is not a 100 per cent safe worker. Now here are a lot of ways to sell, and a lot of ways to advertise, which is a preliminary step in the selling process.

One of these ways is to use signs. I'm sure all of you use them in some form or other and to some extent. Here are some we have used. Since first impressions are important, every applicant coming into our employment office sees this statement, "Safety is a must in our company and helps make it a good place to work, make sure of safety first."

From the time an employee signs on with us, until he signs off many years later, he is besieged with signs. They may hang on the wall of a district garage and carry a message for operating personnel, or be large outdoor affairs, so located that both employees and the public can see it through the entrance gate. It may paraphrase the well-known G.I. slogan, "Kilroy was here—and worked safely," and be pasted on the side of a transformer so it may be discovered by the next crew assigned to this location; or it may be a catchy message cemented to the aisle of our shop, where mechanics, carpenters and painters can see it—if they watch their step.

For bulletin boards, we buy posters from the Edison Electric Institute or the National Safety Council, or we originate our own. One such is of a series we created, showing what happens to Miles Zaway when his mind *is* miles away. To illustrate the importance of using protective equipment, we conceived 12 posters using a sports professional as the theme. The "Old Pro" says: "The other eight are in the field, but still the game must wait; Until he dons his safety gear, he won't go near that plate." Each month a different sport is depicted: Basketball in the spring, football in the fall, hockey in winter, etc.

Each of our construction crews is furnished a card every month. These are hung in the crew compartment of the trucks where the men will see them as they ride from job to job. Some of the cards are aimed at a specific season of the year, others at a specific date. When we have our annual drive or campaign, we

ign a card to augment whatever other blicity is used.

For many years, our construction crew emen and their supervisors were issued ds of this type. Each four week period, star was placed in the proper space to licate a perfect record. If a lost-time ident occurred, it was recorded. We continued their use several years ago, because the idea wasn't effective for a ile, but because many years of use d dulled their impact. We believe that safety salesmanship, you must keep using ferent and novel techniques to maintain erest. I have been told even something e this will become less interesting as e goes on.

Every four weeks we issue an accident perience report showing the total num- of accidents occurring during the four eks, and year-to-date; the number of abling injuries; and the freqeuncy rate, npared to the previous year. We also scribe the disabling injuries during that riod.

A monthly motor vehicle accident report is ued and lists the number of car and ck accidents and the rate per hundred hicles. We use this comparison rather an accidents-per mile basis because of the ference in traffic conditions between our ral areas and Chicago. Both the injury d vehicle reports have company-wide cir- lation, so that everyone has access to the ures. Transportation memos, varying in lor and carrying a different message each onth, are pasted on the dash or other con- cuous places inside our cars to remind e driver that he should be a "better than erage driver."

From time to time, bulletins on hazards e issued on items which might not be vious to the average person. Some of ese items have been thermal insulating derwear, flammable cleaning solvents and ir sprays, dangerous toys for children, d hazards encountered when working near ants which use radioactive materials.

Of course, we wouldn't pass the oppor- nity to use our monthly magazine, and e try to report safety news of sufficient erest to be printed. When an event of usual significance occurs, we ask for the ont or back cover, and the editor has en very gracious and accommodating.

Now let's discuss some of the gadgets, gimmicks and graphic guile we have used to remind employees that the company has a safety program.

Many of you are familiar with the symbol used by many electric utilities known as Reddy Kilowatt. Our company uses "Little Bill." Shortly after he was introduced to our customers, the safety section created "Bea Safe" to represent our many safety activities. We think she is very attractive and a first-class attention-getter.

For example, when we make arrangements with the window display manager to devote one of the windows in our main office building to safety equipment, Bea Safe is there, to be seen by the public passing by as well as by our employees.

Speaking of displays, whenever we have an open house, such as upon completion of a new building like our technical center or a district office, we try to wangle some space somewhere to preach the safety message. If families are invited, we may show Mickey Mouse to the kids, or distribute an inexpensive prize to each child. Many times after mama has seen what protective equipment papa is supposed to wear, she helps us to make sure he uses it.

Since pencils are pretty universally used, we requested our purchasing department to buy them with safety mottoes imprinted. There is no charge on large orders, and the manufacturer has been furnished with several dozen slogans. Sometimes this results in a humorous touch, such as "Every Week is Safety Week No. 2."

Everyone drinks water sometime during the day, so a safety slogan has been printed on each paper cup.

We have successfully used a telephone message device. Once a week, or oftener, we dictated a message on safety to a recording machine. It was connected to our main switchboard, and at any hour of the day or night, any employee could dial and hear a brief safety message. The machine can be rented from the telephone company for about $25 a month, and should be connected to an easily remembered number, such as 7233, which spells "safe" on the telephone dial. During World Series time, we reported the score at the end of each inning of the Yankees versus whoever was representing the National League.

Another gadget available is an automatic slide projecting machine. This holds sixteen 2 x 2 slides in a revolving disc inside the box; each slide is automatically projected for six seconds onto a built-in screen, and a complete cycle takes 1½ minutes. The machine requires very little space, so it can be located in a building lobby, near a water fountain, coffee dispensing machine, or any other location where employee traffic warrants it. You can load it with slides for linemen one day, for boiler mechanics the next, then direct it toward storeroom hazards, or shift it to the girls' lounge and warn the girls against slippery floors, high heels, open file drawers, and other hazards encountered by office girls.

Our 10,000 and 20,000 volt rubber gloves are turned in for testing every three months. First, they are washed and sterilized, then carefully inspected, electrically tested, and sealed in boxes for re-use. Just before sealing, a card is inserted to remind the linemen and others who use them that a glove on the hand is worth two on the truck. The cards are varied, bringing a new message every quarter.

Another effective tool is the use of safety achievement awards. When a small group —half a dozen men—has worked one, two, or three years without a disabling injury, this award is presented by the division safety advisor. For larger groups, who accumulate 50,000 or more manhours, a framed certificate is awarded, signed by the superintendent of safety and the president of the company. When 250,000 manhours are completed, a red certificate is presented. These are all dated one year, two years, three years, etc., since the last disabling injury. And on those important occasions when a department achieves one million manhours, an impressive golden plaque serves to remind all employees involved that they have accomplished an outstanding safety achievement.

Usually "coffee and" is provided when the first award is presented; after several years, a breakfast may be served, and when a million manhours is celebrated, a full course dinner marks the occasion. We realize that a $4 dinner for 250 employees is $1,000; but we also know that an analysis made

in our company several years ago showed that the average cost of a disabling injury (exclusive of fatalities) was $443. Thus, if we eliminate just *one* lost-time accident in each of the two years it takes a group this size to reach a million manhours, we are money ahead, for the saving of the indirect expenses and the reduction in the number of minor accidents are plus values which completely offset the price of the dinner.

Many times, individual awards are made to each member of the group, with suitable engraving which serves as a constant reminder of the occasion. Many items are available—key chains, ash trays, tie clasps, nail clippers, small tool kits, steel rulers, etc. We encourage the awarding of these gifts, because other employees see the item or hear about them, and strive a little harder to win something themselves. It is a peculiar trait of the average employee that he'll work all year for $5000, but for $5000 plus "coffee and," or breakfast, or dinner, and a souvenir, he'll work *safely* all year!

When a group is getting near an award date, we like to see it advertised with cards or certificates in advance to stimulate further interest in reaching the goal. Some people are superstitious, saying, "Let's not talk about it until the day it happens"; but we feel that the more publicity there is, the more safety consciousness is created.

To increase pride in the wearing of hard hats, we designed and issued "Scotchlite" emblems, symbolic of the department or type of work involved. Whenever a man has been spared a severe injury, or perhaps death, by wearing a hard hat when struck by a falling object, we present him with a special hat, emblematic of his membership in the Turtle Club. The hat becomes his personal property and the ceremony usually occurs at a safety meeting. We average about one presentation a month. What an easy way to recognize the saving of twelve injuries a year!

Similarly, a Wise Owl Club certificate, presented to a man whose eye has been saved, stimulates interest in the wearing of safety glasses and goggles. Both the Turtle and Wise Owl Clubs are glad to furnish the equipment and accompanying certificates, either free or for a small charge.

Here is a very effective tool for pin-
ɔinting those areas which need special
tention. At the end of the year, we
ıalyze all accidents occurring in a divi-
on or generating station. First, we list
ıe accidents according to the foremen
hose men were involved. Second, we record
ıe classifications of the workmen injured,
ıd their age groups. Then we list the
ıjuries by type: falls, burns, electric shock,
c. Next we show the reasons: improper
ɔls, lack of adequate instructions, omis-
on of protective equipment, violation of
ıles, etc. Then we go over every item
ith the superintendent and his assistant
ı that they get a complete and accurate
icture of their accident problem and can
ıke steps to correct their deficiencies.

Even though we all know the only an-
wer to success in our business is hard
ork, I suppose we will continue to search
ɔr an easier way.

For the last nine years, we have put on
ı annual campaign or special drive, to
ıpplement the work of the division safety
dvisors. Early in 1955, we had "safety
eek." A letter was mailed by the man-
ger of industrial relations to the home of
very employee. The goal was to have
ıe entire company work one week with-
ut a disabling injury. Buttons were is-
ıed, to be worn by everyone during the
rive. These were made of celluloid and,
ıuch to our embarrassment, a welder in
ne of the shops set his on fire and we
lmost had an accident! The back cover
f our monthly magazine carried the theme,
Let's dwarf the number of accidents with
ıe safe seven—and keep the record clean."
rew cab cards for men using trucks and
osters on bulletin boards for shop and
ffice workers reminded everyone they should
e *extra* careful from March 20th to 26th.
he week was a success, and almost 16,000
mployees working 40 hours apiece, reached
00,000 manhours without a disabling in-
ıry for the first time in company history.

In September of 1955, we tried to double
ıe figure; this campaign was called, "Shoot-
ıg for a Million." Our shops built a
ocket, we picked a pretty girl to touch
off, and arranged with the editor to use
oth the front and back cover of the
Edison Service News." Again a letter
ras mailed to all employees, and pins

were issued, only this time they were made of cardboard. Each day was sponsored by a company official, and a daily bulletin was issued. The bulletins had a picture of the official, and a little corny verse to add interest. Each successive day showed the rocket moving farther from the earth and closer to our goal of 1,000,000 manhours. As you have probably guessed, our "Sputnik" turned out to be "Sputternick," because of an accident during the second day of the campaign. However, our efforts were not in vain because several areas determined they would get a million manhours themselves. Two of our generating stations made it, and a third reached 870,000 manhours before an injury broke the record.

Our 1956 campaign was a slogan contest, with cash prizes ranging from $200, down to $5, for the 25 best slogans. In addition to the publicity in our magazine, we put posters on all bulletin boards and used our telephone message device to encourage participation. Included in a letter to every employee was a set of rules and an entry blank. When the contest closed, we had received over 6,000 entries, indicating the interest shown by employees all over the system.

The 1957 program utilized the very powerful safety movies of the U.S. Steel Corporation, "Knowing's Not Enough." Publicity included cards in elevators and on lunch room tables, posters on bulletin boards, flags at each headquarters, crew cab cards, and the back page of our magazine. Everyone seeing the film was given a small flag to wear on cap, blouse, or lapel, and our safety advisors were specially-made ties with yellow flags showing against a blue background. This was probably our most successful campaign and the slogan, "Knowing's Not Enough," is still being quoted by our people during safety discussions.

Our campaign in 1958 was called, "Get Safety into Orbit around Edison System." Division vice-presidents, station superintendents, department heads and safety personnel wore handkerchiefs and neckties specifically made to illustrate the theme. Foremen wore arm bands during the two weeks of the campaign. In addition to magazine and poster publicity, each employee was sent a letter, and specially designed match books were distributed by an attractive "Bea Safe" girl in various stations, division offices and reporting headquarters. We also arranged to have a message from "Bea Safe" imprinted on every employee's pay check envelope.

In 1959, when we adopted mouth-to-mouth resuscitation as the preferred method of artificial respiration, we showed the film "Rescue Breathing" to every employee on the system. We also distributed wallet cards. When the Resusci-Ann training manikin became available, we purchased one for each division and initiated individual practice for most of our people over our system.

The 1960 campaign was based on a movie which was written, directed and produced by our own personnel, using professional help only for the recording and editing. "Take Another Look" is a 16mm sound color motion picture which portrays six accidents typical of those which might occur on any electrical utility system. Using a golf outing as a background, this 27 minute movie uses "flashbacks" to illustrate each accident. We followed it up with posters on every washroom mirror. The movie stimulated considerable interest outside our company and about two dozen copies of the film have been sold at $150 each.

In 1961, we held an essay contest in connection with a company-wide showing of the National Safety Council movie, "Safety Everywhere—All the Time." Employees were urged to send in essays of 100 words or less on the theme, "I should practice Safety Everywhere—All the Time, because . . ." Entry blanks were mailed to homes, and $625 in prizes offered. Award checks were presented to the 26 winners at a noon dinner, with suitable pictures and publicity.

In 1962, we adopted "heart compression" or "cardiac massage" as a life-saving technique to be used in conjunction with mouth-to-mouth or mouth-to-nose respiration on victims whose heart has stopped because of electric shock, heart attack, drowning, gas inhalation, or other causes. Our medical director trained a group of specialists, who in turn trained other employees in the proper technique. Due to the extreme im-

portance of proper application of the heart compression technique, we have instituted a re-training program at approximately six-month intervals for those people considered to be working in high hazard areas.

This year a system-wide program was developed from a script written by one of our safety advisors, entitled "Safety Is In Your Hands." A 45-minute narration on tape was augmented by a strip film which combined actual photographs and cartoons to illustrate various aspects of our own company functions with regard to safety principles both on and off the job. Except for film developing and rental of the recording studio, the entire program was produced exclusively by company personnel.

As you can see, we try to sell safety rather than force it, to convince people they *ought* to work safely rather than penalize them when they don't. We constantly remind supervisors and foremen that accident prevention is their responsibility, and that we are there to *help* them, not to *dictate* to them. We also stress the fact that we are available 24 hours a day. If a night shift wants to hold a safety meeting at 11 p.m., or 2 a.m., or 7 a.m., we'll be there to handle our part of the program.

But the backbone of our safety program is the work done by our safety advisors out in the field, or the shops, or generating stations; contacting men day after day; counseling with foremen; inspecting job conditions; and participating in safety meetings. Our safety advisors are encouraged to develop supplementary programs in their own areas and sometimes prove quite successful.

In 1959 I wrote the script for a program on statistics, to illustrate the frequency of injury to various parts of the body. Speaking parts for the head, arm, foot, etc., were developed, and as a slide was shown of the bandaged member, one of our people read an aggrieved opinion in regard to the carlessness which resulted in the injury. The number of injuries of each type was shown on another slide. Originally done live, the show was subsequently put on tape and toured the entire Edison system. That Fall it was presented at the National Safety Congress.

In 1960, to promote interest and encourage familiarity with our new safety

book; I wrote another program, using
rtoon character developed by another
any to emphasize the safety rules. The
ıtive self" approach proved quite suc-
ıl and this program also circulated
gh many of our shops and generating
ns. Somewhat similar to the statistics
am, speaking parts were assigned and
ons were shown to coincide with state-
ı of good safety practice, for example:
ders should be kept in good repair";
trical equipment should be inspected
arly"; "fans must be properly guarded";
er welding procedures must be fol-
l"; and "leave a work area as clean
u found it."

ese two programs are offered as ex-
s of supplementary safety promotions
ı can evolve by encouraging the in-
ıal initiative of your field representa-

w, perhaps you are wondering how we
loing as a result, or perhaps in spite,
e activities I have described. In 1954,
ad 569 disabling injuries—average 11
week, and we were 18th out of 20
electrical utilities. By 1961, we were
than average, with 100 disabling in-
s, slightly less than two per week
ı 82 per cent reduction. Unfortunately,
uffered a slight increase to 123 dis-
ɣ injuries last year. This year, to date,
ıre doing better than last year but
quite as well as in 1961. Obviously,
re working diligently to effect further
ovement in our accident experience.

vant to emphasize that all these gim-
ı, gadgets and ideas I've described are
y advertising which calls attention to
act that we have a product—safety—
ll to our employees. The actual acci-
prevention work is done by competent
eering, adequate education and train-
strict, but fair enforcement, and last
l, enthusiasm.

om this review, you can see that the
nonwealth Edison Company is pretty
in the same position you are. We
antly strive to get our safety product
on the street": to devise a new ap-
h or to adopt the successful ideas
ther people, in order to influence the
ing of the man on the job.

elieve we come to the Safety Congress
much like the man who dreamed he

discovered a new store. He entered the store and found an angel behind the counter. Upon inquiring, he was told that everything was free and he could have anything he desired. Immediately he ordered peace on earth; an end to famine, sorrow and disease . . .

"Just a moment," smiled the angel. "You haven't quite understood. We don't sell fruits here—only seeds.

I sincerely hope that something I have said might prove to be a seed worth cultivating. It has been a privilege to review the activities of my company as we gather here in our mutual desire to learn new ways to establish a perfect safety record.

COMMUNICATING YOUR IDEAS

By JAMES E. DELANEY

Administrator of Supervisory Development, Guidance and Control Systems Div. of Litton Industries, Woodland Hills, Calif.

Since the problem of communication is so broad a subject, this paper will explain only four basic concepts. When business men and women fully understand and apply these ideas, they will find a great improvement in their ability to communicate effectively.

The Triangle of Meaning

It is writer's or speaker's obligation to present his thoughts so clearly that the reader or listener will understand the message completely.

The communicator should remember the following points:

1. Human understanding is the goal when people write or speak.

2. Inadequate preparation of both written material and formal speeches can cost the company countless dollars. Therefore, one should take sufficient time to do an excellent job.

3. Mental blocks such as attitudes, convictions, complexes, and prejudices can hinder one's communication. The communicator must realize that he cannot win everyone to his way of thinking.

4. He should answer these questions before he writes a message or delivers a speech;

a. Who will read or hear the message?

b. How much do they know about the subject?

c. What information should they receive?

Oral Writing

One of the best principles to use in writing is that one should "Write approximately as he would talk." A person who seeks to communicate should apply this technique in order to produce the rough draft.

He should ask the question, "How should this concept be presented?" He then prepares an outline of the ideas to be discussed, and dictates the message to a secretary or perhaps a tape recorder. If neither of these is available, he can whisper the thought aloud and then immediately write down what he has said. This method will produce the easy flow of ideas which constitutes good business communication.

The next step is the editing process. If the draft is read aloud, one can detect wrong tone, bad grammer, sentence fragments, and misspelled words. The writer should remove any slang, trite, and old expressions that are part of the "spoken" language but are never written. He may also have to remove or change words, phrases, and sentences. It will take several drafts to produce an excellent piece of writing, but the results will be satisfying.

Two Styles of Writing and Speaking

Most stories, novels, and plays follow the "pyramid form." This is achieved by starting with statements of facts and descriptions of events that gradually build to a climax. When his point is reached, the story quickly comes to a close.

This organization of ideas is used when writing or telling a humorous story or trying to influence the reader or listener. One lays the background, creates the atmosphere, and builds the story to the "punch" line. This is the dramatic way to organize, and the method creates interest and suspense.

The inverted pyramid or "V" form of organization is best for presenting business or technical information. One gives the reader or listener a general picture of the situation, elaborates on the most important facts in logical order, and then closes the presentation with a convincing conclusion. He starts strongly—he finishes strongly.

The "Key Word" Outline

The communicator must decide what ideas he is going to write or to discuss. He lists the "key words" or "key ideas" as they are

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A NEW ASPHALT I

By C. L. HUISM
Highway Eng., Iowa State Highway

I am here to give a short presentation of what we, in the maintenance department of the Iowa State Highway Commission, consider a new asphalt distributor.

As a little background, this distributor was developed because we were tired of the old trailer-type units that lacked maneuverability, had limited usage on heavily traveled roads and were limited by legal 35 mile speed limits.

The solution to our situation is quite simple, one might add; "simply purchase distributors that are truck mounted." This solution was not satisfactory, for we had 130 distributors, and to truck mount them would tie up 130 trucks for 12 months of each year.

This would be an expensive solution to our problem. What we wanted was a distributor that could be truck mounted when its use was desired, but could be stored in a yard without tying up a truck when not in use.

The pilot model was developed in our own maintenance shops at our headquarters in

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ht of on 3 x 5 in. cards. A key word
vord or short expression for any idea
will later be expanded into a para-
or full concept if one is speaking.

n he examines the ideas carefully and
s upon the best order of presentation.
e ideas are rearranged, he may think
w ideas. He then adds these new ideas
e proper place in the outline. Also,
essary ideas will be removed.

fh the outline as a guide, he can now
op each key word into a complete unit
ought. This plan accomplishes three
:

All necessary facts have been presented.

One key word has been developed into
agraph or complete unit of thought.

All ideas have been placed in logical

DISTRIBUTOR

IAN
Commission, Ames, Iowa

s, Iowa. We have done away with the
ng gear, the trailer hitch, and have an
ilt distributor skid mounted on four
The two back legs are permanent but
elescoping; that is, the lower sections
ope into the upper sections. The two
legs are reclining in that they pivot
id the center point and fold up out of
way when the unit is loaded into the
dump body. In this loading sequence,
irst operation is to line the truck up in
of the distributor. Next raise the
box approximately 6 inches to give it
t a 6 to 10 degree incline.

simple boat winch and cable is used to
the unit into the truck dump body.
recessed wheels are tucked within the
distributor frame. With these wheels
ie cocked position, as a truck dump
backs under the distributor unit, the
ht of the front end is carried on these
wheels after the two front legs are re-
d. The wheels are mounted on an ec-
ic shaft which gives sufficient throw
ving them out of position when the unit
aded in the dump body.

When the pressure has been taken off of the two front legs, the weight of the front end of the distributor is resting on these two wheels which are, in turn resting in the bed of the dump body.

The two front legs each have a hydraulic jack in their foot. By releasing the pressure on these jacks and loosening the wing nut at the top end of each front leg, they are ready to swing out of position as the truck dump body is winched under the unit.

As the operator turns the winch crank, the cable attached to the front end of the truck dump body is acually pulling the truck underneath the asphalt distributor, while the front legs begin to swing up in a reclining position.

The heavy angle iron at the back of the distributor unit then butts up against the apron of the truck dump body. At this point the truck dump body is dropped to its horizontal position. By so doing the weight is removed from the two back legs and the unit is now resting entirely in the dump body of the truck. The operator now releases the two front wheels so that the weight of the front end of the unit is on the skid, rather than the two front wheels.

In the adaptation of truck dump bodies to this type of distributor, we weld a large eye to the front wall of the dump body in which to hook the grab hook of the winch cable. This cable is cut to a critical length so that in the unloading operation, it can only release the distributor to a point where the two front legs can swing down into position. One could not drive out from under the unit without the front legs coming down, but would be stopped by the critical length of the winch cable and would begin to drag the unit.

The reason for a two speed winch is that in the lesser gear reduction, we can load slightly faster with an empty truck. The lower gear reduction is used when loading with a full tank of asphalt. Please notice here also that in our operation of heating asphalt for road maintenance, we have converted our entire fleet of distributors to LP gas operation. We are using liquid propane.

To differentiate this tank type and separate it from domestic use, we have painted the dome of each tank highway orange and have equipped the bottles with a special liquid withdrawal valve which is not compatible with any household or domestic service. This eliminates a hazard of bottles getting mixed up and being inadvertently used for household service wherein they would immediately cause an explosion.

There are several safety features worthy of note. One is the platform for the operator. To our knowledge, this is the first distributor that has a side railing for operator protection. He is also up in the air higher where he can see the area he is working and is in a better position to view any obstacles that may be present. He is within 10 to 12 feet of the truck operator and in this fashion is better able to coordinate their work. In the former use of a trailer-type unit, the distributor operator and truck operator were approximately 30 to 40 feet apart and were unable to communicate with one another.

Even though there is some overhang from the back of the dump body, it is less than four feet, which is the legal limit in Iowa without being identified with a red flag.

The entire operation of loading the distributor is approximately 10 minutes. In this 10 minutes we have completely loaded the unit, it is ready for operation. The controls for the distributor operator are all conveniently clustered around the platform so that he can control both the burners, the engine, and the distributor valve mechanism.

In the unloading sequence, the first operation before raising the dump body is to drop the two rear telescoping back legs and put the pins in position. However, before the dump body can be raised, the operator must go within the dump body and cock the lever which swings the two small front wheels into position. By doing this he is putting the weight on the back of the skid and the two front wheels. By raising the dump body, the weight is transferred from the rear of the skid to the two back legs and the two front wheels.

At this point the truck driver begins to drive out from under the unit. The winch cable is in place, and is actually the member which is controlling the speed with which the truck drives out from under the distributor. This is also controlled by the operator on the winch cable handle where a brake can completely stop the unwinding of the winch cable, if desired.

As the two front legs begin to swing down into position, the skid of the distributor is actually off of the truck bed itself and the weight is actually carried on the two small wheels up ahead of the two front legs.

The truck is driven ahead to the point where both front legs have completely swung down into position. Next the operator locks the two legs in position by simply attaching a wing nut to a bolt in each end of the two front legs.

After the two front legs have been secured, the operator is now getting ready to undo the winch cable, but before this can be done, he must slightly pump the two hydraulic jacks, thereby taking the load off of the dump body and putting it onto the two front legs and two back legs.

After disconnecting the winch cable, the operator is ready to drive away from the distributor unit.

The front legs are also drilled for a coarse adjustment; however, through practice we have found that this is not necessary since satisfactory adjustments can be made in each hydraulic jack. The clearance between the skid and the dump body from the swing on the two front wheels is approximately one and one half inches.

When the unit is completely self-supported and the truck is ready to drive away, the time elapsed in this unloading operation is less than five minutes.

The question may come to mind, "Is a unit of this type in storage stable under severe weather conditions?" This particular unit was exposed to a broad-side wind of approximately 70 miles per hour, the tank was empty; however, the wind had no effect and did not move the unit in its resting position.

Some details of construction would be of interest.

In the LP gas burner control box, we have designed our own control circuit. The distributor has two main burners and a hand burner. If we have flame failure in either of the main burners, a safety circuit will shut the gas flow. We have clustered the engine controls together, and to the right rear of the platform we have clustered the distributor controls together.

On the operator's platform, looking into

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mp body, there is a railing around
ides of the platform and across the
We have a safety chain and clip so
he operator is completely protected
riding on the back of this unit. There
ple clearance between the tank itself
ie wall of the dump body in order
ie operator can walk completely along
stributor unit. I might mention, inci-
y, that any standard 10 foot dump
that is made today will accommodate
istributor unit.

control the safety shut-off valve with
of thermocouples in series so that
failure in either burner will shut off
is supply to the unit. We use liquid
awal on all units in order to elimi-
reezeups of lines and to get quicker
o the burners.

comparisons of the safety features of
mit with the trailer-type unit, we
d out that all of the tail lights on the
are still completely visible even though
stributor is loaded and ready for op-
n. By comparison, because of the width
: older trailer unit and its height, the
ights visible from the rear are the
ox clearance lights on the back of the

h the truck mounted unit, the stop
visibility from the rear is excellent.

of our biggest reasons as I men-
before, for going to this type of dis-
or instead of the trailer mounted unit
fact that to comply with new State
regulations and laws, we would have
tall trailer brakes, turning signals, and
complete set of lights and reflectors
: trailer units. We felt that, with this
mount unit, we could reduce our initial
y eliminating the lighting and brake
ies required and, in fact, eliminating
hole trailer running gear.

of the lights are clearly visible from
ngle one might observe this unit along
ghway. The amber beacon is standard
ment on all maintenance units of the
State Highway Commission and, when-
hey are doing any repair work on the
urface itself or the adjoining shoulder,
standard procedure to use these amber
g lights—day or night.

still have approximately 100 of the
trailer type distributors in service. We

are making plans to eliminate these units as rapidly as possible and to convert our whole fleet to the skid mounted units.

I would like also to call your attention to the contrast in the safety features on the operator's platform of the older unit, as compared with the skid mounted unit. The operator has a platform, but it is a solid deck plate rather than the open grid plate in our truck mounted unit. We feel the open grid platform is self-cleaning, where the older platform not only built up with asphalt, but would be slippery for any operator stepping up onto it. There also is no railing for the operator.

A view of the older unit from the rear would show that visibility for the operator is very poor. He is to the side and far enough ahead of his distributor spray bar that he cannot actually see the spray bar nozzle in operation. It has been one of our common problems that operators drive for hundreds of feet before they realize that they have plugged nozzles and are leaving a bare strip in the seal-coat operation.

We made action pictures of our pilot model being used at Iowa State University to resurface streets in a student housing area, which show the excellent spray pattern from this operation. We have used a shield on the left hand side of the spray bar to protect the most recent application of asphalt and cover aggregate.

The truck with the chip spreader follows right behind the distributor unit. We feel that one of our biggest successes for our seal-coat operation is to get the aggregate in the asphalt, covered and rolled as quickly as possible. Smooth uniform application of asphalt just ahead of the aggregate spreader makes this possible.

First manufactured units that the Iowa State Highway Commission had built, according to specifications drawn around the pilot model, with all of their added features, were purchased at a reduction in cost of $250 per unit over purchases a year ago.

We feel that most of this reduced cost was due to the fact that we eliminated the trailer running gear, wheels and tires from the purchase price of the distributor units. Also it eliminated the extra fabrication of steel in the tongue and pintle hook eye.

This is a close-up of the distributor bar arrangement that is used by Seaman-Gunnison on their particular make of distributors. Through experience, we have found that the fully circulating spray bar not only adds to a better appearing job for maintenance operations, but makes it much quicker to vary the width of spray.

This is a view showing the whole platform assembly, including spray bar, engine, and operator platform. Notice the low silhouette except for the stack extensions for the flue exhaust.

After the units have been completely fabricated and tested at the Seaman-Gunnison plant at Baraboo, Wisconsin, they are loaded for transit to the headquarters at the Iowa State Highway Commission in Ames, Iowa.

One question that might come to your mind, is "What is the tank capacity of these units?" They are approximately 525 gallons, the same as our original pilot model. They look larger because they are insulated with 1½ inches of rock wool insulation in order to contain the heat of the asphalt within the tank during the day's working period.

Another application we have made of this retractable skid mount leg arrangement is on a slip-in salt-and-sander hopper box which we have converted to the leg attachment principle. Again the two front wheels are on an eccentric that swings into position when loading the unit. A sprocket on the front of the hopper transmits the live power from the power take-off to the gear case at the rear of the hopper box. We are using the same winch and cable arrangement that was used on the asphalt distributor.

When the loaded unit is ready to operate, we have the three identification light cluster on the salt box itself, with two spot lights shining down onto the spreading mechanism. These are plugged into a standard receptacle, which is mounted on the back of the dump body itself. All required lighting is visible.

Although the leg arrangement described is only one year old, we wish to state that in the progress of the Iowa State Highway Commission, we have in operation 19 distributors with the skid mount leg attachment and also have in operation to date approximately 30 of the sand and salt hopper boxes. Recently contracts have been let for the

fabrication and manufacture of 71 more hopper box units, these to be delivered before the coming season's winter weather.

I feel that the use by the Iowa State Highway Commission is a testimonial of the merit of the idea; the principle being that the most versatile body for a maintenance truck unit is the standard ten foot dump

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WIRE ROPE ANI

By N. E. FREEB
Prod. Engineer, Broderick & Bascom

Wire rope is an integral part of many machines involved in the movement of men and materials, and is used in just about every segment of our nation's work-a-day life. In conjunction with wire rope, safety should be uppermost in our minds due to the high potential of personal injury, the possible property damage and the high cost of schedule disruptions and other loss of time and motion.

Organized safety has done wonders in the field of wire rope usage, but there remains much to do. It ofttimes seems that more emphasis is put on the promotion of the steel toe safety shoe and the hard hat than on the correction of poor practices which are the very reasons for this kind of protection.

The wire rope industry has long stressed the proper methods for all types of practices involving its products; and they employ specialists to assist you in your specific problems. We would urge you to take full advantage of them. There is a crying need for safety-in-usage practices by all users. Furthermore, there is a need for exercises and demonstrations pertaining to the storage, installation, use and inspection of wire rope along with organized follow-ups to these exercises by management. Perhaps the greatest need is for the recognition of wire rope as a primary tool.

Far too often in the past, wire rope has been considered an expendable item; unfortunately it is grossly mistreated because of this classification. Wire rope is not merely an item of supply nor is it an auxiliary piece of lifting or pulling apparatus. Indeed,

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. By using slip-in attachments, whether be an asphalt distributor, a sand or er box, a water tank, or other item; by the reclining leg arrangement, we can a truck unit more versatile and use every operation encountered in day to week to week, safe highway mainte- operations.

D SLINGS

OURN

Rope Co., St. Louis, Mo.

a precision machine composed of many s of carefully selected high quality ma- l fabricated into an integral member h in most instances is the primary link een the load being moved and the mov- or lifting mechanism.

ire rope has extremely high tensile gth for its bulk and weight in com- on to other types of structural mem- It is the safest structural material m for the transmission of mechanical gy to lift or pull or to brace or support atic load.

ire rope is an amazing paradox: it has ability to resist abrasion, bending, crush- and the myriad other forms of abuse, at the same time it is flexible enough shipped on reels, wound on drums and es — all at a low unit cost and with ighest degree of safety.

rhaps this paradoxical nature of wire is its own worst enemy; for with such gh degree of safety and dependability often the subject of gross neglect which not afford the user the highest return is investment. The wire rope industry is accused of being fussy about its prod- as to care, installation, and use. With- stating that all users abuse rope, it is opinion that if wire rope were as "puny" mreliable as some parts of the machinery which it is used, we are certain it would ccorded much more attention.

own in one of our favorite restaurants altimore, Maryland, was a sign which "We buy the best of fish, fowl, and ; it is our cooks who spoil them." We

could just as well say that this is true in the wire rope business. Wire rope manufacturers build the finest precision machines for an exacting purpose; it is the user who determines the ultimate life.

Wire rope gives adequate warning of approaching failure by the progressive development of wear, broken wires and other physical characteristics which can be detected by proper inspection far in advance of an unsafe condition. The cogent point here is that in far too many cases there are no real "check-off and check-up" methods employed for wire rope or the equipment upon which it is used. Far too often this is entrusted to the low man on the totem pole with the grease gun in his hand. There is no program spelled-out, no definite instructions, no education, as a result we generally have well-greased equipment!

Our purpose here today is to present a "Check-up and Check-off" program concerning the procedures and factors affecting the storage, installation, lubrication and inspection of wire rope which we hope will serve as a guide at your place of employment. You must realize that we can only hope to provide a guide inasmuch as the completeness of any program is a matter limited by local operating conditions, individual experience, costs, equipment and most of all — personnel.

In order to facilitate this presentation we are going to follow an imaginary length of 6x37 class wire rope through the various phases of wire rope handling and installation, noting factors affecting wire rope life, application of lubricants and inspections as well. While realizing that we are encompassing many fields of use, our discussion involving an industrial application of an overhead crane hoist involves knowledge which is applicable to every wire rope application.

I. After the length of rope has been received at our imaginary factory we must first endeavor to properly store it. Care must be exercised to select a location which is clean, dry, and free from corrosive fumes or atmosphere. Too, the rope must be protected from weather by some manner of housing or cover such as tarp. If the rope is to be held in extended storage, it is imperative to re-lubricate at intervals. We know of one user who not only re-coats the exposed surfaces, but turns the reels periodically so the lube won't settle in one direction. We must guard against the piling of heavy objects on top of the wire rope which may crush or otherwise damage it.

II. Now the call comes in for a hoist rope replacement on our crane. When a piece of rope is drawn from storage for use on a piece of equipment, it must be properly uncoiled or unreeled in such a manner that the balance and symmetry built into the rope is maintained. The procedure for uncoiling a length of wire rope is illustrated:

A. Hold the outer end of the rope on the floor, turn the coil up on end. Roll the coil along the floor letting the rope trail behind.

B. DO NOT lay the coil on its side and uncoil by pulling the rope end. This can disturb the balance of the rope and/or lead to loops and kinks.

The procedure for unreeling a length of wire rope is as follows:

A. Pass a suitable bar or pipe through the center holes of the reel, and jack up the reel so it is supported by the inserted shaft.

B. Use a timber brake applied to the flange, or some such device, for snug and uniform controlled winding at the machine. This also prevents the formation of unnecessary loops at the storage reel. Note that it is suggested that both the reel and the first sheave be rotating in the same direction to avoid a "reverse bend" which can cause "twisty" rope.

C. Persistent use of incorrect methods of uncoiling and unspooling can only lead to poor rope service. One word about kinks: They cannot be relieved after once imparted to the rope for at best they leave a dog-leg. Normal service is not attainable inasmuch as abrasion and fatigue are likely to develop rapidly at the damaged area. In severe kinking, the whole rope structure is distorted and the core loses its proper fabricated position relative to the strands which results in damage to the core; wires are damaged and the rope is weakened materially. Extreme care must be exercised when unreeling or uncoiling to prevent movement over sharp corners or small radii as this causes spiral and often imparts to the rope a customary "cork screw" appearance.

III. Before installation of our new hoist rope on our crane, we should make a detailed

inspection of the equipment. The following items should be checked:

A. Using a sheave gauge, check the sheave grooves and drum-groove profiles. The gauge is shaped to nominal rope diameters plus the tolerance for that diameter. The following are the industry wire rope tolerances:

Nominal Diameter of Rope	Undersize	Oversize
0 — 3/4"	0"	1/32"
13/16" — 1-1/8"	0"	3/64"
1-3/16" — 1-1/2"	0"	1/16"
1-9/16" — 2-1/4"	0"	3/32"
2-5/16" — and larger	0"	1/8"

B. Operation of rope through tight grooves causes the following conditions:

1. Heavy abrasive wear; usually at the two points of contact between rope and sheave.

2. Rope crushing and distortion.

3. Ironing of the strands which pushes the lay back causing wildness in the rope which can also lead to high strand development or kinking.

C. Check the sheave and drum grooves for "corrugations." New rope lays differ from those of stretched rope; therefore, the strands of the new rope probably won't fit the corrugations and thus the outer wires will be cut-up and crushed.

D. Check for worn sheave bearings. Wobbly sheaves can cause the rope to scrub on the sheave flange and get out of proper alignment. Resultant fatigue is due to vibration, and the vibration can reach an amplitude sufficient to cause the rope to jump the sheave.

E. While we are checking for the wobbly sheave, we can detect any of those which are frozen.

1. Frozen sheaves can cause severe abrasion and also cork-screw or spiral the rope.

Type Rope	Cast Iron (Avg. Br.-125)
6x19 Reg. Lay	500 #/in.²
6x19 Lang Lay	575
6x37 Reg. Lay	600
6x37 Lang Lay	690
6x30 Flattened Strand	800

1. If a calculation indicates that the radial pressure is too high for the sheave and drum material on your hoist, a harder drum lagging or sheave lining would certainly improve both your equipment and rope service.

It is possible under these conditions to ce sufficient heat on the outer surfaces e outer wires which accompanied by a hing action from the surrounding cooler will cause a change in the micro struc- of the wire resulting in brittleness and fatigue. This is the so-called "burning" iece of wire rope.

Sight across the top of the drum on a erpendicular to the drum axis to check lrum symmetry. Lack of symmetry faulty spooling.

If it is determined that the sheaves drums are wearing or corrugating y, it may be an indication that these l be fabricated of harder material be- of high radial pressure.

Radial pressure is calculated as follows:

$$P = \frac{2T}{D \times d} = \text{Lbs. per sq. inch}$$

ere:

P = Radial Pressure (lbs./sq. inch)
T = Tension in rope (lbs.)
D = Sheave or Drum diameter (inches)
d = Nominal rope diameter (inches)

The following conclusions can be drawn this formula:

ressures become *greater* as the load *eased,* thus greater abrasive wear and fatigue.

or a constant load, the pressure *in-* with a *reduction* in size of the rope ave and/or drum diameter, and thus vear and fatigue result.

The table below indicates the Allow- adial Pressures for various types of nd sheaves or drums:

Cast Steel 30-40C-Br. 160	Manganese Steel 11-13% Mn-Ground
900 #/in.²	2500 #/in.²
1035	2575
1075	3000
1285	3450
1450	4000

a material change cannot be made, ing the sheave or drum diameter certain limits causes a decrease in ial pressure, as you can see from our ions concerning the formula.

I. Check the limit switch on the hoist for proper functioning. Ofttimes the limit switch has been removed in an unsafe move and never replaced.

J. Finally, check braking devices and all other mechanisms on the hoist to insure faultless performance.

IV. Now we are ready to install our new hoist rope with hopes of getting most of the service that has been designed and fabricated into it. However, we are not out of the woods yet! Here are some pointers to check before and during installation.

A. If any cutting must be done, the rope must be seized on both sides of the contemplated cut prior to cutting, despite what you ever heard about "preforming." Seize with about a 14 to 17 gauge annealed wire for 8 or 10 wraps.

B. Reeve up with a minimum of reverse bends in order to reduce the bending fatigue after the rope is put into service. Keep the rope under slight tension to avoid forming loops or kinks.

C. For smooth-faced drums, care must be taken to spool wraps of rope close without actually crowding to insure even winding during operation. It is recommended that a brass head hammer or wooden mallet be used to force the rope into position if at all necessary.

D. Use care so as to not damage or crush the rope in making end attachments:

1. Wedge-type fittings must be tightened with care to insure even gripping to prevent high-strand. Also the wedge and housing must not be worn to permit strand slippage. Be sure to remove all welded ends of rope before securing all fastenings to prevent imbalance in the rope.

2. Clips must also be applied with care if used:

a. Always use the proper number.

b. Always apply saddle on live side and U-bolt on the dead end of the rope. We have a saying at B&B which goes like this: "Never saddle a dead horse."

c. One last step that is often forgotten is to re-tighten all clip nuts after the rope has been in service a short while and lost its constructional stretch.

E. A new rope should be broken in by a short period of operation. As you know just from buying new shoes, this rope is a brand spanking new machine, and we need to "break it in." Here is the "patent prescription" for wire rope break-in:

1. With no load attached — cycle crane 10 times — no more: no less.

2. Cycle once with ¼ load, a ½ load, and a ¾ load — no more: no less.

3. With a full load attached — cycle crane 10 times — no more: no less.

4. Repeat at ½ the expected life.

V. Finally we have the crane back in service as the foreman barks — "Well, it's about time!"

Now, we must keep an eye on our rope to know when it should be removed.

The decision to remove a rope from service is based on careful inspection of the rope and evaluation of its condition as related to previous experience on the same machine.

We have prepared a copyrighted booklet entitled *Guide to the Care & Use of Wire Rope*, which accurately reflects our opinions on the subject of inspection; and we suggest it for related reading. It is available to you. We do feel that several points should be highlighted for your consideration when inspecting wire rope.

A. Inspection should be made according to a definitely planned schedule. A typical schedule would be as follows:

1. Daily inspection by the equipment operator — a rather rapid visual examination of the rope surface to note any important changes since the previous day or evidences of damage or any abnormal condition.

2. A detailed inspection by a trained and experienced man should be made periodically. The interval may be weekly, monthly, bimonthly or longer depending upon the requirement for the installation. Past experience indicates the rapidity of normal deterioration.

3. A record sheet of some sort should be kept on each rope. The rope and equipment should be identified — the date of rope installation along with inspection dates and remarks as to the condition of rope and machines.

B. A detailed examination should include the following:

1. It may be necessary to clean portions of the rope before inspection by means of

compressed air jet using all the necessary safety precautions, or with kerosene or wire brush.

2. The entire length should be studied to determine the section which has suffered the most severe deterioration. Such deterioration will be evidenced by one of the following:

a. Drastic reduction in rope diameter and lengthening of lay

b. Worn or abraded wires

c. Broken wires

d. Corroded wires

e. Marks of mechanical abuse such as distortion and crushing.

To discuss each of the above more thoroughly, first let's consider a general reduction in diameter and elongation of lay which is not in a localized section.

a. In all wire ropes we have a period in which constructional stretch occurs. This takes place early in the life of a rope and amount to approximately ½ of 1% in a rope with an IWRC and approximately 1% in a fiber core rope.

b. Then comes a prolonged period of operation with very little change.

c. Finally near the end of service life, rope will again show marked increase in stretch.

If it is noted that there is a localized reduction in rope diameter, one of the following is indicated:

a. Core failure

b. Excessive localized abrasive wear, perhaps at a kink

c. Excessive loading

d. Internal corrosion

e. Rope distortion or unbalance from accidental damage

The degree of abrasive wear on the outer wires is significant. A record either of the length of the wear spot per wire in the most severely worn section or the estimated reduction in diameter of the most severely worn outer wires should be kept. Such a record will assist in comparing the present wear with that on previous ropes at the time of their removal from service.

Severe, localized abrasive wear may indicate the need of preventive maintenance — tight sheave grooves, drum abuse or a condition of misalignment. At the same time

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et angle should be checked. Poor
gle can not only cause excessive wear,
build-up excessive torque in a rope.

fleet angle is the included angle be-
line representing the greatest travel
rope across the drum and a line
through the centerline of the lead
at right angles to the drum axis.
commended allowable fleet angles are
ows:

a. For smooth-faced drums:
Minimum — 1°30′
Maximum — 0°30′

b. For grooved drums:
Minimum — 0°30′
Maximum — 2° 0′

number of broken wires in the worst
y should be noted and recorded. It is
lpful to note the type of break if it is
able inasmuch as such information
lp determine possible corrective meas-
n addition to wire failure from abra-
ear, some other types of wire breaks
follow:

ensile breaks (cone and cup)

atigue breaks (square-off broken end
anular surface)

hear breaks (smooth break with twist-
appearance)

brasive fatigue (chisel fracture)

orsional (diagonal plane fracture —
metimes resemble fatigue)

regular (combinations of two or more
others. Can include cut or scraped
from accidental damage)

r records for several ropes are availa-
is possible to analyze the data and es-
a criterion for wire rope removal
on abrasive wear and wire breaks in
orst section of the rope. The pattern
ameter reduction and lay elongation
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f the strength of each wire. So, in

effect it is a double-edged sword. The degree of severity of the effects of corrosion are quite indeterminate once corrosion has commenced; therefore, it is our opinion that the problem falls within the realm of preventive maintenance. Some of the guideposts indicating external corrosion are:

a. Appearance of rust or scale on the wires

b. Pitting on the wires

Indications of internal corrosion are manifested by:

a. Rust flakes working out between the strands.

b. Outside wires may appear slack or seem to stand away from the rope.

c. Under load, the diameter of the rope showing these characteristics may be greatly reduced.

Careful scrutiny must be given on each inspection for *any* evidence of mechanical abuse or accidental damage to the rope. These should be treated as "red flag safety items" and correction made immediately; for such malfunctions can cause deterioration that will seriously alter the normal service pattern and can lead to severe property and personal injury. We suggest checking for the following:

a. Burns (electrical or heat)

b. Sheared, cut, or nicked wires

c. Peened wires which are those wires "pounded" out of shape

d. Dog-legs or kinks

e. Crushed or distorted sections of rope

VI. Let's now discuss the importance of lubrication in wire rope maintenance.

A. Rope lubrication is particularly necessary on those applications where the rope has quite lengthy service life.

B. A suitable lubrication schedule offers the following advantages:

1. Protects the rope from corrosion, both external and internal.

2. Reduces internal friction thus cutting down abrasive wear and bending stresses.

3. Preserves the core.

C. For indoor cranes it is preferable to use light penetrating lubricant specifically formulated by the various oil companies for this purpose. In order to increase penetration the rope must be reasonably clean.

D. For outdoor cranes ofttimes a heavier external protective lubricant is used to deter corrosion.

E. The frequency of lubrication varies with the operating conditions, and must be established following a study in which one central thought is paramount — the rope should never be allowed to become dry. A good maintenance practice is to co-ordinate the lubricating schedule with the inspection schedule since both require the rope to be relatively clean to accomplish either properly.

F. Methods of lubrication are the ingenious products of sharp maintenance departments. In the main they fall into three categories:

1. Drip system — over some main sheave.

2. Dip systems — passing rope vertically through a cone-shaped container of lubricant or passing the rope horizontally through a trough.

3. Brushing lubricant at a convenient location — usually at drum as rope is wound in.

VII. Our imaginary hoist rope has now run the full gamut of storage, handling, installation, inspection and lubrication.

The last thing that happens is the inevitable assignment to the scrap pile. However, if all of the principles we have outlined are followed, that fatal moment will have been delayed as long as possible at the highest degree of safety.

Now we come to a discussion of wire rope slings which are specialized products of our industry used in the art of rigging.

Rigging is the process of handling material with slings in conjunction with a crane, hoist, chain fall or any other lifting device. Here, too, rigging safety is uppermost due to the high potential of personal and property damage and loss of time and motion. Safe rigging practices will tend to minimize all three of these conditions.

In a discussion such as this we can only touch upon the general approach to the problem of safety in rigging and discuss the most grievous offenses noted in observation of lifts in various sectors of the country.

As to the general approach we must consider three basic things: the men, the work area, and the equipment. Planning should

take place well ahead of the actual lift itself.

The men selected to do the job must be properly "lined-up" by being alerted to conditions surrounding their jobs and they must possess a clear understanding of the methods to be used and the job sequence to be followed. It may be wise to consider photographing "production" lifts that duplicate time and again for a "ready reference." In a "check-off and check-up" procedure the men must be instructed in great detail by analyzing the job and giving them instructions on eliminating each hazard. The emotional qualification of the men is important for the good rigger must know how to react in an emergency by "keeping his head."

The work area must be adequately prepared so as to create no problem in addition to the load itself. Safety equipment should include both personal protective items such as gloves, hard hats, and safety shoes — and general safety equipment such as barricades, warning signs, tag lines, cribbing and the like. These should be considered thoroughly in the "pre-planning" segment of the job.

Now let's discuss the offenses most often noted.

1. There is the problem of improper hitches used for the load. Which hitch for which job? A rigger must know and recognize the difference between a good and a bad hitch. Jobs vary in size, shape and weight and location of points where slings may be attached. Yet for every load a rigger must know the right hitch, where and how to attach the slings, and most important he must know how jobs can be expected to react when all or part of their weight is supported by these slings.

Probably the most important single rule for all riggers in this respect is that a spliced sling should never be used in a single-cable hitch over the heads of other people. Single-cable hitches are numerous but they have one thing in common — there is only one cable supporting the load. Just about in every case a second cable can be used to not only control the load but it adds an additional margin of safety. Poor hitches are not only safety hazards; they cost plenty in the form of damage to slings.

Just what are the basic hitches and how can we evaluate them in terms of "rules

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ıb" easily understood by the ordinary First, we have the direct connected hich is nothing more than a choker low much can it lift? Here is a "rule ıb" for a fiber core sling: Diameter , times eight, gives the safe load rat- ons. If the sling is hand spliced our thumb says it must reduce this load y 15 per cent due to efficiency of lf there is a mechanical splice no re- is necessary. If a sling with an is used we must add 7½ per cent to gures.

take an example: Suppose we had a h fiber core hand spliced choker " x 1" x 8 gives us an 8-ton working ince this is a hand spliced sling we duce this rating by 15 per cent which we end up with 6.8 tons. Next we "choker" hitch which is like a noose med by passing a loop through a ontrary to what we might think, t consider that this sling will lift per cent of the directly connected n other words our 8-ton capacity rived by the convenient rule of thumb 5 tons when the sling is used in a hitch.

on, we encounter next the basket here the load is cradled in the bight sling with both loops being engaged ok — shackle or link. If we had s exactly vertical we could consider king load as twice that of a directly d sling, but so often angles are en- d to the extent that we prefer our thumb to include the value of 1½ e directly connected sling capacity. r words our 8-ton capacity is 12 basket hitch.

the heading of direct connected omes the subject of multiple leg A combination of two, three or four slings can be combined in a common on such as a link or a shackle. re multiple leg slings and the load nust take into consideration the ef- ull of each leg at the angle at which erating in each instance. Should the ary, each leg must be calculated ly and the sling fabricated to take ount the most critical condition.

and three leg slings distribute the ually. Where four legs are used, practice is to put a turnbuckle in

one leg. This is to provide a means to assure all of the legs are accepting an equal share of the load. To illustrate, most of you, doubtless, have sat in a chair on an uneven surface where the chair rocked. There were times during this irritating process when your weight was on two legs of that chair even though the chair had four legs — get the drift? The same principle can and does apply to slings.

2. Let's take up the second of our most common offenses encountered in industrial lifting. There is no appreciation of the effect of angles on sling loading. Failure to recognize load-angle relations may result in overload on the slings. Keep the attachment-angles as nearly straight up as practical. As an example — a cable that is right for a 10-ton load at a 30° attachment angle is only half strong enough for the same load at a 60° attachment angle. The attachment angle is measured from the vertical by the wire rope industry and from the horizontal by the chain industry. When the attachment angle is greater than 60° it is necessary to use a lifting beam.

3. The third offense most commonly noted is that concerning the lack of understanding of the center of gravity in lifting. Just what is this "mysterious" thing called the center of gravity. It is nothing other than a point at which all the weight of an object is said to be concentrated. The center of gravity always acts vertically downward to bring the object lifted to a position of equilibrium directly under the crane hook.

Know the location of the center of gravity and the direction in which it will be expected to act. Too much stress cannot be placed on the effect of the center of gravity in turning loads. When the location of the center of gravity is known and an understanding acquired of the direction in which it acts, then it becomes easy to attach slings so as to obtain a pivot point where the turning action is more or less automatic. It also facilitates determination of the center of gravity and other points if all jobs are treated as rectangles.

4. Offense number four in our parade of most often noted offenses is that concerning hooks and their applications.

It is not the purpose of this talk to delve into the design formulae for strength of hooks, but rather to point out the uses and abuses most often noted in slinging.

The standard Dirigo hook is the usual type of hook employed on slings. It has a circular shape which enables it to roll with the load, and unless the rolling action is restricted, the upper eye will always be on a straight line of the pull. Whether the pull is vertical, angular or horizontal doesn't make a particle of difference.

While the Dirigo hook is used successfully in almost every case, it can also be abused. It can be used in a hookup in a hole where the hook movement is restricted at a corner causing a bending moment in the shank of the hook.

Probably the greatest abuse of a hook is point loading. Hook manufacturers are very conscientious about the development of their hooks — they are expertly designed. Essentially the hook is meant to lift vertically. The center line of action on a single hook should follow down from the center line of the upper eye through the bearing point on the curvature of the hook. The bending moment is calculated from the weight acting along the center line of action at the bearing point times the distance from this bearing point to the center of gravity of the critical section.

Simply stated, the critical section is a curved lever and you are familiar with the force required to lift a load with a short lever. Increasing the length of the lever decreases the force required to overcome the critical section strength. Point loading simply stated is just that as the curved beam is lengthened due to the point loading, the bending moment is increased.

5. The fifth offense noted deals with a misunderstanding of what is termed "the factor of safety." Oftentimes we hear about safe working load, rated capacity and working load which, essentially, all mean the same thing.

All wire rope slings are manufactured with a safety factor of 5 to 1. That is to say that the rated capacity is ⅕ of the ultimate or breaking strength of the sling. Alloy chain, for instance, has a safety factor of 3.75 to 1 up to 4 to 1.

Loads should be handled that *do not exceed* the rated capacity of a sling. It is quite a trick to know when a wire rope sling

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has been overloaded. For example, a wire rope could be overloaded to the elastic limit (about 55 per cent of the ultimate) without showing any particular signs of external damage, yet this sling should be removed from service. Damage is internal and the nicked wires could fail at any moment.

This is not to say that there is not adequate notice of failure, for that happens to be the particular quality of wire rope over other sling materials—it has adequate warning of breaking wires.

6. This leads to another one of the offenses noted — the lack of control of care, maintenance, and inspection of cranes, hoists and materials used in overhead lifting. Let us note with all the vigor at our command that we feel it is most important to have one man in charge of all the inspecting.

This man should become familiar not only with the slings used in a plant but also the wire rope consuming equipment. Regular inspections should be made and the results recorded so case histories may be accumulated. He should be given all of the data that is made available, industry wide, so that he can arrive at the proper time for removal of a wire rope sling. Inspection is only as good as the ability of the inspector.

7. Another offense noted has to do with unsafe end terminals or connections such as poured sockets, untightened clips, undersized shackles, etc. Socketing must be done by an expert. Don't use unsafe end terminals such as babbitted sockets, untightened wire rope clips and undersized fittings. A sling must be balanced throughout as far as all components used in making up the sling.

8. One of the most frequent offenses noted is the homemade rig. They embrace the multitude of old discarded hoist ropes, leather, rubber hose, rusty wire rope. Their lifting capacity is unknown by anyone — they defy calculation. A qualified person should design lifting gear — a qualified manufacturer should make it. Please don't use homemade lifting gear.

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Volume 22

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Transactions

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NATIONAL SAFETY COUNCIL
425 N. Michigan Avenue
Chicago, Illinois 60611

51st NATIONAL SAFETY CONGRESS

Papers delivered in the

RAILROAD SESSIONS

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GREETINGS FROM SAFETY S

By H. C. DAULTON
General Supvr., Safety, Loss & Damage Prevention
Railroad Co., Louisville, I

It is with a real sense of pleasure that I bring you greetings from the Safety Section of the Association of American Railroads. Both of our organizations are striving for the same goal—the preservation of human life.

The railroads of the nation are proud of the fact that, so far as the transportation of passengers is concerned, they continue to surpass all other modes of transportation in safety. In the year 1962, for each 100,000,000 passenger miles, there were only .14 fatalities in railroad passenger train service. The highways accounted for 2.3 deaths; regularly scheduled airlines, .35 deaths; and the buses, .16 deaths. Out of 312,000,000 passengers carried on trains, there were only 28 fatalities. On the high-

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THE PRACTICAL T

By ROBERT D. GIDE
Chief, Div. of Safety Standards & Services, Bu
U. S. Dept. of Labor, Washing

The safety professional who admits in theory to such a thing as an "unavoidable accident" is a drag on the business. He who admits to such a thing as an "accident" is a cube from Squaresville. Theoretically, you could protect against anything if you saw fit to do so. If anything is foreseeable, how can it be accidental? If anything has happened once, how can it be other than foreseeable? If a happening is in anyway foreseeable, doesn't it become a calculated risk if nothing is done to stop it?

Acts of God, acts of men, and the laws of nature are reasonably understandable and foreseeable. Who among us can claim that he deals with original occurrences? What we might consider is the need for better calculators of risk and peddlers of control over

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express to you my wishes for a
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minister and control, we shouldn't charge them with allowing such nebulous things as accidents to occur. A better charge concept might be that they took a "calculated risk." Corrective action may only be practical when results exceed acceptable minimums. For example:

- If we expend X number of dollars, we can purchase X number of personnel men, with X qualifications, capable of providing us with X per cent of accuracy in procuring, testing and placing. We never admit to being able to hit 100 per cent accuracy.

- If we expend X number of dollars we can purchase the personnel and facilities to provide X amount of pre-induction and on-the-job training. No matter what we spend, we never admit to being able to do a perfect training job.

- If we are competitive in the labor market we can expect to have supervisory personnel with X per cent of knowledge and skill in dealing with those under them and with X per cent of knowledge and skill in using the physical facilities and materials at their disposal. We know that no one is a perfect supervisor.

- If we spend X dollars to procure, select and place individual workers. X dollars to train them, and X dollars to provide X per cent of effective supervision and leadership, we can expect X per cent of our workers to be average or above. Since average is between the best at the top and the worst at the bottom, average is the best of the worst, or worst of the best.

- If we have been X per cent effective in items one through four above, we can expect X per cent of our persons to work X per cent effective.

The same type of reasoning and analysis could be applied to our consideration of the control of the working environment and the control of machines, materials and equipment.

In short, we are dealing with an inexact science in an inexact world with inexact people in an inexact environment using inexact materials, equipment and facilities. If this is so, when is an accident an accident?

Once we realize that we are going to get only what we pay for, and start trying to justify our existence on this reasoning basis, we will have more feet down on earth to discuss earth-like problems with earth-type superiors who sign the purchase orders and pay the checks.

Who is more of a bore than one who constantly peddles the concept of a perfect no-injury record in an imperfect world? Who peddles the "accident" concept when he knows well that everyone knows a certain number of injurious occurrences to people or things will occur because it isn't practical, or economically feasible, to try to prevent them all?

Don't get me wrong. I'm not advocating abandoning a certain per cent of our citizens automatically to the catastrophe mill. I am just suggesting that relating our effectiveness to a "calculated risk" concept might be more earthy and understandable to the boss. If nothing else, it might appeal to his sporting instinct—which we all have to varying degrees and directed to various things.

Don't try to convince him that you can perform miracles; and don't kid yourself. He is only going to get what he pays for, and you are only going to be able to show results up to X per cent effectiveness based on your X per cent abilities based upon X per cent efforts expended.

How do you demonstrate the calculated risk concept? Mainly by demonstrating your grasp of the situation by relating all factors involved in the practicality of control. I am not promoting anything like a statistical means of risk calculation.

The calculated risk must be measured against the practicality of control. Saying it is not practical to take certain control measures begs the question. In such an analysis you must bear down on two basic considerations, (1) cost of control, and (2) convenience or inconvenience of control. And the one may determine or color the other.

In order to lay the cards on the table before the boss or your own conscience, you have to dig for the answers you seek. Too many folks cannot distinguish basic investigative research from a hole in the ground but one procedure is as follows:

First—*What's the problem? Collect facts.*

What happened?

When did it happen?

Where did it happen?

To whom did it happen?

What tools, equipment, materials or combinations involved?

Methods or processes involved and questionable?

Human factors questionable?

Were there time factors, location factors, sex factors, age factors, skill factors, knowledge factors, mental factors, as contributory elements?

Second—*Research things you're not up on —Review those you know.*

Handling methods

Layout and arrangement

Mechanical actions and motions

Electrical phenomena

Symptoms of toxic exposures

Chemical characteristics and effects

Environmental complications of noise, vibration, heat, humidity, radiation, lighting, ventilation, etc.

Physiological limitations or considerations

Psychological implications

Others.

Third—*Why did it happen?*

Now match the facts from the first group against the technical know-how and practical techniques you researched or reviewed in the second group above. Interrelate all contributing factors or elements.

Play house with the problem and lay it out on the couch as your head shrinker would do. Some of us have group identity problems and find it hard to relate. This skill is the answer to the *Why* query.

Fourth—*Control measures.*

Get down to the nuts and bolts of the situation. Are you going to come up with some excuse such as unvoidable, accident prone, unforeseeable, or are you going to prepare a case for the boss to make a decision on? Let him decide; is it (1) too costly to c
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THE RAILROAD GRADE CROSSING TRAFFIC LAW STUDY

By CHARLES H. BOWMAN
Prof. of Law, College of Law, University of Illinois, Champaign, Ill.

It is always a pleasure to me to be with railroad people since I grew up with the Illinois Central railroad. My dad worked for it and with it for 30 years. After my mother died I grew up in railroad boarding houses. My first job was as a call boy for the Illinois Central.

Somewhere along the line I wandered off and got into law. But I still like to talk to railroad people, and one reason I was glad to undertake this study on the grade crossing laws was because I do have and will always have an interest in railroads and anything pertaining to them.

Rather briefly, what we did first of all was to undertake to see what the laws are in the various states. You know, any of you who have worked with this type of job, what a tremendous and comprehensive type of job it is.

First thing we did was to take about 15 states and look at them, to see what kind of laws they had in regard to railroad grade crossings. Then we compiled 32 what we called standard clauses which seem to recur more and more in the statutes, covering different subject matter—sound warning devices, visual warning devices, engine windshield and wiper, track motor car section, blow posts and sign boards, and so fourth—32 of them that we made up as guide lines for study of the laws.

Then we made up sheets, one for each state, and went through each state's statutes. As you know, all of these laws are not found in one place. They are scattered throughout the statutes. You start looking through the statutes of a particular state, such as Illinois, and we have three volumes now, comprised of some 181 chapters, and these laws in relation to grade crossings you find scattered throughout the laws of the state. So it is quite a tedious job to go through these and through the index. No statutes are indexed very well, so it is a matter of checking them, and cross checking and going back and doing the best you can.

We took one of these sheets for each state and filled it in according to these 32 standard clauses which we had compiled from the preliminary study. We put down the citation of the state statute, that is, where it could be found in the state statute so we could refer back to it, and then the standard clause which we had already compiled, if that is what it was, and if there was any variation from it, we put it over in this column. Any unusual variation, or unique type of variation, we put in a fourth column. Then, down at the bottom of each state, we added any additional provisions that we would find in that particular state in regard to railroad crossings. So when we finished we had one sheet for each state with all of this information on it.

Some states, of course, had very few laws in regard to railroad grade crossings, and others had quite a bit. But when we got through we had all of this material and then the question was, what to do with it.

We talked with quite a few practical people, and it was decided that the best way to present it to you who are interested in it, would be to take the central subject matter, and to set it up in a preliminary draft form of a statute, gathering all of the statutory materials covering the main headings which we finally divided into six. We call these articles.

One is general provisions, which any statute should have, and many of the states have these general provisions in regard to the title, the uniformity of interpretation, purposes, the effect of the captions of each section, etc.

Article 2, Location and Construction of Crossings.

Article 3, Protection of Crossings.

Article 4, Movement of Motor Vehicles at Crossings.

Article 5, Operation of Railroad Trains at Crossings.

Article 6, Enforcement and Sanctions (the penalties).

Now, under each one of the articles we have sections.

Now, under Article 3, which is one of the main ones. We have local traffic control devices, maintenance of grade crossings, advance warning signs, pavement markings, cross-buck signs, automatic devices, flagmen, blowposts, lighting of crossings, display of unauthorized signs, signals or markings, wires over crossing, removing obstructions to view at and near crossings.

These all are under the main heading of Protection of Crossings, so that going through the statute, or preliminary draft even, you can look at the main heading and then pick out the specific one you want in the sections.

Having done that, we then went through the statutes, and we had made some notes as we went through these, and picked out the statutes and provisions that we seemed to find recurring in the most states, not necessarily the *best* statutes of all the states, not necessarily the worst, but the ones that seemed to be recurring the most, or if you please, if you take the majority of the states as a model, which you certainly shouldn't do, because generally this is the worst, instead of the best, you might say that this is representative of the statutes that we found.

Now, admittedly, these statutes are old. In fact, we didn't find very many new statutes. Some of them go all the way back to 1850 and 1860. I don't know how you fellows have been operating all of these years with the laws that you have. I don't see how you do the job that you do with the laws that you have. And certainly they are in need of revision. How it is done, and when it is done, I don't know, but certainly your laws in regard to safety at railroad grade crossings are in need of revision.

So we went through, and we compiled, the laws in each of these sections, taking what we thought might be a representative provision and then underneath it, or following, as we did in Article 2, we made some comments as to where it came from, if there was a specific source, and some alternative provisions for your consideration.

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Now any of you who have ever participated in drafting legislation know that before legislation is finally submitted to a state, it involves the thinking and the suggestions of many people. When we drafted the Illinois Criminal Code, which I have been working on (and we just finished it, thank God, after nine years), we had a full committe of 21, and a drafting subcommittee of 11; on some of our sections as many as seven drafts were submitted by the subcommittee to the full committee before we finally arrived at what we submitted to the legislature.

After we published the Code, which we did after we finished it, and distributed it to all the lawyers in the state, with the text of the proposed statute, we still had to make changes. The lawyers, and practical people, would point out things that we had forgotten even after nine years of work.

You have to get a broad, wide distribution so you can get the ideas of everyone interested in this field before you can go to the legislature with it, because legislation, in my estimation, should be as short and succinct as possible, leaving as much as possible to the regulations and rules, because you can go back to your administrative agencies and get these changed, but you can't get legislation changed very often. If it gets on the books, especially if it is controversial, and you go back and try and get it changed, you'll find you just can't get it changed. So for that reason, I think you should keep your legislation short and to the point, as we have tried to do, and leave as much as possible to administrative regulation.

Here, again, you fellows work with it. Some of the laws we have are very verbose and very comprehensive, and here you run into trouble of interpretation, and you get into a lot of litigation in the courts.

If you keep laws short and to the point, you are a lot less liable to get into litigation. But this is a matter of choice.

Fortunately, when we finished both the Criminal Code of 1961, the legislature only made 12 amendments. Thus, you can imagine how much work had gone into it, and how many ideas we had gotten from everyone concerned with it when the legislature would make only 12 amendments. In the Code of Criminal Procedure of 1963, which is much more emotional because it deals with search and seizure and things of that kind, we had only 18 amendments, most of them mine. In 1961 we had one dissenting vote, and in 1963 we had four dissenting votes in the General Assembly.

What I am saying to you is this, and this comes from experience, that you must get the broadest possible distribution of proposed legislation; you must get ideas of those who are interested. They should study it, then give you their ideas and incorporate them into redrafts, and then you should consider this again.

Now, when you get into controversial areas, pretty soon you are going to have to hit a compromise. Everyone can't have his own way. We know that, so you will have to make compromises here and there. But, only by sitting down and talking things out can you arrive at compromises, something that would be satisfactory to both groups. When it comes to railroad grade crossings you have three groups, the public officials, the railroads, and the motoring public. You have to reconcile all three interests because sometimes there is conflict.

What we have done is try to get you off the ground on this, and try to get you something to work with. If we could get your comments on the various drafts and provisions, we will be glad to redraft, or to supplement the comments to show additional ideas in regard to these different sections. As you will notice, the comments now are all directly on state laws. They do not embody any comment that this group thinks so and so, or that group thinks otherwise, and we haven't gone into administrative regulations either, we have concentrated just on the statutes.

So if we can get comments to point out that on these various sections there are different ideas about them, we could add these so that on the second time around you could begin to get down to work. It doesn't take too long to whip something like this into shape. The biggest job has already been done, except, of course, the need to reconcile the conflicts of interest, and different views.

1963 National Safety Congress

GOVERNMENT'S ROLE
CURTAILING GRADE-CROSSIN

By JOSEPH H. HAYS
General Counsel, Assn. of Western Rai

There is beginning to emerge from a recent investigation conducted by the Interstate Commerce Commission a better understanding of the role which should be played by the Government in grade-crossing safety. Proceedings conducted by the I.C.C. under its docket number 33440 have brought to light a number of important concepts, some of which are new and some of which are partly so. While collisions between trains and motor vehicles are, numerically, a small part of the over-all highway safety problem, the severity of these accidents and their frightening fatalities, injuries and property loss are so great as to justify special effort to prevent them.

From a review of the problem in all of its aspects, it is evident that prospects for improvement lie in two broad fields: First, better enforcement of laws and regulations applying to the drivers of motor vehicles at railway-highway crossings; and, second, the installation of more grade separation structures and automobile protective devices.

To begin with, it must be recognized that there would be no collisions between trains and motor vehicles if there were no intersections at common grade between highways and railroad tracks. However, as of January 1, 1960, there were 224,[illegible]47 such intersections in the continental United States. A fair estimate of the cost of separating all of these crossings is $86,119,119,000. This is more than three times the total capital investment in all the railroad plant. Separation of all such crossings would not only be prohibitive in cost but clearly unnecessary.

Following the same reasoning, there would be no grade-crossing collisions if all drivers of motor vehicles complied with existing laws and regulations and, under the dictates of ordinary common sense, exercised proper caution at grade crossings. Presumably, automatic devices are adequate to alert drivers and help them protect themselves from their own folly. However, it is surprising to realize how many drivers will race the train to the crossing or a
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virtually no public effort to enforce grade-crossing caution; and, conversely, where genuine effort by fleet supervisors had been made to obtain compliance, the results undoubtedly have been worthwhile.

Two or three incidents will illustrate the point.

On August 9, 1960, four men were cremated near Magellan, Ala., when a gasoline tank truck was driven into the path of an approaching train. Only a few days later Commission inspectors checked the conduct at this very same crossing of the drivers of tank trucks handling petroleum products. One hundred seventy-seven crossed the tracks in a 24-hour period. Of these, 66 of them, or 37 per cent, failed to stop. No arrests were made.

On April 18, 1962, a propane tank truck was driven into the path of an approaching train in Indiana. In the resultant explosion, three members of the train crew serving on the head end met horrible death by fire. Exactly seven days after that collision, the railroad involved checked tank truck behavior at that same crossing for a 24-hour period. Of 106 tank truck movements recorded, 60 made no pretext of stopping, 20 made "partial" or "running" stops, and only 26 came to a full stop as required. Here again no arrests were made. The railroad men at the scene had no police power.

You will all remember when a school bus near Greeley, Colo. was driven into the path of an approaching train and some 20 school children were killed. Just one week thereafter a school bus loaded with children stopped as it approached a crossing over the same railroad at a point in Kansas. A boy riding in the back called out to the driver, "Train coming — don't go." But the driver went anyway! By some providence the train missed the bus by inches. The boy had the courage to report the driver and the engine crew turned in the information at the next stop. Within 48 hours that driver was grounded — I hope forever. But that incident proved again that some people simply will not learn by example.

Time after time inquiry disclosed that seldom, if ever, are police officers available to issue traffic tickets or take other action when drivers brazenly crash crossings. The I.C.C. inquiry failed to disclose a single place or area in the country where anything like a consistent effort was made to enforce grade-crossing stop laws. This is not necessarily a criticism of the efforts of police officials. Their inclination has been to concentrate their efforts in policing traffic as it flows along the highway. However, when stop laws may be ignored with impunity there is no wonder these deadly incidents go on.

On the other hand, there are refreshing examples of profit from compliance and enforcement. The record of the Class I common carrier motor bus industry is outstanding. During the four-year period, 1958 to 1961, there were no passengers on such busses killed at grade crossings. Greyhound operated for an 18-year period (1944 to 1961) without a single passenger fatality. We are all familiar with the simple rule, rigidly enforced, that before a common carrier bus enters a rail crossing it must stop and the driver must open the door.

A company operating a fleet of trucks in the east hauling propane liquefied gas detailed an excellent record. From 1945 to the date of the hearing in 1962 it had experienced only one grade-crossing accident. In that case there were no fatalities but, even so, the driver was discharged within two hours after the event. In addition to safety education and incentives, the company emphasized its discipline and enforcement. Drivers were watched and when one failed to stop at a railroad crossing he was discharged at once.

Railroad-owned motor trucking subsidiaries were shown to have excellent records as a result of strict driver supervision. One of these had operated 250 million vehicle miles without a single grade-crossing accident. Many other well-run motor carrier companies have accomplished comparable results.

In school bus operation the unique record of the state of New Mexico was fully explained. The state supervisor of school bus transportation for that state, J. T. Reece, was justly proud of his 25 years without a single collision between a train and a school bus. Rigid checks and close supervision not only by officials of the department but by state police as well are given credit for this outstanding accomplishment.

In the I.C.C. hearings, witness after witness, particularly rail brotherhood men, asked for,—in fact pleaded for,—stepped up activity by law enforcement officials to compel

obedience to grade-crossing stop laws and similar regulations. They pointed out that the average motorist is conditioned to observance of highway stop signs and traffic lights. He knows he may get a traffic ticket if he fails to stop. But drivers seem to ignore rail cross-bucks and even wig-wagging lights. These witnesses asked that officers be assigned to make crossing checks at frequent intervals, to issue tickets for violations, and to really prosecute. Certainly this seems to be a reasonable request.

I think it is apparent that perhaps the first and foremost job to be performed by government is to carry on an effective and intelligent campaign to enforce and encourage voluntary compliance with the simple regulations that would produce grade-crossing safety.

At this point I would like to mention an incident which, in itself, is not of such importance but which affords an example of something that could be done all over the United States. Last December I took part in a conference with a small group of railroad men at Phoenix, Ariz. One of them was a locomotive engineer. We were discussing the grade-crossing problem and he told of a particular crossing just outside the city which had caused him many anxious moments. A refinery or a tank farm is situated near by and the crossing is used by a large number of tank trucks. He had observed that rarely did a tank truck stop before entering the railroad crossing and on many occasions, with his whistle screaming, he had missed loaded rigs by inches.

The railroad group decided to do something about the situation. They called in the safety supervisor of the state Public Utilities Commission. He checked the crossing and found the reports to be true. Police were stationed there for a few shifts. Violating drivers were given warning tickets and a good "talking to" by the judge. Field men talked with drivers at the loading dock. The local newspapers were asked to help. They carried news items about the enforcement campaign and an editorial on the wisdom of compliance. As a result drivers of these tank trucks have formed the habit of stopping at that crossing, and a fateful collision has thus far been avoided. No one sought the discharge of the drivers — only their

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brotherhood groups told a vivid story of what the railroads are doing in this field. They proved, beyond question, that no other industry surpasses the railroads in effective action to promote public safety, spending millions and assigning scores of highly competent men to full-time duty in promoting safety at grade crossings and elsewhere. The practices they have worked out for observing and reporting "near misses" and then following up with interviews and other appropriate action are both ingenious and effective. This program and other material have been put together in a remarkable symposium for education, inspiration and action to prevent vehicle-train collisions and is presented to the public under the arresting "Signs of Life" title.

In presuming to comment, in these remarks, on the role of government in grade-crossing safety, I can suggest nothing to be added to the "Signs of Life" concept except possibly to urge more of the same. These dedicated men from all walks of life who carry on that program need more support, particularly at the local level. I envision a vigorous plan of action in the states and in the cities and towns, sparked by this very Committee, and participated in by automobile clubs, motor carrier groups, railroad management, railroad and truck labor groups, school groups, safety councils, the press, law enforcement officials, state and local police and sheriffs, and others who want to prevent this needless slaughter.

Only a short time ago the Railway Labor Executives' Association, speaking for the 21 railway brotherhood organizations of which it is composed, inaugurated a nationwide campaign to get enforcement of grade-crossings safety regulations. By formal resolution that group requested the cooperation of railroad management, public officials and others in the conduct of an organized effort to get safety at grade crossings.

There are those who contend that you will never be able to stop all grade-crossing accidents. Strictly speaking, that may be true, but great progress has been made in reducing their number, even without much consistent police action, and it is only reasonable to believe that the zero mark may be approached when that team work by the public and the law men is forthcoming.

As I have pointed out, the provision and maintenance of grade separations and automatic protective devices is very expensive. For a period of about 30 years the federal government has helped pay the initial cost of these structures and devices with railroads assessed only for the benefits they receive with a limit on such assessment at 10 per cent. However, this policy applies only to installations on the limited mileage of highways built with federal aid funds. And furthermore, the maintenance of such structures and devices continues as an obligation of the railroads. Some states have laws similar to the federal law applicable on state roads but there are only a few of such states and these state laws are generally limited to the cost of separation structures and do not cover automatic devices.

A principal difficulty has been the financing of necessary structures and installations on city streets, local roads and, to some extent, state highways. In the building of roads the desire on the part of the states to match, and thus obtain, federal aid has resulted in the prior construction of main rural roads with not much money left over for local roads and the streets of cities and towns. Generally speaking, officials with jurisdiction over roads in this last category have been without cash to separate grades and to pay for automatic crossing protection, although some of our worst disasters have occurred at country crossings.

A relatively new concept as to financing of these structures and devices was brought to light in the I.C.C. hearings and was endorsed in principle in the proposed report of the examiner. R. B. Thomas, chief engineer of the Illinois Commerce Commission, testified in the I.C.C. proceeding to explain a growing program of state participation in the cost of grade-crossing protection.

For many years the Illinois Commerce Commission has had rather complete jurisdiction over railway-highway crossings at common grade. In addition to ordering separations, gates or other devices and apportioning the cost, this Commission has full power to close crossings it deems to be hazardous and unnecessary. In one place where a main line railroad ran through the center of the town there were 12 grade crossings and the collisions and casualties were great. After a study, eight of these crossings were closed and the remaining four were equipped with

automatic gates. Since that was done not a single fatality has occurred. The situation in other cities and towns was studied and it was found that effective action was hampered, if not prevented, by the lack of municipal money to pay for the necessary devices.

In Illinois a comparatively small percentage of the money from gas tax and registration fees is allocated to the cities and towns. Since a very high percentage of motor vehicle mileage was over these streets and was thus earned on the streets, the Illinois Commerce Commission did not hesitate to recommend to the legislature that a small part of the gas tax revenue be placed in a grade-crossing protective fund so it might be used to help finance necessary protection on local roads and city streets. The first proposed act to accomplish that end was passed by the legislature in 1955 but was vetoed by the governor on the insistence of those who wanted to see that such revenue was used exclusively for road construction. However, in the next session, 1957, the bill was again passed, this time by the almost unanimous vote of the legislature, and it was then signed into law.

When first created the act set aside $25,000 per month from gas tax receipts to be placed in this special fund. In the following session, 1959, the amount was increased so that there is now available some $600,000 per year to be used to protect with automatic signals and other devices the most dangerous crossings in the state. The Illinois Commerce Commission has complete power over this fund. It may determine the crossings to be protected and may use the fund to pay for all or any part of the cost. The money may not be used on federal aid roads or state roads. While serious consideration is being given to the assumption by the fund of maintenance cost as well as construction, that responsibility in Illinois is still a burden to be borne by the railroads.

Since the adoption of the Illinois act, similar acts with somewhat lesser funds have been created in Iowa and Nebraska, and only in 1963 in Wyoming and Minnesota.

The Wisconsin legislature set up a fund in 1949 from which a part of the cost of grade-crossing protection could be paid by the public. That act first provided for only 50 per cent of the cost, but in 1963 the law

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statements were made in the testi-
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ıe subject was that made by Henry
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The magnitude of the cost figures for an appreciable number of new installations of automatic devices makes it clear that, as a practical matter, the railroads could not be expected to bear the burden. A genuine contribution to safety at grade crossings can be made by formulating some means by which public funds may be obtained and used to build and maintain structures and devices which will automatically protect the motor vehicle driving public from its own folly. Earl F. Campbell, managing director of the California Traffic Safety Foundation, put it very succinctly in his testimony before the Commission when he said:

"Rail traffic is a part of the over-all facilitation and safety blueprint. Large sums have been spent by the railroads in providing remedial measures designed to achieve maximum safety. The public has a major interest in rail-highway accident controls. These controls are created for the benefit of the driving public, and therefore it would seem only just that the public should pay for controls which are an integral part of the highway system. This would represent only a small part of the total highway cost, but would accelerate the building of safety into our expanding and urgently needed highway system."

If we are to have and to use both a national system of railroads and a national system of streets and highways, crisscrossing each other at thousands of places, we must, to an increasing degree, spend what it takes to insulate each system from the other. The tremendous gain in motor vehicle use and the need for rapid, efficient transportation over both systems makes this imperative. To do the job would take that which seems to railroad people to be a very great amount of money, yet a sum which would be only a small part of the whole highway budget. Being realistic, we know that the only place to turn for the amounts necessary is to the public treasury. The sooner the funds are made available and the gates or other protection installed the sooner we may be able to reduce to a minimum the death and destruction at grade crossings.

So it becomes clear that the role of government in grade-crossing safety encompasses at least two very important projects, namely, an enforcement program, consistently followed, to induce compliance with laws and regulations requiring motor vehicles to stop at, or operate with adequate care at, railway-highway crossings at common grade; and, secondly, the appropriation of public funds with which to build and maintain an adequate number of grade separations and automatic protective devices at grade crossings in order to further insulate from each other vehicles moving over highways and those moving over railways.

THE IMPORTANCE OF SUPERVISORY TRAINING IN THE RAILROAD INDUSTRY

By M. A. NUGENT
Supt. of Safety, The Southern Pacific Co., San Francisco

Our subject of discussion is one that I feel the most important subject in any safety program. Due to the far flung operation of a railroad, it applies more to the railroad industry than any other, and that is the "Importance of Supervisory Training in the Railroad Industry."

We read in various periodicals of upgrading railroad officers. Many railroads are sending them to universities throughout the country with the thought of making better managers. I have no quarrel with this policy. But, we have thousands of supervisors and officers on the railroads who are not given the opportunity of attending universities, although they hold responsible positions in management. These people are supervising still more thousands of employees. Our discussion today is aimed at that group. A program of this kind will pay off in higher morale and fewer accidents.

This group is the hardest group to sell on safety and I will attempt to show you some of the reasons why. They are always under pressure to get things done with greater efficiency and less waste and they may feel that they are somewhat overworked—and possibly they are.

In their preoccupation to get things done, they may feel that the more pressing matters reduce the necessity of carrying an effective accident prevention program. It is often a burden to cope with all the matters they must deal with. They give the greatest attention to those matters that seem of immediate importance, so safety matters wait for an occasion when there is more time. But, all too often, that occasion may never arise.

You may not agree, but after 48 years of experience, holding a variety of jobs in the operating department, I have observed with keen interest the actions of various supervisors. I believe the success of any program will depend on the ability of the supervisor to carry the program down to the rank and file employee. Who else is close enough to the worker to do the safety job? The worker considers he works for the supervisor, not the higher-ups who are miles away in some glass temple. If the supervisor devotes a few minutes a day checking equipment and safety practices, he will instill in his men a safety consciousness that only a supervisor can do.

There is no more effective way of selling safety to railroad employees than through the supervisor. Unless he is imbued with ideas regarding safety, he will never get the safety program off the ground. Safety and morale will always come from the top down, never from the bottom up. As far as the supervisor is concerned; this must start with top management, but it will only reach the rank and file employee through the supervisor. Supervisors are the key members of any effective safety program. Their education is of primary importance and will

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By D. K. MILLER
Asst. Supt. of Safety, The Southern Pacific Co., San Francisco

Having worked in such positions as laborer, boilermaker helper, switchman, yardmaster and then 16 years as a line officer, I feel that I am in a position to evaluate the accident prevention program that is now in existence on the Southern Pacific Railroad.

My first experience in assuming complete responsibility for a safety program came when I was superintendent of the Los Angeles Union Passenger Terminal in 1953. Through the large number of personal injuries recorded, it was definitely apparent that some type of training program was in order. A representative of the Southern Pacific safety department set up a series of conferences with all supervisors. These conferences were set up on a weekly basis. Material used covered the past injury record and emphasized the causes and means of correction. The supervisor was trained to see and correct unsafe work practices, how to issue orders, how to train employees to perform specific duties, and how to conduct conferences. It became noticeable that most of our supervisors began taking an active interest in the safety program. Within a three-year period, we were able to reduce our ratio from 20.90 to 3.36. The training program was largely responsible for our success.

In leaving Los Angeles Union Passenger Terminal, and moving out on-line again in the capacity of assistant superintendent on two different big and busy divisions, I was in a position to see the training program on the Southern Pacific in its infancy. The safety department started to issue periodic supervisor's accident prevention bulletins to all line officers. Material contained in these bulletins included such subjects as good housekeeping, personal protective devices, analyzing accident causes, investigating and reporting of accidents, gaining employee participation, audio-visual aids, safety rules and enforcement, on-the-job training, and seeing and correcting unsafe practices.

Safety supervisors, when disseminating this information, conducted interdepartmental conferences with all line supervisors. These meetings were held on an average of twice a year all over the Southern Pacific railroad. About 900 officers participated in these conferences. The information discussed in these meetings, as well as at quarterly staff meetings, served as a basis for a training program. However, with the number of employees being promoted to officers, this is a never-ending program.

Another important procedure we use in training supervisors when revising one of our rule books, or planning some modification in our safety program as it applies to the transportation, mechanical, or maintenance of way departments, is to arrange for a meeting of a certain number of line officers with safety department personnel. In the case of rule books, a committee composed of line officers and safety department personnel sits down and reviews the rules thoroughly, and revises them in the final form for printing. This has been going on for several years now, and we believe it has proven very beneficial in having a line supervisor feel that he is playing an important part in shaping our safety program.

One of the most important programs of the safety department is the responsibility for selection, control, and subsequent use of protective equipment for all departments. These include protection for head, eyes, body, feet and respiratory protection; and clothing for protection against corrosive and toxic substances. The department recommends purchase and use of such materials as creams and cleaners for protection against occupational diseases such as dermatitis. In November 1957 a catalog was issued that contained all approved protective equipment, and use of anything not stipulated in the catalog is prohibited.

Of course, any new equipment receives consideration and replacement is made where warranted.

To obtain a uniform understanding all over our railroad, the safety department conducted educational conferences with all supervisors and trained them in the use of protective equipment. As new equipment is issued, supervisors are again instructed in its proper use. While it is difficult to determine exactly how many personal injuries have been avoided through use of protective equipment, we know a substantial reduction has been made, due to the fact that we are

not experiencing the number of injuries to heads, eyes, hands and feet as we have in the past. In addition, complaints with regard to respiratory ailments have diminished to a great extent.

In addition to this type of education, formal education is offered to a select group of officers and employees who are seriously considered to have definite management potential. Naturally, they must meet various qualifications such as age, seniority and past educational achievement. Each candidate must also demonstrate leadership ability and show signs of positive evidence of making the Southern Pacific a permanent career.

In addition to the programs mentioned, safety supervisors are allocated a portion of the railroad which they continually police, assisting line officers to carry on their accident prevention program.

To gain employee participation, such devices as picnics, family night meetings, luncheons and dinners are held periodically all over the railroad. With proper planning, we have found these functions very helpful in the establishing and furthering of an awareness of safety.

Undoubtedly, we are making some progress in the safety program in that over the last five-year period, we have noticed a decided downward trend. From every indication this progress will continue and should place us in a very enviable position as compared with other Class 1 carriers throughout the country. Despite the fact that our ratio is showing a continual decrease, the field of accident prevention is fertile and training of the line supervisors must be continued to alleviate the number of fatalities and injuries that are still substantial. In continually analyzing the injuries that are being sustained on the railroad, it appears obvious to all of us in the safety department that unsafe work practices and disregard of safety and transportation rules are the major causes of all accidents.

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SAFETY IN HIGHWAY OPERATION

By BERTRAM L. WHEAT
Safety Dir., Eastern Express, Inc., Terre Haute, Ind.

For many years I lived on a farm near the hamlet of Coxville, Indiana. Just less than 100 yards behind our home ran a branch line of the Baltimore and Ohio railroad. One of my fond memories is my acquaintance with the foreman and the section crew who maintained the right-of-way past our home. The foreman was a large, congenial Irishman, and it was a day of great significance when I got my first ride on a motor car. I remember the section gang foreman's name was "Mike" and he took a great liking to my kid brother, who yet today is known by the nickname of "Mike."

I recall that the section crew came many miles by motor car to maintain the right-of-way.

As the years have progressed, the railroad industry in essence has taken advantage of the great flexibility of the highway motor vehicle. Today many of these section crews no longer ride many miles on motor cars with the long delays necessitated by removing their car from the track to let train traffic pass. Many railroads today have progressed to the use of automotive vehicles to transport their maintenance-of-ways crews.

This has brought about many new problems and brings me to my subject, "Safety in Highway Operation."

Previously, when the section crews left their place of domicile, they were primarily concerned with two things: train traffic and automotive traffic at railroad grade crossings.

Today, when they traverse our highways to their place of work, they become a part of all the complex problems of our modern highway transportation system.

Let us look for a moment at some of these problems. First of all, the operator of the vehicle is an individual who is already in your employment and you cannot select from an outside source the individual you may like to have to operate the vehicle. Thus, let's consider what I think are some of the important factors you should take into consideration in the selection of the driver. Time will not permit us to go in detail into all the facts, and at best will only permit us to highlight some of the requirements. In some instances, the driver may be operating the vehicle alone, going out to repair a Diesel unit which is broken down, or he may be going to repair a breakdown in your communications system, or he may be entrusted with the lives of several of your workmen who are going out to maintain the right-of-way. In most instances driving of your vehicles is secondary to his primary work. It is secondary, but of prime importance. Therefore, what will you look for in assigning a driver to your vehicle? It is an important decision and should not be treated lightly.

I believe you should first consider the following factor: personality of the individual. We are interested now in the driver personality, and it has three parts, according to the Traffic Safety Institute of Northwestern University: (a) Natural abilities, (b) learned capabilities, and (c) motives and attitudes.

His natural abilities are those abilities he has to start with, and here we take into consideration his physical condition.

His learned capabilities are those factors he has acquired by study and practice.

Motives and attitudes are what makes him behave the way he does.

In selecting this individual to be your driver, let's consider first his natural abilities, and as mentioned, this takes into consideration his physical abilities. We can best learn his physical abilities through the results of a physical examination, to determine, among other things, his version—and we are primarily interested here in his usable vision, which can be determined by the use of a Keystone telebinocular or the American Optical Company's orthorator in the hands of a skilled operator. My experience has proven that the Snellen chart does not always tell us an individual's usable vision. We should determine his depth perception, field of vision, visual acuity of at least 20/20 in each eye, and test for color blindness. He should be given psycho-physical test to determine glare recovery and reaction time.

His minimum hearing requirements should be not less than 10/20 in the better ear for conversational tones without a hearing aid.

His natural abilities would also include the full use of hands, arms, and legs, in order to manipulate the controls of a vehicle.

The physical examination should also determine whether or not the individual who is to operate your vehicles has organic diseases such as a heart ailment, epilepsy, high blood pressure, or diabetes, which are apt to interfere with his driving.

His learned capabilities can easily be determined by giving him a test which would cover such subjects as correct driving practices, safe driving practices, equipment loading, and safety rules. A driving test will show the areas in which he needs additional training.

The last of our three general classifications consists of motives and attitudes, and as I mentioned before, it determines how the driver behaves and what he does. It determines how the driver thinks and feels about a great many things. These factors of personality are very hard to determine without a great deal of professional training in psychology.

Now, let us see what tools we can use in endeavoring to select the proper individual to operate our vehicle. These are some to which I would give considerable attention: Prospective driver's past record—what has been his performance with your company? What has been his performance record with his previous employers? Has he been a satisfactory employee? The things we are looking for here are his ability to perform his work, his reliability, his courtesy to others, and whether or not he has been a troublemaker.

Secondly, it would be extremely important to check his traffic and accident record and this can be done through the registrar of motor vehicles of the state in which he is licensed.

Third, police record: this can be checked through your own private police force through the police department of the city or the sheriff's office of the county in which he resides. Criminal records should be checked. This investigation will many times turn up traffic arrests and accidents which have not been reported to the state licensing agency.

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our very best to keep the streets and highways safe. In addition, our employees have the same civic interest as our industry in preventing accidents. Therefore, we are all bound by duty and desire to keep our communities a safe place in which to live.

The regulated motor carrier is somewhat different from the average industry. Normally, what goes on behind the walls and fence of an industrial plant is confined to the employees and the company. In the motor carrier industry, you might say we operate in a fishbowl. In other words, we are under constant observation, as are you when your vehicles are on the highway, by other motorists. The vehicle ahead, behind, or approaching from the opposite direction may contain the governor, a state or United States Senator or representative, or it may contain your very best customer. I believe this is one of the reasons why the organized motor carrier industry has taken such an active part in participating in safety in highway operation.

Affiliated with the American Trucking Associations, Inc., and the Motor Transport Conference and Commercial Vehicle Sections of the National Safety Council, the motor carrier industry constantly strives to improve our highway accident frequency, practices courtesy on the highways, and makes every effort to save the life and limb of all its users. Much progress has been made in these fields. For example, let's take a look at what the regulated motor carrier industry presently does to promote highway safety.

As mentioned previously, the American Trucking Association and its affiliated Council of Safety Supervisors participate in many regional, state and community activities. They have helped formulate standards for the selection and training of drivers that are in widespread use throughout the country today. Through the state-affiliated council, many motor carriers operate road patrol cars, not only supervising and observing their own units, but also writing good and bad observation reports on other truck drivers. This is very similar to the "near miss" report program the railroad industry participates in through the National Committee on Motor Vehicle Traffic Safety at Rail Grade Crossings. In the motor carrier industry, these reports are disseminated through the state association to the owners of the vehicles for whatever action may be deemed necessary.

Perhaps many of you have heard of the driver-of-the-month program which recognizes a driver for an outstanding act of heroism while practicing his professional driving techniques on the highway. Recognition is also given for long and outstanding years of safe driving.

From these monthly drivers is selected the driver-of-the-year, who receives outstanding recognition and has the opportunity of meeting with the President of the United States. We believe this program helps keep professional drivers safe and courteous.

The state and national truck Roadeos are also important factors in contributing to highway safety. The National Fleet Safety Contests, one of which is sponsored by the American Trucking Association and the other by the National Safety Council, have very vividly demonstrated how accident frequency can be reduced by those participating, thus making our highways a safer place on which to drive.

Until 1961, our industry, through our affiliated national organizations, along with the Junior Jaycees and the Liberty Mutual Insurance Company sponsored the Teen-Age Roadeo, thus attempting to stimulate some interest in safe driving on our highways by the younger set.

Our industry also contributes money and assistance to the Highway Traffic Board of the American Standards Association in attempting to standardize traffic signs and signals, and also safety features of automobiles. It also participates financially and actively in the President's Committee for Traffic Safety and takes an active part in planning regional meetings.

Our association contributes $5,000 in scholarships to the American Driver-Education Association. It also participates in the American Automobile Association's High School Driver Training Committee.

The motor carrier industry had done much, through our national association, to assist financially and actively in the national committee's efforts on uniform traffic laws and ordinances and uniform motor vehicle code. You will recall that one of the projects of the National Safety Council's Committee on Motor Vehicle Traffic Safety at Railroad Grade Crossings is to attempt to get uniformity of regulations at all rail grade cross-

ings. I am sure if you travel extensively you are keenly aware of the fact that many states and communities have not yet adopted the uniform motor vehicle code. It becomes quite confusing when the driving rules of one state are directly opposite of another. For example, reckless driving in some states is a minor driving violation while in others conviction can cost you your license.

The results of these programs have been encouraging. The 76th Annual Report of the Interstate Commerce Commission to Congress reports that intercity authorized (common and contract) carriers of property with annual revenue of $200,000 or more reveal the following information: the total miles of travel for five years ending with the calendar year of 1961 consisted of 40,212,000,000 miles. This is a 10.3 per cent increase in mileage over the previous five years. The total deaths reported to the Interstate Commerce Commission by the above-mentioned carriers for the five years ending 1961 showed 1.5 per cent increase over the previous five years. You will note there has been a 10.3 per cent increase in mileage over the past five years with only 1.5 per cent increase in the number of fatalities in which trucks were involved. The Interstate Commerce Commission does not get accident reports from private carriers.

The results of the National Fleet Safety Contest sponsored by the National Safety Council are even more encouraging. Governor Pyle of the Council has reported the following information as a result of the 1962-63 National Fleet Safety Contest: 2,522 fleets participated in the contest, representing 296,464 vehicles. In all, these vehicles travelled over 6½ billion miles during the contest year. The accident rate for this contest year was 12.34 accidents per million miles. This is the lowest accident frequency in the 32-year history of the contest. It is a 66 per cent reduction since World War II, when the rate was 36 accidents per million miles. You can readily see the accident frequency has shown, with very few exceptions, a continual downward trend.

How about the average motorist — the other millions of vehicles presently on our highways. As outlined in the National Safety Council's plan for total mobilization for traffic safety, they are of prime concern to all of us.

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The National Safety Council concentrates its greatest effort on traffic safety, yet the motorist feels that the signs, the messages and the safety slogans are meant for someone else rather than for him. What can we, as individuals, do to help eliminate the tremendous loss of life and the pain and suffering which occur on our highways each day? Let's start at home. Most of what we teach our children is taught by indirection. They habitually learn more by imitation than by conscious instruction. Our children speak English because they hear us speaking English. They would speak French or German or Chinese just as naturally if at the crib they were addressed in one of these languages. They listen and they imitate.

Are you today setting a good pattern for your children to observe in your operation of a motor vehicle? They assume that what we do must be right so they do what we do. They absorb our attitudes toward life and more important, our attitudes toward driving, and if our driving attitudes are poor, then in a great measure they will respond accordingly when their time comes to take the wheel. How they abide by the traffic laws and regulations and how they participate in defensive driving practices will depend largely on the example you have set for them. If you are the type of driver to cheat a little on the speed or if you are the type who is like the father of the little girl who, when asked in school if her Daddy was a safe driver, replied "Yes, he sure is—because I watch out the back window for the policeman all the time,"—if you are this type of driver, they your children will take for granted these are the standard practices for operating a motor vehicle on our highways. To instill safety within them and for them to be able to subdue their desire for fast operation on the highway will be a most difficult task when they reach the age of a legal driver.

If we could only instill in the young drivers today, and for that matter, in those who have had many years of driving, the fallacies of speed, the fallacies of letting our minds drift from our driving, I believe we would have a far safer highway on which to operate almost immediately. If we could only instill the apparent dangers of high speed vehicles operated improperly, if we could only realize how quickly an accident can happen. Sudden death is no more graphically worded than in Reader's Digest which carried an article entitled "Slow Motion of High Speed," by Edgar A. Walls, III, and Carl Wall. It was the result of scientific studies by experts who test-crashed hundreds of cars to determine new safety features for autos. Let's paraphrase what happens each tenth of a second when a car going 55 miles an hour crashes into an immobile tree:

1/10—front bumper and chrome "frosting" of grille collapse. Steel slivers penetrate tree as much as 1½ inches.

2/10—hood buckles and smashes windshield. Spinning rear wheels leave ground. Grille disintegrates. Fenders bulge at doors. Frame begins to stop momentum of 2½-ton body. Driver continues forward at original speed and at a force of twenty times gravity. (Hence his body weighs 3200 pounds.) His legs stiffen against the floor, snap at the knee joints.

3/10—driver's body lunges forward. Steering wheel bends to his death grip. His head is near the sun visor.

4/10—front of car is demolished, but rear end still is going 35 miles per hour. (Imagine that!) Driver's body still moving 55 miles per hour. Motor block wedges into tree. Rear of car ships up against hanging branches of tree.

5/10—driver's fear-locked hands bend steering column almost vertical. Force of gravity impales him on steering wheel shaft, puncturing chest and lungs.

6/10—driver's feet are jerked from tightly-laced shoes. Brake pedal shears off at the floor. Chassis buckles in center. Body bolts snap. Driver's head smashes into windshield. Rear of car crashes to ground, with spinning wheels churning the dirt.

7/10—doors burst open, tearing hinges. In a final lunge, seat rams forward, administering the coup de grace to a body spurting blood from the mouth and with a heart frozen from shock.

It takes just seven-tenths of a second.

If we could only realize these dangers, I am sure we would make a greater effort to give driving our fulltime and undivided attention.

Safety in highway operation is of the ut-

most importance to every user of the highway. I hope you will give some consideration to the responsibility you have of placing the drivers behind the wheels of your vehicles, and that you will take a good look at your own driving p
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AS I SEE IT NOW — DISCU
HOW SAFETY SHOULD BE

By H. J. SURLES
General Supt. of Transportation, Great Northern Rai

Before it can be decided whether or not we can do better in railroad safety, we will have to take a quick look at where we have been, where we are today, and then decide where and how we might go in our efforts to better our safety performance. In my own lifetime, I have seen a revolution in railway safety, and I am confident I will see even more in the some 17 to 20 years before I retire.

As I reflect on my life in railroading, I more and more realize that it is more by accident and chance that I am able to be here today after some 32 years of railroad experience. In this context, my definition of the term "experience" would be that I was not caught in the booby traps set up by myself and my fellow workmen. When I take into consideration the more than 46 years my father put in as an engineman and trainman, and the some 30 years his father put in primarily as an engineman, under the conditions of the age in which they worked. I think I was very fortunate to have been born.

I started working long enough ago to be in on the tail end of the "devil may care" era of railroading, and I have heard much of this period from both my father and grandfather. This was an era of rough, tough men, crude equipment, and no protective equipment. Production was the only goal of management, and the man who could disregard the most rules and survive attained the highest status. Employees were often so encouraged by management. They considered the fastest running engineers, and the conductor that could get over the road the quickest, as their best men. They did not care h
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Those of you with sufficient experience realize that I didn't learn these rules through any verbal instructions. Nobody thought to tell me not to do these things. It wasn't accepted practice for a foreman, or any one else, to tell you these things. You learned almost completely by experience.

In later years, I worked in several different crafts — switching, train service, engineering, and even later, of course, in supervisory jobs in each of these fields. By this time, there was developing a practice of giving some on-the-job training and instruction, particularly in the train-service crafts, and today it is most prevalent.

During these same years there was a very revolutionary change in the attitude of management toward safety. As you know, the National Safety Council as it is today, embracing every phase of safety, in every walk of life, originated in a meeting of railway and other officers in Milwaukee many years ago. Embryo safety programs were initiated in our industry years before such programs were initiated in other industries, although many industries now have surpassed us in many ways in formalized safety programs.

In the earlier years, such programs were merely tolerated, as long as they did not interfere with production. Over the years, more and more managements began to adopt safety programs, probably first because they recognized the economies of such programs, but later, surely, also because of the moral aspects, until today, all of our top railway managements are pushing and enforcing safety programs integrated with production.

This has brought about a revolution in teaching methods, design and invention of tools, and the completely safety-engineered properties that we have today.

Most of these revolutionary changes have taken place during our lifetime. Certainly most of the gains have been made in most recent years.

For railroad safety men, the road has not been an easy one. It has meant a continual struggle with their managements to enhance the value of a safety program in their everyday operating procedures. It was a very frustrating struggle for them for many years, and it has only been since the Second World War that safety men have had more operating managers for them than they have had against them, or at least lukewarm for them. Even then, too many managers were giving lip service but not making their decisions in favor of safety practices. There may be a few of these managers around today, but I do not know them.

The results of this revolution in our times are obvious. In the aboriginal years of safety, 1905-1909, we averaged 535 trainmen on-duty deaths each year. During the period 1957-1961, we averaged 21 deaths each year.

During the same periods, 248 passengers were killed each year 1905 to 1909, compared to 15 in the period 1957 to 1961.

You will note I have mentioned only fatalities. No mention has been made of crippling injuries, nor of disabling injuries. This is because the most complete and absolute result of a failure in our safety practices is the death of an employee or a passenger. The diseases in our operating practices that result in fatalities are the same as those that result in crippling or disabling injuries. When an incident takes place as a result of an operating failure, it is only a matter of degree whether it will result in a fatality, or a crippling or disabling injury. This is why it is so important to examine each breakdown in our practices very carefully.

An incident that results in a minor injury today could easily be a fatality or a crippling injury when it occurs again tomorrow. You have all had the experience of suddenly seeming to have your safety program bloom. For some reason, unaccountable to you, everything is going lovely. Incidents are occurring each day, but they are not resulting in lost-time injuries to any extent. The statistical record never looked so good.

You realize that this, in part, is the payoff for your safety efforts, but you cannot justifiably believe that suddenly everyone has received the message, and that you are now receiving just rewards for all of your hard work. At the end of each month, while this is going on, you receive a letter from the boss, complimenting you on the fine safety record. If you are like I was when I directed our safety program, you will cringe a little more at each successive complimentary letter, because you know as I do that the pendulum will swing. Eventually, whether your record is running good or bad,

it will level off to the degree that your safety program has taken hold on your property, to the level that you have been successful in establishing your program in the working habits of your people.

Through all of these periods, good and bad, you are going to have about the same number of incidents in any given period, and the number of them is going to adjust almost directly to the degree that you are successful in getting your safety program applied on your property. It is in this area we must work in the future, if we are to do better.

If you add up your accidents that resulted in fatalities and injuries in a given period, and double it to account for the number of times that something wrong was done on your property where no one was trapped, you will have defined the scope of endeavor where you can do better than you are now doing in safety effort. The era has passed where we can point to fatalities and lost-time injuries as our sole criterion of progress. We must deal with incidents in our operations that can cause any type of injury.

I will now have to mention a word that is much maligned, particularly in the world of safety: statistics. There is nothing wrong with statistics, they are a wonderful thing, actually the perfect tool of safety. However, they are easily abused and misused, and they so often are. One result of this has been that too many people think of statistics as a bad word, rather than a good word. Statistics are, however, an indispensable aid to safety. Only by their proper use can you tell where you have been, where you are, and where you might be heading in your safety programs. Nevertheless, it should be remembered that they are only a measure. When used as a measure, they can be of the greatest assistance in any safety program.

I will never forget the year that we went through 11 months of the year without a fatality. We then went through 30 days of December fatality-free. At 4:45 p.m. December 31st, at Verendrye, N.D., one of our trainmen was involved in a fatal accident. This was disappointing to us in many ways, both statistically and morally, because we were hoping to be able to show all of our people

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By E. L. GUERTIN
Supt., Canadian Pacific Railway Co., Montreal, Que., Canada

There is a saying that "success in a talk is like success in love—it all depends on how you grasp the subject".

At first glance, the theme, "As I See It Now", appeared most challenging but after mature reflection, I had to conclude that, basically, there is little changed insofar as concerns the precepts of safety in railroad operations.

The essential features that many senior experts taught me 20 years ago stand as true today as they were then.

The question arises as to what my qualifications might be to discuss this subject, and, I wish to make clear that I am not posing as any kind of authority. When I discussed the matter with the chairman of our program, he insisted that the combination of my previous experience as a safety officer and the good safety record of my division warranted the risk of getting a pelting.

Let me first give you an insight of my division. It contains extensive mileage of single track—almost 600 miles, with 17 miles of two tracks, operated by signal indication —a short piece of C.T.C. and another of staff system; 125 miles of A.B.S., and almost 475 miles operated by timetable and train order. We have 140 miles of mountain territory with its multitude of grades and curves.

We have commuter trains hauling some 8,000 passengers into Montreal daily; a yearly special event known as the "Quebec Winter Carnival" which calls for many special trains and the handling of very large crowds. We handle winter port traffic at two points. We control joint operation in one terminal with three railroads. We handle over 1,900 trains per month, and that is counting each train as only one from its originating terminal to its final destination.

By tremendous good luck and, I like to think, a little bit of good management, the division has gone 44 months without a single train accident due to employee negligence.

There are over 1,500 employees who accummulate more than 3½ million man hours per year.

was 5.8, and to the end of September this year, under one—made up of only two employee casualties.

There is no doubting that these are outstanding safety records and, perhaps, there might be some features of our program that might be of interest.

I can bring no special formula, for I am not a miracle worker, nor do I have any magic wand to wave, but I will say that our approach to safety in my division, is a constant one, with a very purposeful grind.

When in safety work, I used to preach at officers' meetings that the superintendent had to place first things first, and, since the very first admonishment that appears in the Uniform Code of Operating Rules, under "general notice", is "Safety is of the first importance in the discharge of duty", I constantly emphasized that safety should at no time be relegated to the background. Having become a line superintendent, I found no hardship in placing first things first because of my background and training in safety.

To recognize that axiom is one thing, but to do something tangible about it is something else.

First and foremost, safety needs the full support of management, and let me assure you thart we have it in our case, then, this same attitude must stem down from all high officers to each and every supervisor, who must recognize and feel his responsibility and, more important yet, exert his fullest influence in this respect.

Only through supervision can safety permeate the entire organization. No supervisor must be left to doubt that this is an important part of his job and that he must convince all others likewise. If we don't get the answer through the supervisory staffs, we will not get the answer at all.

When the supervisors understand safety comes first, they cannot but reflect the superintendent's sincerity.

I have dealt in generalities. Now, to get down to methods and practices:

First in importance, without a doubt, is the monthly meeting of officers at which

jor part, safety. It requires determination to tear all supervisory officers away from their jobs to attend these meetings, but, barring serious troubles, we do so. On-the-job meetings are held at least on a quarterly basis at terminals, but I must admit that the days are gone when employees were willing to attend meetings on their own time. So, to compensate for this void, and because geography does not give the opportunity for close contact with employees, I try to maintain an open line of communication by means of a monthly personal letter addressed to each employee's residence. This letter deals with any important aspect of our organization, but a good part of it is directed to safety. With the letter goes a copy of our company's house organ, *Sponner*, and our accident prevention bulletin, "On Guard". There is a great deal of work and effort in the preparation of such a letter, for it has to be carefully edited and must have the desired impact. I know that the time is well spent.

The officer's meetings, employee meetings, and personal letters are supplemented by personal contacts, inspections, and, perhaps the most important of all, an effective system of seeing and correcting infractions of rules and regulations.

No one will doubt that there is a definite connection between rules observance and accidents, and officers and supervisors must have the guts to correct, always.

In this connection, the superintendent should assure himself that all supervisors are familiar with the rules and regulations

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SELECTING, TRAINING AND MA
SAFETY SUPERVISO

By VERNE C. WHITE
Director, Supervisory Training
St. Louis, San Francisco Railway Co., St.

For most individuals there must be a reward in the future (other than pay) for work well done. Knowledge that he has something worth working for motivates man to utilize the energies of the potential within

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Those railroad companies which promote an individual to the position of safety supervisor without thought of management development, but as an end in itself, must be even more careful in their selection. For a man to be successful as a safety supervisor for a long period of time, without the possibility of promotion, he must have the quality of finding a satisfying experience in helping other people without being able to measure any degree of success in advancement for himself.

The success of one large hardware chain in the St. Louis area is built upon the principle that in today's business world there are so many jobs in which an individual cannot, at the end of a day, back away from his work and measure his progress. That same individual, however, can go to this hardware store at night and buy tools and sized materials to build a stool or bench. At the end of that day he is able to measure progress and realize a reward for his efforts.

Man depends upon past success to build his future successes. In safety work it is difficult to measure success in the accident that did not happen. If a man takes a position in which success is difficult to measure, then he must be that special breed who receives personal satisfaction from the feeling that he is making progress through satisfying experiences. Even this kind of individual can be motivated with a compliment from his immediate supervisor, a pat on the back or a "well done."

The best coach in the world cannot produce a winning team unless his material is up to certain standards. Selection techniques are very important in any company if the coach expects to field a winning team. Best results in selection of safety supervisors will be achieved when management comes to appreciate and interpret wisely the facts brought before it by testing, interviewing and evaluation. Too often employees are selected and promoted because of their popularity with certain individuals. Tested and proved selection and appraisal techniques should be brought to bear at all stages of his development to assure current and objective appraisal of progress.

Many railroad companies today are moving "full steam ahead" into the problems of developing better schedules, selling their transportation services, installation of microwave and computers, etc. without realizing that many of their top men are close to retirement and those on the second team haven't yet been tested in action. How will replacements be selected? How will they be developed? What do they need to know?

Consider for example the railroad superintendent. He is concerned with communications and signals, with mechanical operation of the locomotives and freight cars, with making schedules and a profit, with labor agreements and with labor, with the public, Rotary clubs, chambers of commerce and people in general. He must be a well-rounded individual with the ability to get work done through people, to make a profit for his company and to follow the leadership of higher executives and at the same time develop the necessary qualities of leadership that permit him to become a higher executive.

From where does such an individual originate? Superintendents on many railroads were originally switchmen, brakemen, firemen, dispatchers, etc. Is it reasonable to assume that such an individual will become well rounded after he becomes a superintendent? Is this the most logical way of developing managerial leadership or should training be given in advance of this promotion?

In the long run, technical training alone is not enough. The railroads must direct themselves to the broader problem of encouraging a dynamic constant development of their employes toward the end goal of producing resourceful, self-starting executives. Leadership involves the problem of influencing adult behavior. It involves the encouragement of people to examine critically the policies and procedures under which they must function, and the willingness of executives to initiate, to assume responsibility, or to criticize and suggest changes in current policies and procedures.

Leadership stems from self-confidence. Becoming acquainted with the various company executives and having experience in the many departments through safety work helps develop the self-confidence so essential to leadership. Would it not seem reasonable also, that a safety supervisor, with the opportunities of entering, studying and working with various departments, observing how other people supervise and are supervised can gain valuable experience as a part of his training for higher management? This experience provides an excellent supplement to

what he learns through his company's formal management development programs.

In the Frisco Railroad, many of the top executives came through the safety department. In the capacity of safety supervisor they gained through experience some of the qualities necessary to becoming a well-rounded individual. The Frisco safety supervisor speaks at high school meetings and civic clubs, company safety meetings and at employe group functions.

His title admits him to the diesel shop, the communication and signal office, to ride on freight trains, passenger trains, locals, switch engines, into the control tower, testing laboratory and into the general manager's office. His associations are with labor and with top management personnel. While meeting people from these extremes, he also learns the problems involved in the operation of the railroad; problems which arise within the various departments and the people who solve these problems.

No program of development will really produce results until every supervisor recognizes and discharges his personal responsibility for developing the people entrusted to his care. The key is greater delegation of authority, coupled with understanding and thoughtful handling of subordinates to bring out their good qualities. The great responsibility on the supervisor is to lead rather than to drive; to develop rather than stifle. He should be aware at all times of a subordinate's responsiveness to his views and attitudes.

The position of safety supervisor is a staff assignment and as such can develop one's ability to think clearly and to handle people. The typical line supervisor spends most of his time dealing with routine matters. The staff man, on the other hand, has a minimum of routine and deals with new problems constantly thus providing new opportunities for practice in improving his analytical ability. Also since he lacks authority, he must get results through cooperation and salesmanship. The good staff man requires considerable skill in human relations. A staff assignment thus proves an excellent way to test an executive's real ability.

Many line officers are bolstered by experience, surrounded by their staffs and familiar routines which make them appear better than they really are. In staff work, an individual

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Assuming the right person is selected for the job, what kind of philosophy should he maintain to best serve the cause of safety?

The ultimate goal of safety is to avoid accidents. Therefore, it might be assumed that this is the objective of any safety program. However, avoiding accidents is a negative goal, it infers "do not have an accident." How can people be motivated toward something which is negative?

"Safety" is preferable to "accident prevention" as a goal for the safety supervisor but such a title does not describe a need which, when fulfilled, will create a satisfying experience. To have crossed the track to reach the other side does not under ordinary conditions give one an experience of satisfaction at still being alive.

Safety, like good health and fresh air or life itself is missed only when it is gone. If accidents were not unpleasant it is doubful that safety would be thought of or sought after.

The value of safety, therefore, arises from the fact that accidents are so undesirable. Safety seems to become a thing of neutral value and people are unaware of its desirability until the accident has happened. This creates an acute problem in industry because accidents are much less frequent than they were 20 years ago. As accidents become more infrequent, people become less aware of the virtues of safety.

Safety may be approached from the point of view of the engineer or of the humanitarian. The engineer would remove the hazard from work by changing the operation of dangerous machinery, designing and installing safety devices such as cutoff switches, belt guards and fail-safe mechanisms. He would attach guards to certain machines, design safety goggles of better quality, develop non-slip and non-skid stairways, walkways, etc.

The humanitarian is more concerned with the correction of human factors in accidents. He is concerned with training men to use safe methods, to become aware of the presence of hazards, to develop safe working attitudes (attitudes of cooperation), to reduce fatigue, to properly select men for their occupations and to be concerned with their mental condition.

Through the humanitarian approach to accident prevention, safety committees have been organized which have had tremendous effect in reducing accidents. The problem of the humanitarian is increased many times in trying to get men to use effectively the tools and devices designed by the safety engineer.

Without a doubt one of the greatest tools of the humanitarian approach to safety is the safety committee *when* it is active and *when its membership includes workers and officers as well as the safety supervisor.* An active safety committee can have tremendous value in keeping safety education in the mind of employes at all times. Their primary function should be that of developing safe work habits. An active committee can bring social pressure upon the employe who declines to use safety measures and who becomes careless.

Posters and slogans are also desirable in an effective safety campaign. Emotional appeals have certain value but it is regarded as only temporary. If they arouse fear, they do more harm than good because a frightened worker is not a safe worker. A gruesome picture may attract attention but it does not educate a person on safe work habits. Posters showing agony in the face of an injured worker, a pair of hands dripping with blood or the mutilated body of a child are not constructive because they arouse fear and pity more than an education in safe work habits.

The most effective poster is one which gives a positive message as opposed to telling people what to do. A sign which reads, "wet paint do not touch" will have more fingerprints around it than a sign which reads, "wet paint test here." A poster which tells you not to have accidents points toward a negative goal and not a positive goal. It tells you what not to do and never points out how accidents may be avoided. The important thing is to approach safety as an educational problem. It is important to point out safety as a positive goal, something to strive for and which can be reached because it is made to seem desirable and is kept foremost in people's minds at all times.

Build strong habits into the safety program. Safe working methods should become habitual with all employes. There are certain ways of throwing a switch, specific body postures, certain ways of climbing a pole and

applying pressure, of lifting, etc. which are relatively safe. By the same token, certain movements are unrelated to the job and expose a person to injury. These movements should be eliminated! The proper work methods should be studied and taught to new employes.

A posture which allows a man to lose his balance and fall if the wrench slips; holding a hand in line with a cutting edge; standing in such a position that the head could be bumped if the worker suddenly moved without thinking; holding the face close to a grinding wheel from which particles of steel may fly are examples of movements which should be eliminated from the work pattern.

Safe habits should become as much a part of the work pattern as it is to pass the pepper along with the salt. The wearing of safety goggles must become a part of the grinding operation and not an accessory to the operation else it might be forgotten. If it is an accessory to the grinding operation, the operator may then decide to wear the goggles or not to wear them. He will decide not to wear the goggles if he happens not to have them with him at the time, if the goggles are uncomfortable or if they interfere with his vision. If it is a habit, he will automatically put the goggles on.

The problem of enforcing safety rules will be reduced to the extent that safe methods are incorporated into the job as a habit and not tacked on as an extra precaution to be taken.

When safe working habits are a part of the work pattern it is unnecessary to warn employes of the impending danger. They relax with the assurance that their safe habits will automatically make their actions safe. Telling a person not to be absent minded is as ineffective as telling him not to worry.

Habits are strong and dependable forces. This becomes apparent if we try to oppose habits. The success of the TV series, "Candid Camera," is built upon the expressions on people's faces when they are unable to cope with a situation through habit, when it becomes necessary for them to think. Suppose a telephone were wired in such a manner that the mouthpiece was on the receiver end and vice versa. There would be a long period of adjustment before a person accustomed himself to picking up the phone and reversing its position between his mouth and his ear.

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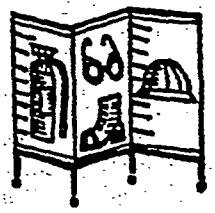

1964 NATIONAL SAFETY CONGRESS

OCTOBER 26-29, 1964/CONRAD HILTON HOTEL, CHICAGO

1965

The Congress is always a big week, a worthwhile week for the 10,000 safety people who attend.

1966

At the '64 Congress you can meet other safety people, with the same problems and responsibilities as yourself. You can exchange views and ideas on accident prevention, health, hygiene, and fire prevention . . . on safety in industry, traffic, school, at home and on the farm.

1967

You can see the largest of all safety equipment exhibits at the Congress . . . an opportunity for you to make well-informed buying decisions for your company.

1968

This four-day educational program, planned and presented by the National Safety Council, can be your most thought-provoking, most worthwhile safety experience in 1964.

Make plans early to attend the 1964 Congress and bring the other people in your organization who have safety responsibilities.

NATIONAL SAFETY COUNCIL

SCHOOL BUSES IN TODAY'S RURAL PROBLEMS

By CAPTAIN DONALD E. OA
Commanding Officer, Safety & Traffic Bureau, Mi
East Lansing, Mich.

It has often been said that the school bus carries our most precious cargo. Yet, all too frequently this precious cargo fails to receive the special handling and consideration it deserves. We believe progress is being made in improving the efficiency and safety of school bus transportation in Michigan, and I trust this also is happening throughout the nation.

In any event, my knowledge of the problem is based on what has happened in Michigan, and my comments will draw heavily on this experience.

School bus transportation is big business. During the 1962-63 school year in our state, 536,000 children were transported daily in 7,200 school buses, which traveled a total of 68,000,000 miles.

School bus transportation also is growing rapidly, more than twice as fast as vehicle transportation generally. Between 1953 and 1962, the number of pupils transported daily increased 60 per cent, the number of buses increased 64 per cent, and total annual bus mileage increased 62 per cent. Between the same years, total vehicle registration increased 25 per cent, while total travel mileage was up 31 per cent.

Many factors are contributing to the sharp increase in school bus transportation, including the growth in the school population, the trend toward suburban living, and the trend toward consolidation of schools.

Despite all the effort in Michigan to improve our school bus transportation system, school bus accidents (except those resulting in death or injury to children before boarding or after alighting from school buses) have shown greater percentage increases between 1953 and 1962 than the exposure factors previously mentioned.

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local street and county road officials, various state agencies—department of public instruction, state universities, state highway department, state police, department of state, public service commission, state safety commission, —the state legislature and the general public. Perhaps I missed others which should be included, but those named all can make a contribution to efficient and safe school bus transportation, and *must* for such a program to be most effective.

For years the state police have made special studies of rural school bus accidents, and from these studies we have learned many things.

One of the things we have learned is that for the most part, school bus accidents are caused by the same old mistakes and failures year after year, and that most of such accidents could have been prevented by greater care on the part of the motoring public, school bus drivers, the children being transported, and their parents. Nevertheless, we are gratified that some of the contributing factors in these accidents are being reported less frequently than in the past.

For example, only one child has been killed by another vehicle when crossing the roadway to board or after alighting from a stopped school bus since our two-way stop law became effective September 13, 1958. Also, there has not been a single child injured during the past three years crossing the road to get to his parent's car on the opposite side after the child alighted from the school bus. Other accidents involving children being hurt when crossing the roadway to board or after alighting from school buses have been reduced, and fewer children are struck crossing from the rear of the bus. Other "associated type" accidents (those directly or indirectly influenced by the stopping of school buses) also have been reduced three successive years after increasing for at least ten successive years, 1950-59.

Our reports indicate that motorists must take into account that the actions of children are unpredictable and that they may do the things least expected. This means that motorists should be prepared to take any necessary action to ave. an accident when in the vicinity of a bus as well as obeying the letter of the law. A child may dash across the road without looking and heedless of his own safety as the bus approaches the pick-up location and before the bus has stopped; a child may suddenly decide to cross the roadway when the bus pulls away after letting him off; and a child may dash back into the roadway to retrieve a dropped book or pencil. These are only a few of the many unexpected actions of children.

Likewise, year after year our reports indicate that neither bus drivers nor children should ever take for granted that drivers of other vehicles will stop from either direction as required by law when buses are stopped to load or unload passengers. There are many reasons why this is true, and a few of these are given to illustrate this statement:

a. Some motorists drive too fast to make the required stop.

b. Occasionally brakes are defective and the vehicle cannot be stopped soon enough to avoid striking a child.

c. Too frequently motorists fail to see the bus in time because of inattention, preoccupation, or distraction, being blinded momentarily by the sun or because trucks or other vehicles block their view of the stopped bus.

d. Others drive when they are physically impaired—extremely fatigued, under the influence of alcoholic beverages, emotionally disturbed or handicapped in some other manner.

e. A small percentage of motorists drive in a reckless manner with little regard for the safety of others.

Some of the hazards referred to which result from the actions of other drivers can be minimized if school bus drivers will:

1. Give timely and adequate signals to warn others that the school bus is about to stop for children to board or alight and continue operation of flashers while such action is taking place. (School bus drivers in Michigan are required by law to actuate flashing red signals on the front and rear of school bus whenever, but only whenever, such vehicle is stopped or about to stop for the purpose of receiving or discharging school children.)

2. Make certain that flashing lights are adequate and properly maintained.

3. Stop bus only where it can be seen for a distance of at least 500 feet by approaching or overtaking drivers.

4. Stop bus off paved or main traveled part of highway whenever possible at the time children are being picked up or discharged from bus outside of cities and villages. On any limited-access highway, do not stop, park or leave the bus standing, attended or unattended, except in an emergency or mechanical difficulty.

5. Signal to children when the way is clear for them to cross the roadway after making certain it is safe. Bus drivers and school officials should arrange for assistance by school bus safety patrols whenever necessary and feasible.

6. Require children crossing roadway after being discharged from bus to do so only from in front of bus as required by law.

7. Insist that children walk (not run) across roadway.

8. Never proceed with bus until children have crossed roadway safely. A child left stranded may run into roadway and be partially hidden from other motorists by the bus as it moves forward.

9. Make certain that no child remains hidden in front of the bus before moving forward. This precaution cannot be too strongly emphasized because two children were killed in this manner during the past two years, one in 1961 and one in 1962. A mirror is now required on the front of buses to aid bus drivers in seeing children immediately in front of the bus, but regardless of mirrors, bus drivers should not proceed until they are absolutely sure the way is clear.

Parents can help assure the safety of their children by making certain they are aware of potential hazards when crossing the roadway; by teaching them never to cross the roadway without stopping, looking and making certain the way is safe; and by insisting that children cooperate with school bus drivers. They also can help by not parking their cars on the opposite side of the road when they stop to pick up their children.

In 1962 there were 325 rural accidents in Michigan in which school buses were physically involved: one fatal, 77 injury and 247 property damage. These accidents caused one child pedestrian death and 173 injuries.

Unfortunately, some school bus drivers still violate the law and are wholly or partially responsible for accidents in which

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In 1962 there were 12 such "associated type" accidents in Michigan which caused injury to 12 children. That year was the third successive year in which no child was killed by another vehicle crossing the roadway before boarding or after alighting from a school bus, and the 12 such accidents reported were three less than in 1961—the same number as in 1959, the previous low for this type of accident in at least 13 years. And as previously reported, only one child has been killed in this type accident by another vehicle since the two-way stop law in Michigan became effective September 13, 1958.

In 10 of the 12 "associated type" accidents the child was struck when crossing from in front of the bus, and in four of these accidents the child was reported to have run in front of the bus. Flashers were reported to be operating on school buses in eight of these 10 accidents; no information was reported on flasher operation for two buses. Children also ran into the roadway in the other two accidents, one to cross the road to board a bus which had its flashers on but was still moving, the other to cross the road after being let off from the bus. In the latter case, the driver of the bus had turned off the flashers and started to move forward.

Striking vehicles were passing the school bus from the rear in seven of the 12 accidents, and from the opposite direction in five.

Some of the reasons given by drivers for failure to stop in time to avoid striking children included: thought children had all left bus; failed to see flashing lights; talking with passenger and failed to see bus; talking with girl friend and did not think of stopping; was looking for an address and failed to see red flashing lights or child until he was only a few feet ahead of car; didn't know he was required to stop for bus although driver saw bus with flashers operating. Add these to the many other reasons given for not stopping for buses in previous reports, nd it is easy to understand how driver failure contributes to such accidents in so many instances.

"Other associated type" accidents in Michigan were up for 10 successive years but have been reduced during the past three years, 1960-62, as previously reported.

These are the accidents which happen when a vehicle is slowing or stopped for a stopped school bus and is struck in the rear by a following vehicle, or such vehicle takes to the ditch to avoid striking other stopped vehicles or a stopped bus. Sometimes the following vehicle becomes involved in a head-on collision when it crashes into a vehicle from the opposite direction attempting to avoid the stopped bus. Frequently these accidents result in several vehicles being involved, with one being pushed into the other.

A study of a sampling of these accidents indicates that excessive speed and following too closely are the two most common violations, and reports also indicate that inattention is an important contributing factor. Drivers involved in such accidents report that their view of the school bus was blocked by a truck or other vehicle already stopped; attention was distracted by something inside or outside of car; must have gone to sleep; forgot that stop was required from both directions; school bus was not operating flashing red lights or failed to give warning in time; etc.

In Michigan, school buses are required to pull off paved or main traveled part of the road whenever possible when stopping for children to board or alight. This practice, we believe, tends to prevent rear-end collisions, but there are those who disagree and we have no definite proof to support our belief. In fact, because the wording of our law was not clear, our attorney general ruled that buses should stop on the traveled part of the roadway when stopping for children, but the wording has since been changed and buses again must stop off the traveled part of the roadway when possible. Required flashing red lights at front and rear of bus also may have contributed to the reduction in our "other associated type" accidents.

Reported violations and other reasons given for becoming involved in "other associated type" accidents emphasizes the importance of school bus drivers making certain it is safe before slowing, stopping or starting school buses, and giving adequate advance notice to other drivers of such actions by using flashers properly.

Most of the elements outlined as being required parts of an efficient and safe school

bus operation are being carried out in Michigan, at least to a limited extent, and an excellent job is being done with respect to some phases of the program. For example, many local school districts do an excellent job of hiring, training and supervising their school bus drivers, then provide these drivers with good buses, and see that they are properly maintained.

The Department of Public Instruction finances a substantial part of the cost for the operation of school buses (more than 60 per cent) as provided by law; supervises and finances the carrying out of a school bus driver education program by six full-time instructors and one part-time instructor, in four different universities; cooperates in a state-wide school bus inspection program; and prescribes the rules and regulations for operation of school buses.

During the 1962-63 school year, nearly 5000 (4,934) school bus drivers were given the special training course developed and carried out by the Department of Public Instruction. Many of these drivers, and others also, have taken the training courses of previous years, and at the present time five different courses of instruction have been developed for this special training. Information on this phase of the program is included in the "Michigan Pupil Transportation Handbook" developed by the Department of Public Instruction.

Our legislature has enacted the laws considered necessary for efficient and safe school bus operation, patterned quite closely after those recommended in the Uniform Vehicle Code. These include: a two-way stop requirement; maximum speed of 50 miles per hour; definition of a school bus; laws relating to color, safety glass, emergency doors, fire extinguishers, identification, flashers and mirrors; laws relating to use of flashers and stopping location; and laws relating to those who can lawfully drive a school bus.

The state police enforce the law requiring vehicles to stop for stopped school buses (they averaged 1,140 arrests for this violation during the past four years), and other laws relating to the safe operation of school buses. Members of the department cooperate in the school bus driver education programs, and for years our department inspected all rural public school buses in Michigan, in

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of an efficient and safe school bus transportation system. In closing, I would like to stress that any such program requires the full cooperation on the part of many, constant motivation, strong administration and supervision, and eternal vigilance.

Failure to stop at a railroad crossing can result in a catastrophe, as can a head-on collision with a truck or other heavy vehicle, or losing control of a bus and running off the road when the weather is bad or icy road conditions prevail.

SEAT BELTS AND SCHOOL BUSES

By ROY C. HABUSLER
Automotive Safety Engineer, Chrysler Corporation

In so far as station wagons are used as school buses, all provisions have been made for installing belts fully as protective as those offered for all other passenger cars. Full advantage should be taken of the provision, and each seat should be provided with an individual belt. It is highly desirable to have the child learn at the earliest age that the thing to do when first getting into the car is to fasten the belt. It is the development of this habit that constitutes the great value of seat belts in school buses, and for this reason it would be well worth providing all buses with seat belts, even if we could be assured that there would never be an injury-producing accident. The step is easy to take with regard to station wagons and should be regarded as well worth the money.

In addition to setting the proper example, we would obviously be providing very great protection against possible injury in case an accident really would occur. Protection for the school-age child may be much greater than that afforded the adult, since the clearance between the child and the structure in front of him is relatively greater. Typically he is able to fold completely over the belt without colliding with the seat or other structure in front of him.

With regard to school buses, other than station wagons, the situation may be different only in degree so far as potential protection is concerned, but the lack of provision for attachment of belts has been a serious obstacle. It may not be feasible to attach such belts to the floor because of the interference with the foot room of the children in the next rearward seat. Furthermore, the tendency of the child to kick the belt or belt hardware in front of him is certain to be a drawback with any such installation, with the consequent tugging on the belt proving very irritating to the wearer. This may be a greater problem with school buses other than station wagons because of the tendency to space the seats more closely.

Strength of installation in the school bus (other than station wagon) may be an unknown quantity depending on the adequacy of the floor structure or the seat structure to take the resulting loads, but this should be thought of as a matter of lesser importance. Some protection is certainly very much better than none, and there is still the very great benefit of establishing a seat belt habit at the earliest possible age. As seat belts are accepted for school buses in spite of these compromises and in full view of their potential benefits, we can certainly expect to see more adequate provision made for them in the design of the seats and of the buses themselves.

(1) *Installation — Per Cent of Cars Equipped.* Every motorist is in favor of traffic safety, as long as he himself is not expected to make any change in his driving practices, just as long as he is not expected to adopt any new safety equipment or acquire new habits such as using it regularly.

This has been the atmosphere in which a tremendous national education and persuasion campaign to get all automobile passengers to accept seat belts has had rather modest results. About 20 per cent of all new cars are being equipped with two belts

for the front seat, roughly half of them at the factory and the remainder at the dealer. Of the cars already on the road, perhaps another 2 per cent are being so equipped each year. Rear seat belts, first offered by Chrysler Corporation in 1955, are now beginning to appear in enough cars to make the average motorist barely aware of them, but measurable progress has been confined almost entirely to front seat belts. In all, hardly more than 10 per cent of the nation's cars are as yet provided with the most important item of automotive safety equipment introduced in the last decade.

(2) *Frequency of Usage.* What about usage? Are the belts installed thus far being used? According to the survey conducted a year ago by the Auto Industries Highway Safety Committee, half of all car occupants having belts available to them are using them frequently or every time. While 100 per cent usage is obviously the goal, this 50 per cent figure is very gratifying in view of the repetitious statements by many of our citizens and even some of our own safety teammates that "people" would never wear them.

However, even this degree of usage may not prevail in the months ahead. Up to now, almost all seat belt installations have been made on the initiative of the motorist. By next year that initiative will have been taken away from him in at least 15 states, and perhaps in 25. Among those who had already made their decision in favor of belts or who were about to do so, we can expect fully as much cooperation as now, but what about those who are being forced to accept belts?

Much remains to be done if we are to realize our goal of universal seat belt usage. We can legislate seat belts into cars and have begun that job but we risk antagonizing as many people as we win, at least among the adults. In any case, only the two front seat belts have been provided for, in any of the laws to date. Admittedly these are the most frequent used seats, but any other seat that is ever used should also have a belt. For all practical purposes this means six belts for a six-passenger car and nine for a nine-passenger station wagon.

(3) *Today's Greatest Need—Safety Leaders Setting The Example.* I wonder how many of us have our own cars so equipped.

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have the job of convincing the motorist and his passengers that wearing seat belts is desirable from a protective and comfort point of view and that it is actually no bother at all once the habit is acquired. We have to convince our people that the protective benefits are very real and very great and that there is very little foundation for their fears and reasons for hesitation. My own experience in this persuasion process assures me that this will be very much easier to do among young people. I would therefore like very much to see it given a prime place in every driver education program. The material that follows is offered in support of this recommendation.

(5) *Seat Belt Effectiveness In Reducing Risk Of Serious Injury.* Many cases have been presented in newspapers and periodicals, as well as through the technical literature, to illustrate the effectiveness of seat belts in reducing risk of injury in traffic accidents. However, much more significance can be attached to the study completed several years ago by the California Highway Patrol and the Cornell Crash Injury Research team.

The essence of the finding of this study was that there was a 35 per cent reduction in the frequency of occurrence of serious, critical, and fatal injury among those wearing seat belts as compared with those not wearing belts but involved in essentially similar accidents of similar severity.

We have also noted that seat belts appeared particularly effective in those accidents involving angle and lateral impacts and roll-overs—accidents entailing a particularly great risk of ejection of car occupants. In a subsequent commentary on this study, Robert Wolf, the Director of the Cornell Automotive Crash Injury Research Program, indicated that at least two-thirds of the benefit was found to be associated with prevention of ejection from the car. The remaining benefits were associated with reducing the severity of collision of the occupants with the car's interior.

(6) *Injury Attributable To The Seat Belt.* From the very beginning there has been a persistent undercurrent of fear of entrapment by the seat belt. This fear has been the basis for the reasons given by a great many people who should know better but who even at the present time simply refuse to wear seat belts.

The policeman who administered the driver license examination to my son only a month ago refused to follow my son's example of putting on the seat belt, saying that he would never wear one because he would always want to be free to get out of the car instantly in case of fire. As long ago as 1956, John Moore, then the Director of the Cornell ACIR Program, reported to the Roberts Committee on Health and Safety under the House Interstate Commerce Committee that less than five-tenths of 1 per cent of all injury-producing accidents involve fire or submersion to any degree whatever, and that only a small portion of even this small percentage involve either fire or submersion to such degree as might threaten the car occupants themselves.

When these finding, based on thousands of actual highway accidents, are set alongside the thoroughly established fact that the wearer of a seat belt can easily get out of the belt in a second, it must be recognized that this is no rational basis for refusing to wear seat belts. Added to this information is the more recent study by Indiana University, the American Red Cross, and the Michigan State Police on the detailed evidence associated with a passenger car running off the road and into deep water. This study, reported at last year's Safety Congress and featured on the cover of the current issue of Popular Science revealed that in most instances the occupants could expect to have not merely seconds but minutes—as much as 10 minutes in one case—in which to unfasten the belts and get out of the car before the car actually sank.

These data may convince some of the people still on the fence with regard to the appropriateness of using seat belts, but such demonstrations may have to be repeated a great many times if we are ever going to provide enough reassurance for some of our more frightened drivers.

Before seat belts were introduced by the motor car manufacturers, and at various times since then and right up to the present day, there have been statements to the effect that the seat belt itself could cause serious internal injury. Again it has been very difficult to change the opinion of people by mere presentation of the facts.

Perhaps part of this difficulty has resulted from the opinions being so firmly established

that there was little inclination to examine the facts or even to notice that relevant information was being offered. When one doctor was reported to have expressed the opinion that at collision speeds above 50 miles an hour seat belts could cause serious internal injury, this report was widely published. Furthermore, there was evidence of its being noted by a number of people—they told me that they had read it.

In contrast, there has been almost no awareness of a very comprehensive and creditable study by Cornell Medical College's Dr. Paul Braunstein and Cornell ACIR's John Garrett—"The Seat Belt Syndrome." This study, based on the injury experiences of 3325 car occupants wearing a seat belt at the time their cars were involved in injury-producing accidents, showed that the only injuries directly ascribable to the belt were the bruises over the hip bones where the belt load had been applied. Less than 1 per cent of these 3325 occupants had lower abdominal or pelvic injuries that were more serious in nature, and this was no greater frequency of occurrence than among car occupants not wearing seat belts and involved in similar accidents.

In spite of the dire predictions, no one has been "cut in half" by a seat belt.

This is not to say that there have been no fatalities among people wearing seat belts. Braunstein and Garrett did find one such fatality among the 3325 seat belt wearers, but the description of the accident and picture of the vehicles involved made it quite clear that the seat belt could not have been expected to have made any difference. The car had collided with a bus head-on, and the bus had penetrated the car to the rear seat area.

These investigators found another fatality among the seat belt wearers and used it in their report as an example of "circumstances where the use of a seat belt has absolutely no effect on injury." "An Austin-Healey occupied by two young men, both wearing belts, rounded a curve too fast, skidded, and slid broadside into a tree at about 55 miles an hour. The car impacted almost directly on the right front door, and the occupant of the adjacent seat received a fatal skull fracture. . . ." Since this car had no "top" at all, the passenger's head struck the tree directly.

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may come as a surprise to learn that even in roll-overs it appears that the occupants are safer if held in place by seat belts than if they are free to tumble out, only to have their own car topple onto them.

(7) *Basis For Judgment In Choosing Seat Belts.* Fear associated with the use of seat belts has been expressed in several ways. One has been the demand for great assurance that the belts are of suitable quality and that they meet or exceed standards, specifications, and requirements. In this respect the seat belt has been unique in that the motorist has chosen and purchased the entire car and all of the accessories on it without needing any reassurance from approving agencies. Opinions and advertising have generally been his guide, but when it comes to seat belts the motorist wants to be reassured that the belt meets standards and that it has been "approved" by the most impeccable authority. Mere facts such as those brought out by the Cornell studies simply do not seem to register.

In the study entitled "The Seat Belt Syndrome" Messrs. Braunstein and Garrett showed that seat belts failed in less than 1 per cent of all cases; the data consisted of 3325 car occupants actually wearing seat belts when the car was involved in an injury-producing accident. This is all the more surprising when the cases are examined and it is realized that they include some of the utmost extremity—head-on collisions at high speeds, the head-on collision with a bus mentioned above, and a car-train collision.

This very low number of 29 failures and near-failures appears all the more remarkable when it is recognized that a substantial number of these belts had been installed several years before the accident occurred and were manufactured at a time when the strength requirements as established by the CAA and the SAE were very modest as compared to today's standards. Furthermore, belts of that day frequently failed to meet even those modest requirements in spite of claims made to the contrary, and many belts of that day were supported by no claims whatsoever with regard to meeting standards. This wide range of performance must also have included some cases in which belts might have been expected to be difficult to release, yet not a single person was reported as having been trapped in a fire or in a submerged car.

Thus there is very little basis for the excuse that the motorist was unwilling to use seat belts because of lack of proper assurance of their quality. Nevertheless, vigorous steps have been taken to provide such assurance. The SAE Standard for Motor Vehicle Seat Belts has been steeply upgraded through successive revisions, and an enforcement program has been added.

The existence of the standard was regarded as being insufficient in itself, if only because the consumer had no way of knowing whether the belt he was considering really met the standard. The same lack of confidence prevailed even after the manufacturers provided permanent labels for their belt displaying the SAE number of the standard. There was always the possibility that the unscrupulous manufacturer might make such claims even though in fact he could not back them up.

In response, the American Seat Belt Council, a trade association of some of the larger seat belt manufacturers, organized a program of independent audit of the manufacturer's claim that he was meeting the SAE Standard. An independent commercial laboratory was given the assignment of obtaining samples of the manufacturer's production belts directly from his plant and also through purchases in the retail market. These production samples picked up at irregular intervals through the year are tested for compliance with all provisions of the SAE Standard. If the manufacturer's belts consistently meet all requirements, he is entitled to use a certification label bearing the name of the American Seat Belt Council. Some 60 belt models offered by the 20 manufacturers who are members of the American Seat Belt Council now bear the ASBC certification label.

More recently an even more vigorous certification program has been put into operation, with the certifying laboratory being Underwriters' Laboratories, Inc. Underwriters' Laboratories has the tremendous advantage of having already obtained wide recognition through its certification work in connection with electrical appliances, roofing, fire extinguishers, and other products having potential safety hazards. The Underwriters' Laboratories "listing" or certifications have been so well recognized in some areas as to be required on certain products by governmental regulation.

Underwriters' Laboratories has gone one very important step further with regard to certification. It has shown on the certification label the exact identity of the SAE standard used as the basis for judgment. From the consumer's point of view this is indeed a very important step forward.

The newest SAE Standards for Motor Vehicle Seat Belts—SAE-J4a—is much more demanding than the SAE-J4 Standard it has just superseded. The increase in restraining capability from the previous 4000 pound level to the present 5000 pound level has been associated with a test procedure representative of the most severe combination of conditions of use. As the result, the buckle may have to withstand more than twice as much tensile load as had been required to meet SAE-J4 or as may be required to meet the present Federal Specification JJ-B-185a. Increase in strength requirements, however, is just one of the important changes.

Until the new SAE Standard, SAE-J4a, was introduced, there had been no Federal or state requirements or standards of any kind on the ability to adjust the belt. All of the evidence we have points to the importance of having the belt worn as snugly as possible with comfort if the maximum protection is to be obtained. The protective value of the belt can be expected to fall off very rapidly if difficulty in adjustment discourages the user from making any effort to pull the belt down around him. Merely clicking the two parts of the buckle together in front of him without taking up the slack may result in very little protection indeed, especially for the driver whose knees are apt to be close to the instrument panel controls and whose abdominal area may be even closer to the steering wheel. The new specification calls for a more severe limitation on belt stretch than ever before, and for the same reason. However, this advantage can quickly be thrown away if the belt wearer fails to pull the belt tight after fastening the buckle.

This matter of ease of adjustability can prove to be of very great importance. With no previous standard having any requirements along this line, many belts were approved and certified as meeting existing standards, even though in practice they could not be adjusted at all once the buckle was fastened. The Underwriters' Labora-

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is far more feasible in cool weather, or in the case of cars equipped with air conditioning if the weather is very hot. It might be supposed at first though that this would be of minor importance, since glass can perhaps be broken in case of a sideswipe or roll-over accident—the kind of accident in which it would be particularly dangerous to have the occupant's head or arm projecting from the window. Actually the crash impact work done at automotive proving grounds has shown that in many instances, even including those in which the car rolls several times, the side window glass will come through the entire accident without being broken and will thus be able to keep the occupants altogether inside the car. This extraordinary sturdiness of the side window glass has been a particularly desirable feature of the industry's complete conversion to the use of tempered glass for side windows.

In this connection it should also be understood that it is desirable to keep windows closed rather than open in connection with any possible risk of carbon monoxide entry. There are virtually no circumstances under which any appreciable quantities of exhaust gas will enter the car through the side windows while the car is in motion. Entry is far more likely through rust holes in the floor or through leaks in the fire wall between the driver and the engine compartment. Exhaust gas may also enter through the open back window of the station wagon. The extent to which gas enters through these openings is in part dependent on the direction of air flow through the passenger compartment. If a side window is open and particularly if a vent window is open in the usual manner to draw air out of the car, as when the vent window is open 45 degrees from the closed position, the inflow of exhaust gas through leaks in the floor pan or through the open back window of the station wagon may be very much greater.

It is far safer to ventilate the passenger compartment by having air enter through a fresh air heating system or through the cowl or side vents located forward of the driver and opening directly to outside air in such fashion as to have the car's motion force air into the car. With this thought in mind, the fresh air heater is very much to be preferred from the safety point of view to the "economy" recirculating heater still offered as a price leader. It is difficult to get the driver to open the fresh air vents in wintertime unless the cold air is first directed into the heater.

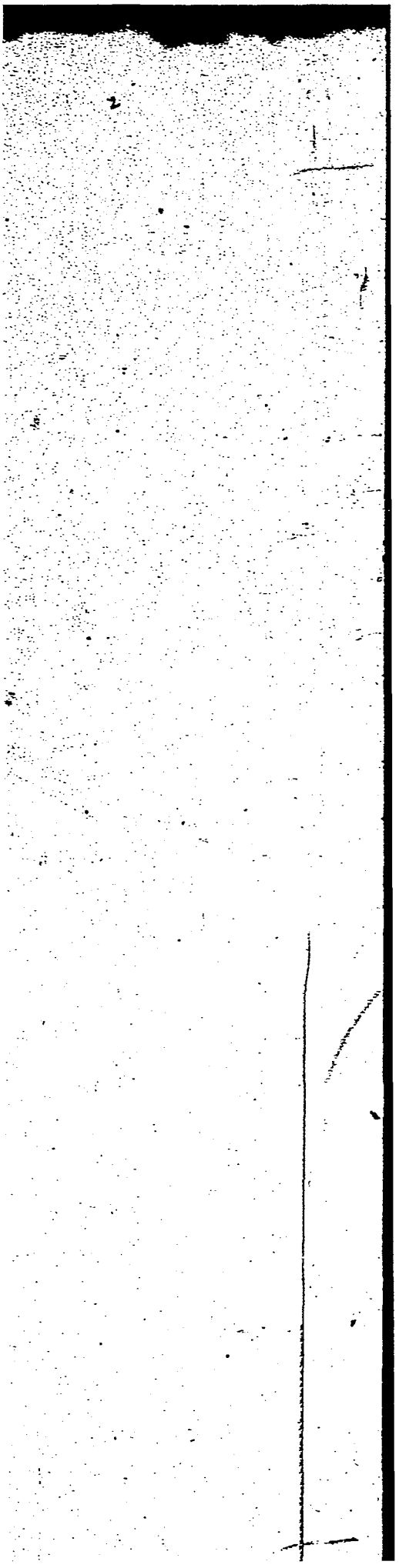
The inflow of exhaust gas through the open back window of the station wagon can also be eliminated by the provision of suitably engineered deflector vanes mounted on the roof or at the rear corners at each side of the rear window. Such deflector vanes are offered as factory and dealer installable extra equipment for some of today's station wagon models and can be expected to become more widely available in the years to come. They also help to a very material degree to keep the wagon's rear window clean, so that the inside rear view mirror will provide the desired clear image.

Returning to seat belts, perhaps the most important step of all in making the seat belt more effective will be to add the shoulder belt. We have known all along that the combination can provide very much greater protection than can be obtained from the lap belt alone. Up to now it has been supposed that it would be more desirable initially to promote the use of only the lap belt on a "first things first" basis.

I am not sure at all that we have been right about this. Sweden started its national campaign to promote the use of safety belts two years after we did and started with the shoulder belts. Midway in the campaign recognition was given to the importance of adding the lap belt so that each person would have a combination lap and shoulder belt for restraint. As long ago as two years, it was reported that more than 60 per cent of all cars registered in Sweden were already equipped with either the shoulder belt or the lap and shoulder belt combination, and that in intercity driving 80 per cent of the car occupants who had such belts available to them were actually found using them.

This was hard to believe, and suggested a certain amount of expansiveness on the part of safety enthusiasts. However, American experts in this field, including the late Harry Mathewson of UCLA, reported on their return that as nearly as they could tell this was a fair measure of the status of lap and shoulder belts in Sweden. There was really wholesale acceptance.

All of this occurred in spite of the fact that there was no compulsion whatever.



There was no law requiring the installation of any kind of belts in any cars in Sweden, nor was there a law that they had to comply with Swedish standards if the motorist chose to put belts in his car. The entire job was done by skillful persuasion led by the national government and heavily supported by the medical profession and the women's clubs. There were indications that this national persuasion program was substantially more intensive than our own in the United States, and still it was hard to understand the very large difference in results.

In my own experience in the use of shoulder belts, the comments I have received may shed some light on the real nature of the Swedish advantages. The real advantage appears to lie in the surprisingly greater public acceptance of the shoulder belt as a truly protective device. Many people have volunteered the comment as they have seen

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PUBLIC RELATION
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THE NEED

By C. B. LEMON
Dir., School Bus Safety,
New Mexico State Dept. of Educ
Santa Fe, N. M.

No program can be effective unless there exists a common understanding among the various publics involved. I know of no area where this need is greater than in school bus transportation. I do not mean to infer that progress is not being made, because it is, but the need to accelerate and expand means of communicating dictates that a great deal of effort must be exerted in this direction.

How often have we heard our school bus drivers rake other motorists over the coals for their failure to stop for a bus that is loading or unloading and how often have we heard other highway users complain about a school bus creating a hazard by attempting to stop traffic either at a hazardous location or in a dangerous manner

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loading and of pupils waiting for their bus can and does lead to strained relations unless there is a mutual feeling of cooperation involved.

Finding the best solution to these and other problems is a challenge to all of us. We feel that drawing upon the ability and experience of those assembled here this morning will point the way and will prove to be valuable to all of us.

AT THE LOCAL LEVEL

Moderator—R. L. Weber, Pres., Berea Bus Line Co., Berea, Ohio

I. Must create better communications between driver to students and to parents.

II. Must establish a code of ethics for bus standards. Buses considered a classroom.

III. Some cases the bus is considered the home room.

IV. Driver is idol of lower grade school bus students.

V. Driver is the only person the parent sees each day reflecting the image of the school system. Final a must, school bus must be considered reflection of the school system. Keep it clean and in A 1 mechanical condition.

VI. The driver must be well-traveled, build up to the higher standards to get recognition from the faculty.

VII. Able to cause his action at practice to be carried home from the bus student. Which means local level must have better selection and training of drivers to create better public relations.

AT THE COUNTY LEVEL

Moderator—Walter Gordon, Director, Transportation & Safety, Bd. of Education, Baltimore County Schools, Baltimore, Md.

There are two different types of county operation:

1. County responsible through a central office for all phases of [illegible]us operation.

2. School districts within a county are responsible for the details of operation and the county office serves as an advisory unit.

I. No matter which we are talking about, public relations is a most important part of each operation. Oftentimes, too little is done by the central office to help individual school districts build good public relations. Too often, the local school districts are too small to use all types of public relations media and the county headquarter should step in to help.

II. In a sense, the effectiveness of a public relation program can be judged by a number of problems, number of telephone calls, and number of letters of complaint received.

III. A good public relations program must start with the driver and be carried on by all employees, such as supervisors, principals, teachers, etc. All type of media for developing good public relations should be used, but at no time should there be anything but an ethical approach.

IV. Some things to keep in mind to develop good public relations on the county level:

A. Know you area, be prepared to talk when you answer the telephone.

B. Make communications brief, to the point, understandable.

C. Keep people informed, sell your idea before you put the idea into effect. Misunderstanding creates problems.

D. Be consistent.

E. Try to think up new ideas to keep people informed.

F. Get your story to both parents, not just to the mother.

G. Use special interest in human interest articles.

H. No problem, no matter how small, should be allowed to drop without consideration, and the person concerned should be duly notified.

In summarizing it was felt that the better the public relation program, the fewer the problems would arise.

AT THE STATE LEVE

Moderator—LaVaughn Hawkins, Director—State Dept. of Public Instruction, Indianapolis, Ind.

I. School bus drivers should be trained to be more considerate of the motoring public.

a. Teach school bus drivers proper "social graces" as a driver.

b. Some bus drivers have the attitude that the driver of other vehicles should always "give in" to the bus driver because he is driving the big yellow bus.

c. Most frequent violations by a school bus driver is the failure to yield right-of-way.

d. More emphasis should be placed on the fact that in many districts, school transportation is the only contact some school patrons have with the school.

e. The school bus driver is the key person in creating the proper image of the school.

II. Programs should be sponsored to better acquaint the motorist relative to school bus regulations and laws such as stopping law, etc.

a. Many parents of today never had the the experience of riding a school bus, consequently they are unaware of some of their responsibilities relative to school bus safety.

b. Solicit cooperation of groups such as state traffic patrols, AAA, PTA, etc., to help disseminate information relative to school bus safety.

1. Include this information in high school driver education courses.

c. Some states have expanding committees working on revision on school bus rules and regulations and establishing programs to obtain wider publicity relative to matters effecting the safe pupil transportation.

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AT THE NATIONAL LEVEL

Moderator—Forrest R. Noffsinger, Training Div., The Traffic Institute, Northwestern University, Evanston, Ill.

I. Legislature seminar sponsored by President's Committee on Safety Legislation.

II. Conferences — national and local for women on safety.

III. Education report of President's Committee for highway safety includes recommendations for action on state and local levels.

IV. Front door service demanded by parents.

A. Cause may be by people moving from city to rural areas.

B. Not getting the message of the cost over to the parents. (Multiple stops.)

C. Take parents on run, show them the problems.

D. Bus driver lacks community status.

1. Needs recognition by community.

V. Through the PTA, NEA, Association of School Administrators, etc. on a national level, sell a national message on school bus transportation.

A. Message.

1. Front door service. (A half mile long)
2. Status of school bus driver.
3. Qualifications for all drivers.
4. Selection and training of drivers.
5. Inspection of buses; daily by driver, more often on major items.
6. Training courses not only for drivers but also for supervisors, mechanics, and all people involved, (getting state funds for this).
7. State specifications on buying new equipment but problem is maintaining this equipment and discarding when worn out.
8. Uniformity of specifications.
9. Uniformity of legislation.
10. Uniformity of operating procedures.
11. Emphasize enforcement of laws.

VI. The group recommends that the Executive Committee of the School Transportation Section form a committee to draft these messages and relate them to the various national agencies stated.

THE NEED FOR DRIVER SELECTION AND TRAINING

By JOHN M. PARSONS
Supvr. Pupil Transportation,
State Dept. of Education, Columbus, Ohio

Someone, far wiser than I, once said that man *is* an intelligent animal, he knows all the answers, but most of his troubles are the result of his not knowing all the questions.

Before we begin our discussion of the subject at hand, it is my understanding that I am to try to propose some of the questions relative to the need for driver selection and training. Therefore, I will concern myself with the *why* of the subject and leave the *how* of it for the discussion groups.

Let us examine the subject: *The need for driver selection and training.* Do we need it? What purpose will it serve?

We must remember that we offer a public service, paid for by public funds. Therefore, the public deserves an honest answer to these questions, and many more that are certain to be asked. Will a program of driver selection and training be worth the cost and effort expended to produce it, or will it just be busy work to further burden the cost of public education?

Another question comes to mind. Will such a program contribute to the general educational process? Still another question, will the program improve the public understanding of the efforts of all others working in the field of public education?

I ask these questions because they are at the core of the success formula of any public venture. The public must understand the need.

Now let us get at the specific reasons why driver selection and training is necessary. I have organized these reasons under the four general headings:

(1) Changes in the school transportation structure, (2) Changes in highway traffic, (3) Changes in the bus driver, and (4) Changes in public attitude.

I. Consider the school bus itself. Not too many years ago the bus was simply a truck that anyone could drive. Today it is a complex mechanism that requires a skilled operator. Next, we should realize how the size of the school bus fleet has grown. Today it is not the four- or five-bus operation of the small rural school to be run by dependable farmer-drivers of a few years ago. It is a big operation that may involve forty or more buses and drivers. These drivers may drive three or four routes, make five or six round trips each morning and evening, or even noon runs.

The modern school bus time schedule would dismay the old time driver. Today with dual and triple scheduling, a driver may be required to serve three or four buildings on a schedule that is as close as three minutes in leeway. Today our buses travel twice as fare and over routes that were unheard of in length not too many years ago. The consolidated school districts of today may stretch out over hundreds of square miles.

In the vast territory of the modern school district are students that, in days gone by, walked to school. They live in small towns and suburbs all over this nation, thus multiplying the numbers to be transported by leaps and bounds. Numbers and size cannot only be applied to the growth of the physical aspects of the structure of transportation, but also to the increase in cost of operation.

Probably the area of growth most apparent to the public is cost. The taxpayer is painfully aware that operating a modern school costs n
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of utmost importance. The driver of today will have more supervision of his job activities, and is required to file more detailed reports as well as work closely with others in the educational endeavor.

The changes in the bus driver calls for more selection and training. The changes will have a great bearing on the success of the transportation program and those in charge of its administration. Let me repeat the changes in the driver: number of drivers, type of drivers, mobility of drivers, other work of drivers, morality of drivers, health of drivers, and supervision of drivers.

IV. *Changes in Public Attitude*—It need not be repeated that the public is tax conscious; but what does this imply? It means that the public wants to know how the dollar is expended, and why. The public wants to know how the educational program can be made more effective and efficient.

Another change can be found in the publicity given to events in school transportation. Front page articles in newspapers are becoming more commonplace.

Along with the growth in school transportation is a growing demand for more service. The public demands service that was unknown years ago, and this service is costly. How shall we provide the necessary service at a reasonable cost, and what is necessary and reasonable?

These questions contribute to another change in public attitude and opinion. It is the lack of a general understanding of the educational problem and particularly the transportation problem. It is my belief that all four of these changes require driver cooperation to the fullest extend. If this cooperation is to be had, driver selection and training will be necessary. It will be necessary to have the driver's help in meeting the challenges presented such as public attitudes, tax consciousness, publicity of transportation problems, service demands, and lack of understanding of the program for pupil transportation.

The need is certainly evident for improvements in the selection and training of school bus drivers, particularly when we analyze the changes that have taken place in our transportation structure, highways, drivers, and public attitude toward the total program.

LOCAL LEVEL

Moderator—Daniel G. Wisotzkey, Dir., School Transportation, Boulder Valley Schools, Boulder, Colo.

Work Shop Session on Selection and Training At the Local Level

I Selection

A Types of test used

1. American transport test (*multiple choice*)
2. Local safety council may offer aid in testing
3. Road test is important to employer
4. Interviewing testing driving

B Factors important in selection

1. Driving record most valuable
2. Personality
3. Economics Status
4. Interest
5. Need
6. Community Status

C Source of Drivers

1. Transit Drivers
2. Housewives (suburban areas)
3. Men (rural areas)
4. College students

D Lack of personnel in many areas hampers the program of selection since people are not available to drive buses

E To improve this condition it is important to put up the status of the drivers by selection, testing and perhaps even uniforms

F It is necessary for the local districts to have a uniform method of selection and this should come from the county or other higher administrative units.

II Training

A One representative discussed testing program consisting of 20 hrs. behind the wheel, 8 hrs. in class and in-service training.

B One discussed license requirements and a driving test with the bus.

C Local conditions require specific training in certain areas and should involve as many interested persons as possible

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COUNTY LEVEL

Moderator—J. B. Littrell, Dir. School Transportation, Office of County Supt. of Public Instruction, Dallas, Texas.

Work Shop Session on Selection and Training At the County Level

I All training programs discussed had the following:

A A lively discussion developed on preventive maintenance and its relation to women drivers. Some were of the opinion that women excelled in observing the clue that indicated the bus needed minor repairs, thus in many cases eliminating major ones. Others did not share this opinion.

B Drivers are encouraged to make suggestions as to what they desire to be included in a training program to help improve the quality of driving in their county.

C All representatives included a section on laws and regulations in the training of drivers. There would be some variations here depending on the different states.

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STATE LEVEL

Moderator—Charles F. Morris, Specialist in Transportation, State Department of Education, Tallahassee, Fla.

Selection and training is necessary, but how do you go about it?

A report by Chairman Morris of a 1959 study "Requirements and Training Program of School Bus Drivers" indicated that 39 states had some form of training on the state level while 11 had no training at all. Twenty nine states had school bus training programs sponsored by the State Department of Education and 10 states by other state agencies.

States represented at this meeting briefly explained their program of school bus training.

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5. It seemed to make no difference whether a district owned the buses or the children were transported by contract haulers, training was necessary.

In the area of training, the following needs were mentioned:

1. Training films or filmstrips dealing strictly with school bus transportation should be developed. At the present time only films on general truck operation are available. Since conditions and rules change from state to state, a filmstrip might be the best training aid.

2. When state level training is conducted, it should be followed up at the local level.

A report by Mr. Morris indicated that one state allowed a 15-year-old person to drive a bus and 39 states had no age limit. Group discussion followed with agreement that it is hard to place an age limit on bus drivers as people differ with age. Examinations were important in selection of drivers, especially as they grow older.

A study revealed that 15 states do not require a physical examination.

Recommendations made were:

1. Driver license check should be made through motor vehicle division.

2. Finger print of all drivers checked through the FBI.

3. Complete physical examination each year, and, in some cases of older drivers, twice a year.

4. A special test designed for bus drivers and a special license issued for school bus operators.

Recorder—George H. Hollis, Regional Supervisor, Traffic Safety Division, Arizona Highway Department

NATIONAL LEVEL

Moderator—Harry D. Fletcher, Fleet Training Specialist, Pennsylvania State University, University Park, Pa.

I. *Selection*

A. It was suggested that national groups give serious consideration to the design and construction of various types of written tests for school bus operators.

B. It was also recommended that national organizations should make funds available for the design and construction of these tests.

II. *Training*

A. The National Vocational Education Association should be contacted in reference to their developing course outlines in the area of school bus driver training. A number of state vocational educational departments already have outlines, however, an attempt to develop an outline for national use should be considered.

B. Consideration by national groups should be given to an award program to recognize fleets for their accident prevention activities.

C. National groups should consider the possibility of a national school bus rodeo.

1963

Volume 25

National Safety Congress Transactions

WOOD PRODUCTS; TEXTILE INDUSTRIES

NATIONAL SAFETY COUNCIL
425 N. Michigan Avenue
Chicago, Illinois 60611

51st NATIONAL SAFETY CONGRESS

Papers delivered in the

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Summary

We have tried to state briefly here, by the help of movies and verbal explanation, the impact which moving material on a film of air can have in your manufacturing operations. I would also like you to keep in mind that you can transport your materials not only in your own p
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A CASE FOR OFF-THE-JOB S

By C. L. HENKEL
Safety Supvr., E. I. du Pont de Nemours & Co., Kin

I have served the Textile Section of the National Safety Council as a member of the Off-the-Job Committee for several years and as chairman for the past two years. When I became chairman of this committee, I contacted the National Safety Council to find out how many members of this section were active in off-the-job safety and reported their off-the-job injuries to the National Safety Council. It was surprising to learn that very few had active off-the-job safety programs and that only three were reporting off-the-job injuries to the National Safety Council.

Now, the reporting of off-the-job injuries to the National Safety Council is not important in itself, but any industrial organization that submits these reports quarterly is aware of the magnitude of the off-the-job safety problem. This is actually the starting point for an off-the-job program. Getting off-the-job injuries reported, analyzed, and classified as to cause is basic because it highlights the magnitude of the problem and shows where to place emphasis in order to make the greatest improvement.

The problem on a national scale is that there are about 9.5 million disabling and fatal accidents occurring annually. Less than two million of these are work accidents, which leaves 7.5 million or almost three out of every four that are non-work accidents. These figures indicate that each year one out of every 18 persons suffers a disabling injury. The total cost of accidents is estimated at $14.5 billion a year, of which about $4.5 billion is lost in work accidents. This leaves about $10 bill
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they cost the Du Pont Company and the Kinston plant. However, again referring to the National Safety Council figures, an estimate of the economic loss from off-the-job injuries to workers, in only one year, was $3,500,000,000. Other than this tremendous economic loss which you and I actually pay for in increased insurance premiums and increased cost of the products we buy, one must consider the contributions the people killed in accidents might have made to the progress of their companies.

For example, one of our fatalities involved two young technicians who died in a boating accident. Both might have contributed greatly to the Du Pont Company, to the communities in which they lived, and to the over-all welfare of our country. The other seven fatalities in the ten-year period at our plant were due to automobile accidents.

Whether you look at it on a national basis, a company-wide basis or a local plant basis, the problem is still tremendous and the time is long past due for taking action.

There has not been much improvement over the past three or four years with respect to reporting off-the-job injury experience to the National Safety Council, and I find it hard to believe that the safety people do not recognize the problem or are completely ignoring this important phase of a total safety program. However, there is probably considerable apathy or inactivity in off-the-job safety because:

1. Management does not realize the importance of an off-the-job program to the over-all operation of an industrial plant.

2. Management does not know what, when, or how to get an off-the-job safety program started.

3. Management believes that industry should not concern itself with employee activities while away from the job.

Whatever the reason at your particular plant or location, each of you as a safety representative has an obligation to your company, your community, your employees, and to yourselves to do everything in your power to promote off-the-job safety.

Why do you have an on-the-job program at your plants? There are two basic reasons for any safety program.

First, it is humanitarian, it eliminates suffering, it creates a feeling of security, it promotes good will in the community, and it means that your employees can live happier, fuller lives.

Second, it is just plain good business. Injuries on the job cost money and must be added to the cost of the product. In these days of high competition, it is important for all of us to keep costs as low as possible. So we must eliminate the medical expenses, lost time, and hidden costs of injuries.

What, then, are the reasons for an off-the-job program? They are exactly the same as for an on-the-job program; namely, it is humanitarian and eliminates suffering, it creates a feeling of security, it promotes good will in the community and means that your employees can lead happier, fuller lives. It is just plain good business. Injuries off the job also cost money. It means relief personnel must be available. It means additional training. It means increased hospitalization and wage disability costs. It means increased insurance costs, and also it places additional burdens on supervision.

In addition to the two basic reasons for having a safety program, there are two other reasons why I think an off-the-job program is a must, namely:

1. Integrating, instituting, or incorporating off-the-job safety into your current on-the-job program makes the safety program complete. You are attempting to reach the whole man all the time, and not just during his working hours when he is performing controlled operations in a controlled environment.

2. By promoting off-the-job safety among our employees and promoting safety in the community, I am helping to protect my family and friends from an accidental injury caused by someone else. This applies particularly to automobile accidents. Many that have occurred to our employees have been the fault of another driver.

The Du Pont company instituted an off-the-job safety program in 1953, so we have had a total of 10-years' experience in off-the-job safety. The Kinston plant started up early in 1953 so all of our experience has been with a complete safety program.

In this time, we have adopted the method recommended by the National Safety Council for classifying off-the-job injuries. An off-the-job lost-time injury is any injury that occurs outside the course of employment

which requires loss of time from the job of one day or more or results in some permanent loss of function. Also, we follow the National Safety Council's requirements on calculating off-the-job exposure hours which are as follows:

The total off-the-job exposure hours are calculated on a monthly basis by multiplying the number of employees on the roll at the end of the month by 312 hours. The 312 is arrived at by considering the "active" off-the-job hours of a five-day work week (eight hours per day) plus active hours of two rest days (16 hours each). This gives (40 + 32) 72 off-the-job exposure hours per week which, when multiplied by 4⅓ weeks per month, gives the 312 hours per employee per month. It is realized that exposure hours vary because of vacation, overtime, temporary employees, unusual working schedules, and normal fluctuations of employment. These variations tend to balance and much clerical work can be saved and a uniform system established by using the 312 hours.

The frequency rate of off-the-job injuries can then be calculated in the same manner as on-the-job frequency, namely, by multiplying the total number of off-the-job injuries by one million and dividing by the total off-the-job exposure hours.

Now that we have discussed the reasons for an *off-the-job safety program*, the tremendous problem of off-the-job injuries, the reporting, classifying, and calculation of off-the-job exposure hours, I would like to review the off-the-job injury experience of the Du Pont Company and the Kinston plant for the past 10 years.

Our experience has enabled us to make various charts based on the company and plant records.

One of our charts is for the Du Pont Company as a whole and shows the total frequency rate, the frequency rate for injuries experienced in automobile accidents, and the frequency rate due to falls. The frequency rates for automobile accidents and falls were broken out because these are the two major causes of off-the-job injuries. It should be noted that the total frequency rate for this 10-year period first showed a consistent decrease and then after reaching a low in 1958, there has been a trend in the wrong direction. However, over this same period of 10 years, for the same emplo injuries experience .30 or a 51 per cen range trend with cidents company-w provements althou slight. However, t year over the pre trend with respect over this 10-year above automobile a

Another chart s rates for the Kinsto the-job frequency injuries experience and the frequency over-all trend wit injuries at the Kin sistent improvemen even though there (1960 and 1961) w reverse itself. Last history. This year same trend is true cidents are concern dramatic as the ov to falls, the trend a same as it is on a c major non-work falls are increasing.

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h respect to off-the-job
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few years back. We had an employee shoot off his big toe when his draw wasn't as quick as his trigger finger. This also occurred at another plant in the company just recently.

2. An employee lost time due to an eye injury when he struck himself in the eye with his belt. He was removing his belt rather vigorously to discipline his child and hit himself in the eye.

3. Another odd eye injury occurred when the shaving lather in an aerosol can came out in copious quantities and got in an employee's eyes. This was not "lazy lather."

4. This is one that I read about recently. A driver drove his small foreign make car into a filling station and naturally enough he needed some gas. The attendant not knowing exactly where the gas tank was started to put it into the radiator and actually did put some in. When attempting to start the car to move it to another location in order to drain the radiator, it caught on fire and one person was burned.

How many times have you seen attendants putting gasoline in cars while smoking a cigarette?

I would also like to relate a personal experience that occurred in my family over the past twenty years. I have four children between the ages of 21 and 11 and since 1940, there has been only one accident which required hospitalization although there have been two serious falls. One did not result in hospitalization.

The experience occurred to my wife. Several years ago we were living in a two story house in Wilmington, Del. As you know, women have a tendency to rearrange the furniture periodically. On this occasion, my wife had rearranged the furniture in the bedroom. Sometime during the night one of the children called out and she got up to see what the trouble was. She did not turn on a light. However, in going from the bed to the children's room, she made the turns that she was accustomed to making prior to the rearrangement of the furniture. However, this time the turns took her to the head of the stairs and she fell the complete length of the stairway. Fortunately, she was not hurt seriously. She had a banged up knee and a broken nose but was not hospitalized. The moral of this accident is "don't let your wife rearrange the furniture," (How can you stop her?) or make sure a light is turned on before moving around at night.

It might be well at this point to outline what needs to be done to get an off-the-job safety program started.

1. As I mentioned earlier, you must know what your problem is before trying to solve it. This can be determined by instituting an injury reporting system at your location. I would suggest you follow the National Safety Council's recommendations.

2. After determining your problem and the magnitude, you must sell your management on the importance of an off-the-job safety program.

3. You must incorporate an off-the-job program with your present safety program. I would strongly advise against trying to have two separate programs.

4. Sell off-the-job safety to your employees the same way as you sell on-the-job safety. Use every means available — safety meetings, safety contacts, safety literature, safety films, etc. This requires extra teaching, training, and the development of safe attitudes, since when your employees are away from the job they must rely entirely on themselves, as they are not in a controlled environment and what they do is not supervised.

5. Encourage employee participation the same way as you do with your on-the-job safety program.

6. Encourage your employees to participate in community safety meetings. There are many organizations which are willing to carry out safety projects in your community if they just know how to do it.

7. This to me is the most important point with respect to improving safety in the future. Safety improvement will come through education of all people with respect to the safety hazards that they encounter day to day and how to avoid injury when the hazards are encountered. It must involve our educational systems from kindergarten through college. It is impossible to completely remove all the hazards, so through education, we can build safe attitudes which will help people avoid injury.

With respect to education, the National Safety Council publication, "Family Safety," is an excellent magazine for use by em-

ployees. We distribute a copy to each plant employee. It has been well received and contains worthwhile articles on home safety. With respect to the magazine, I would like to quote from a recent National Safety Council publication "The Family Safety Story," which describes the phenomenal growth of this publication.

First, I would like to quote J. S. Queener, manager of the safety and fire protection division, E. I. du Pont de Nemours and Co., Inc., who says "The emphasis on non-work injuries apparently creates a favorable state of mind which carries over to an individual's safety performance on the job. . . . This, we believe is what largely accounts for the 50 per cent reduction in company injuries since 1952" (when the firm's off-the-job safety program began).

Secondly, I would like to quote Alan Kling, director of loss prevention, Olin Mathieson Chemical Corporation, who says: "When considering off-the-job safety, most people visualize information flowing from the plant to the home. Frequently it flows in the opposite direction. The hazard of battery acid can be translated to large-quantity use in the plant. The skull and crossbones on the can of lye used to clean the drain in the kitchen sink emphasizes the precautions necessary when handling caustics on the job. A basic understanding of danger can be the found job safety knowle

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SAFETY PROGRAM IN A M FINISHING PLANT

By R. P. TIMMERMAN
Vice Pres., Graniteville Co., Graniteville, S

The Graniteville Company has always believed in providing adequate safety facilities for its employees, because these employees are certainly our most valuable asset.

I am sure that many are familiar with a finishing plant operation. We must realize that this operation contains many potential hazards. We operate lift trucks throughout our plant and warehouses; we consume vast amounts of both propane and natural gas; we handle numerous corrosive and inflammable chemicals s rine, peroxide an we use millions of much of this stean sure—and this cr hot weather. Pow plant under high v of machines used be properly guarded

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