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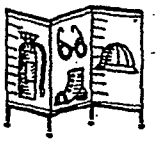
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Basics of Industrial Safety

THE JOB SAFETY ANALYSIS

By F. R. BARNAKO
Manager of Compensation and Safety
Bethlehem Steel Company, Bethlehem, Penn.

What is a job safety analysis?

It is a procedure that identifies the hazards or potential accidents associated with each step of a job, and develops solutions that will either eliminate or guard against such hazards.

What is a job? A job is a sequence of separate steps or activities that together accomplish a work goal. Hooking up a lift, tapping a furnace, setting a deck plate—all are jobs. So is operating a coal-cutting machine. All of these jobs involve a series of separate steps.

A job can also be defined very broadly in terms of what is accomplished. Making steel, erecting a bridge, building a ship, mining coal are also jobs, but are too broadly defined to be suitable for a job safety analysis because they are too complex.

A job can also be defined very narrowly in terms of what gets done. Driving a nail, turning an ignition key—but they are too narrowly defined to be suitable for a job safety analysis. How, then, do you define a job suitable for a job safety analysis?

A simple definition is: those job assignments that a line supervisor may make. Line supervisors do not assign men to make steel, erect bridges, build ships. Nor do they, as a rule, assign men to drive a nail, pull a switch, or turn an ignition key.

They do assign men to repair a machine, tap a furnace, set roof bolts, weld plates, or operate coal-cutting machines. Such jobs are the subjects of job safety analyses. They are neither too "big" nor too "little."

A job suitable for job safety analysis then consists of a series of steps that, together, accomplish a work goal within the scope of a line supervisor's responsibility.

A job safety analysis program is an organized effort to develop an *up-to-date* J.S.A. for every job; to use the finished J.S.A. for training purposes, and to employ it in the enforcement of safe job procedures.

Four basic steps to a job safety analysis are:

- Select the job to be analyzed.
- Break the job down to be analyzed.
- Identify the hazards and potential accidents.
- Develop ways to eliminate hazards and potential accidents.

Let's discuss these steps one by one.

A. Select the Job to Be Analyzed

The responsibility for selecting the jobs to be analyzed belongs to top departmental supervision. The selection of and the order in which jobs are analyzed will influence greatly the benefits to be gained from a J.S.A. program.

Some jobs are definitely more hazardous than others and have a worse accident history. Those jobs that are the most hazardous should have priority. Then the jobs involving less serious hazards can be dealt with. The following factors should be considered in selecting jobs to analyze, and in establishing the order of analysis:

1. Frequency of past accidents. Any job that has repeatedly produced accidents is a candidate for a job safety analysis. The greater the number of accidents associated with a job, the greater is its priority claim for a job safety analysis.

2. Frequency of disabling injuries. Jobs that have produced disabling injuries are a "must" for the J.S.A. Where there is this history, a J.S.A. is called for, because the injuries themselves prove that past action to prevent recurrence has not been successful.

3. Severity potential. Some jobs may not have a history of accidents but may, at the same time, have a potential for severe injury. The opinion of supervision that a job

has this potential should be sufficient to require a J.S.A.

4. The new job. Changes in processes, equipment, and machinery create new jobs or change jobs from time to time. Such jobs have no history of accidents, and their accident potential may not be fully appreciated. Hence, job safety analysis should not wait until there are accidents or even near-misses. A J.S.A. of any newly created job should be made at once. The analysis will reveal the accident potential of the job.

Use of the four factors just discussed will yield the quickest possible return from a J.S.A. program.

B. Break the Job Down into Successive Steps

Before the search for hazards begins, the job should be broken down into basic steps which describe what is done, and in what order, without going into the details of how each job step is done. Here is an example of a step-by-step breakdown of a very simple job—planting a tree.

- Select the site.
- Bring tools and equipment to the site.
- Dig the hole.
- Prepare the hole.
- Put the tree into the hole.
- Backfill, tamp, and water.
- Brace the tree.
- Clean up and return equipment.

Notice that each step is a generalization. Details are omitted. Hazards are not mentioned. Precautions are not described. Notice that each step begins with a "do" word: select, dig, prepare, put, etc. Notice also that the steps are given in their natural order of occurrence.

Two common errors are made in breaking a job down into its basic steps. One is to make the job-step breakdown too detailed, resulting in an unnecessarily large number of job steps. The other is to make the job-step breakdown too general, in which event important basic steps go unrecognized. Using the same job just discussed here is an example of a breakdown that is too detailed.

- Pick up the shovel.
- Position the shovel so that it points down.
- Place right foot on top edge of shovel blade.
- Press shovel down into ground.
- Tilt shovel backward to pick up dirt.

Again, a breakdown that is too general would be:

- Dig the hole.
- Plant the tree.

While the steps in this last example sound natural, they don't tell the whole story. The second step is too general. It omits basic steps of the job. Since the main reason for breaking down a job into basic steps is to concentrate the search for hazards on one step at a time, omitting basic steps runs the risk of overlooking hazards associated with each step. When that happens, the J.S.A. is weakened.

The reasoning applied to the simple job of planting a tree applies to all industrial jobs. The job must be broken down into "natural" basic steps.

C. Identify the Hazards and Potential Accidents

When the job has been broken down into basic steps, each step is analyzed for the hazards and potential accidents that may be associated with that step. The purpose is to identify all hazards, whether they are part of the job environment or are hazards directly connected with the job procedure.

While analyzing each job step no attempt should be made to develop solutions. Doing so interferes with spotting hazards and potential accidents.

D. Develop Ways to Eliminate Hazards and Potential Accidents

When the hazards and potential accidents associated in each job step have been identified, and their causes are understood, the next step is to develop ways to prevent their occurrence through:

- A better way to do the job.
- Change of job procedure.
- Environmental changes if procedural changes are insufficient.
- Methods which will enable the job to be done as infrequently as possible.

There are several methods of preparing a J.S.A.:

1. By Observation—In this method the su-

pervisor watches a man he selected to do the job.

2. By Discussion—Here a group of supervisors familiar with the job discuss the job steps, each one drawing on his own experience, and develops solutions.

3. Recall and Check—The supervisor from recollection makes a J.S.A. and then by observing the job and discussions with men and supervisors, checks his solutions or changes them as indicated.

Any one or a combination of these may be used. Numbers 2 and 3 are particularly adaptable to those jobs which are done infrequently or which are difficult to observe personally.

We feel there are proven advantages to doing J.S.A.'s by the observation method and that it is the best method. Let's review the steps of this method and discuss a few of the details.

A. Break the Job Down into Successive Steps:

1. Select the right man to observe. He should be experienced, cooperative and willing to express his ideas. All these make it easier to work with him on the analysis.

2. Brief the man on the purpose. Explain what is to be done. Reassure him that the only reason for observing him is to study the job, not him, and that he was selected for observation because of his experience and capability.

3. Observe the job for basic step breakdown. What's the first basic step of the job? What starts the job? What's the next basic step? What is done next? The steps should not be too "narrow" or too "broad."

4. Check breakdown. Check the breakdown with the man being observed. Get his agreement on what is done (not how it is done), and the order in which the steps are taken.

5. Record the breakdown. After observing the job and checking the job-step breakdown, record the basic steps (on the J.S.A. worksheet).

Each job step is written in brief terms so that it describes what is done, not how. Each job step should begin with a "do" word, like remove, replace, weld, revise, open, install, reset, hoist, and so on, and describe the thing to which it applies; for example, remove extinguisher, replace gear, weld seam, remove shaft, open valve, and so on. Record the job steps.

To summarize, the following is the method for breaking the job into basic steps:

- Select the right man to observe.
- Brief him on the purpose.
- Observe the job for basic step breakdown.
- Check the breakdown with the man.
- Record the breakdown.

B. Identify Potential Accidents Associated with Each Job Step

When carrying out this step of the J.S.A.:

1. Brief the man on the purpose. He is again going to be observed doing the job. Perhaps a day or so has intervened since the last observation. Explain that this time the purpose is to identify hazards and possible accidents. Let him know that the results will be checked with him.

2. Look for specific type of potential accidents. Don't look for potential accidents in general. Look for specific types of potential accidents. The best way is to study the job step for specific hazards. For example, "Can a man be struck by, or contacted by anything while doing this job step?"

After recording all such potential accidents, then study the job step with other questions in mind: such as "Can a man strike against anything? Can he be caught in, on or between anything? Can he fall in any way? Can he expose himself to gas, heat, harmful rays, etc.?"

Such questions should be asked, when applicable, at each step of the job and continued as often as necessary until all important potential accidents have been identified, and observation plus prior knowledge of the job should supply the answers.

The advantage of studying a job step in this way is that there is less likelihood some important possibility will be overlooked. It is a systematic way to identify hazards and potential accidents.

This is not the time to consider how to prevent the potential accidents. At this point, concentration should be entirely on finding hazards and potential accidents.

3. Record the potential accidents immediately. While observing, the hazards and the

agent that might result in accidents should be recorded or at least recorded immediately after the observation.

The potential accidents in each step are then recorded using the same number as the job step involved.

4. Discuss potential accidents with the man observed, and with others. Check with the employee observed after recording the potential accidents at each step of the job. His experience may reveal some ideas that might never occur to anyone observing the job.

In addition, check with others who have had long experience with the job.

By alternately observing the job and discussing the hazards and potential accidents with men of experience, a good list of things that could happen on each step of the job will be developed.

In summary, to identify potential accidents:

- Brief the man on your purpose.
- Observe for specific types of potential accidents.
- Record potential accidents immediately.
- Discuss results with the man observed, and with others.

C. Develop Solutions for Potential Accidents

When all of the accidents that might possibly occur have been recorded, the last step of the J.S.A. is developing solutions for the potential accidents. The key points to follow are:

1. Study job revision first—find a new way. Before developing numerous solutions for the potential accidents associated with the job, find out whether there is not an entirely different way to do the job that will eliminate the hazards. Give thought to work-saving tools and equipment. Focus on the work goal of the job.

2. Study procedural changes—find a better way. If there is no alternative to the established way, develop procedural solutions for each potential accident.

Review the list of potential accidents associated with each job step. For each potential accident recorded ask: What should the man do, or not do, to avoid the accident? How should he do it? If a procedural solution is not satisfactory, then further study is needed of that step.

The recommended safe procedure that should be followed to avoid a particular accident must be specific. Don't use such phrases as "Be alert," "Use caution," or "Be careful." They do not state what to do or how to do it. Generalities have no place in a J.S.A.

For example, let's compare two precautionary statements regarding wrench slippage. Does this statement really tell what must be done to avoid wrench slippage? a. "Make certain wrench does not slip and cause loss of balance." How about this one? b. "Set wrench securely. Check wrench grip by exerting a slight pressure. Take a solid stance with feet wide apart before exerting full pressure, so that you don't lose balance if the wrench slips."

3. Study environmental changes if procedural changes are not satisfactory. The solutions or safe procedures as developed may not be entirely satisfactory. Check the potential accidents in which the change in procedure isn't actually a solution because it does not offer the full protection desired. Then, try environmental changes as a solution. For each potential accident, ask this question: What change in the job environment, such as a change in tools, materials, equipment, or work area, will prevent this accident? Here is an example:

Job: Man working inside large ingot mold seated in a bosun chair suspended from overhead crane. Hazard: Possibility that crane may be bumped, causing man in chair to be slapped against side of mold. Correction: Fabricate working platform; set it inside mold; provide access to platform; properly identify job and semi-isolate mold. Result: Hazard eliminated, job worked smoother, and overhead crane released for other shop movements.

Here is a second job. A ladle of steel rigged for tilting in order to pour the metal. The problem here was that the groundman was exposed to a falling hazard as well as a splash hazard when he went in to hook up on the left side.

When the procedure was changed to hooking up on the right side, the original hazards were reduced, but a new one was introduced. The man now had to lift and engage a heavy hook in the lug of the far, or right, side.

While studying this situation for a solution to finger pinch points, splash of metal hazards, etc., it became apparent that a design change in the tilting mechanism was indicated.

A counterbalanced off-set hook was designed to rest in position on the ground. The crane block hood was equipped with a latch to prevent its swiveling.

The craneman now performs the entire series of steps without anyone on the floor being exposed to hooking up the ladle.

When an environmental solution appears possible it should, of course, be discussed with higher supervision along with the other benefits to be derived, such as less time or effort required to do the job. Of course, where the foreman has the authority to make the change, he should make it, if thorough consideration convinces him that it will improve job safety.

4. Consider changes that may reduce the frequency of repair and service jobs. Repetitive repair and service jobs are done because a condition needs to be corrected. For example, machine parts become worn and need to be replaced; equipment becomes clogged and needs to be cleaned out; lubricants are used up and have to be replaced, and so on.

If the condition can be prevented or can be made to occur less frequently, the job of correcting the condition will need to be done less frequently.

Study the condition that may be corrected by the remedy under consideration. What causes the condition? Can anything be done to eliminate or reduce the causes of the condition? If not, can anything be done to retard the condition itself?

Here are some examples of answers to such questions: Correction of excessive vibration increased the life of a part, thereby reducing the frequency of replacement; improved filtration in a piece of equipment reduced the number of cleanouts needed; a longer-lasting lubricant reduced the need for frequent hand lubrication of a machine; a barrier erected to protect equipment from vehicles prevented frequent damage.

5. Check the solution by reobservation and discussion. All procedural solutions should be checked by reobserving the job and discussing the proposed recommended safe job procedures with some of the men who do the job.

Where practical, group discussion of the J.S.A. with several of the men is suggested. Get their ideas about hazards, and especially about the proposed solutions. See whether they agree that the proposed safe procedures are practical. Ask for their suggestions for improvement in the things proposed.

Copies of a J.S.A. should be made available to all supervisors whose men do the job analyzed. If a J.S.A. is readily available, it is more likely to be used.

The major benefits of the J.S.A. come after its development. First, however, a word about the benefits to be gained from the development work itself.

As a result of doing J.S.A.'s, supervisors learn more about the jobs they supervise. Employees' safety attitudes are improved when the men themselves are encouraged to participate in the development of J.S.A.'s; moreover, the men learn more about job safety because of their participation. Safer and better job procedures and safer working conditions are developed as a J.S.A. is put together.

Yet these important benefits represent only a portion of the total benefits to be gained from the J.S.A. program. The principal benefits come from using the J.S.A.

The J.S.A. should be used in these phases of the supervisor's work:

A. Instruction of Employees

When a J.S.A. is distributed, the supervisor's first responsibility is to explain the contents to employees and to see that they receive any necessary instruction. The entire J.S.A. must be reviewed with the men concerned so that they know how the job is to be done in the future. It is from this point on that men are expected to follow the recommended safe procedures of the J.S.A.

B. Employee Safety Contacts

After employee instruction, the J.S.A. should be used for planned safety contacts. All steps of the J.S.A. should be used for this purpose, although emphasis should be placed on those steps which are concerned with major hazards or serious potential accidents. Past accident experience usually indicates which steps these are, and they should be emphasized again and again in safety contacts.

C. Instructing the New Man on the Job

Men move into jobs that they have not previously done at all, or that they have not done frequently. They must be trained in the basic job steps; they must be trained to recognize the hazards associated with these steps, and must learn the precautions to take against such hazards.

Where the job is covered by a Job Safety Analysis, the J.S.A. should be used for this training; there is no better guide.

D. Preparing for Planned Safety Observations

A supervisor should observe his men doing jobs for which J.S.A.'s have been developed. The purpose of these observations is to determine whether or not the men are doing the jobs in accordance with the safe job procedures of the J.S.A.'s.

Before making observations, the supervisor should prepare himself by reviewing the J. S. A. in question. A thorough review will help him develop the key points that he is going to watch for.

E. Giving Prejob Instructions on Irregular Jobs

Many jobs are done infrequently or on an irregular basis—certain repair and service jobs, for example. The men who do them will benefit from prejob instruction that reminds them of important hazards and necessary precautions. The supervisor should do this instruction at the time he makes the job assignment.

F. Reviewing Job Procedures after Accidents

Whenever an accident occurs on a job covered by a Job Safety Analysis, the J.S. A. should be reviewed to determine whether it requires revision. If the accident could have been prevented by following the recommended safe job procedures, the J.S.A. usually requires no revision.

When an accident results from failure to follow J.S.A. procedures, the facts should be used as a topic for a general safety contact with all men who do the job. Attention should be drawn to the fact that the accident would not have happened had the J.S.A. been followed.

If this review after an accident results in a revised J.S.A., the revisions should be the subject of instruction for all employees concerned with the job.

G. Study Jobs for Improvements in Job Methods

All supervisors are concerned with improving job methods to increase safety, cut costs, and improve productivity. The J.S.A. is an excellent starting point for questioning the established way of doing a job.

Studying the J.S.A. is a good way to stimulate ideas about improving job methods. Tools, materials, equipment, specific procedures—all these can be studied in terms of better alternatives.

Of course, higher supervision should help guide and control a departmental J.S.A. program by:

- Selecting jobs to be analyzed
- Establishing a timetable for J.S.A. completion
- Assigning J.S.A. work to supervisors
- Checking progress of J.S.A. work assigned
- Providing individual guidance to supervisors
- Reviewing J.S.A.'s submitted for approval
- Arranging for distribution of J.S.A.'s
- Arranging for systematic review of J.S.A.'s

FACE TO FACE TRAINING—HOW TO PUT IT OVER

By A. H. MALO, Ph.D.
Resident Psychologist, Kemper Insurance Co., Chicago

Our primary concern in this presentation is with the manner in which the individual worker is to be handled in a face to face relationship with his foreman, supervisor, superintendent or other representative of management. We will, therefore, direct our remarks to what can be referred to as the individual safety approach rather than the group safety approach which takes place at meetings and which involves speakers, audio visual aids, demonstrations and group discussions.

Our main question is: What motivates a man to perform safe acts habitually? In other words, what is it that makes a *man* do *the things that he should do* in order to keep from hurting himself and others, from damaging property, and from raising the cost of the product he is making or the service he is performing? It seems to us that one effective way of answering this question is to determine what constitutes effective supervision of the worker so as to enhance our loss prevention effort.

The first thought that may come to mind is: "How can I handle Joe when I catch him performing an unsafe act?" Our first reaction to this question is that if I wait until I catch Joe performing an unsafe act before I start my face to face safety program, there are some Joes whom I will be approaching too late because by the time I have been made aware of the fact that these Joes have committed unsafe acts, the only places where I will be visiting them will be either the funeral parlor or the hospital.

A sound face to face program must be thought of as involving the answers to the following questions in the order in which they are presented here:

1. How do I recognize a man who is likely to perform an unsafe act?
2. How do I keep him from performing the unsafe act?
3. If he should subsequently perform an unsafe act, how should I handle him?

Let us first explore how we can recognize a man who is likely to perform an unsafe act.

It is logical to think of a man who may perform an unsafe act as a man with a problem. The nature of his problem may be difficult to discover. The symptoms of his problem, however, are readily observable. He exhibits the symptoms in his behavior. He may be restless on the job. Perhaps he is overly zealous in the manner in which he ogles the girls. He may drink too much. He may not be getting to work on time. He may be loafing on the job. He may be disregarding your company's regulations. He may be dissatisfied with working conditions. He may be absent too often. His production may be poor. He may make too many mistakes in his work. He may not be able to get along with co-workers. He may be receiving too many personal phone calls. He may be complaining too much about his work or about co-workers. He may refuse to teach another worker how to do a job. He may be doing one of many other things that could be listed here and that constitute blocks to the effective operation of some segment of your company. This is a symptomatic behavior.

This behavior is symptomatic of the possession of such traits as impulsiveness, immaturity, excitability, aggressiveness, intolerance, insecurity, anxiety, irresponsibility, impatience, revolt against authority, feelings of inferiority, guilt feelings and the several other traits which researchers have found to be characteristic of the accident repeater. If a thorough psychological analysis could be made of each accident repeater, it is very likely that such an analysis would reveal that at the time of his accident, the man's behavior was reflecting the possession of one or more of these traits.

We have indicated behavior that is symptomatic of the possession of certain traits. We must add that these traits are themselves symptoms of problems, usually emotional, which need to be resolved. Let us illustrate what we mean by recounting the story, as reported in a recent issue of the *Journal of American Insurance*, of an ex-

perienced Texas chemical plant worker who badly mangled his hand. No one could explain how the mishap had occurred. The plant physician did learn, however, while giving the man medical attention, that he and his wife had been arguing, that she had recently run off with another man, and that the injured man really did not care much what happened to him. As soon as she was told of her husband's accident, she rushed to his bedside in tears and showed considerable remorse for having left him. The doctor surmised that what the accident accomplished for the man was to get his wife back, at least temporarily. There are some who would say that subconsciously this man wanted to have an accident in order to accomplish this purpose. We do not pass this off as an unlikely possibility.

It is not our purpose here to make a psychotherapist out of every foreman, supervisor, manager or plant superintendent. The analysis of an emotional problem should be done by a psychiatrist or a psychologist. What the boss needs to do is to recognize the behavior that is symptomatic of a problem and then to handle his man in such a manner that the occurrence of the behavior caused by the problem may be lessened on the job or at least not provoked unduly.

This leads us to the consideration of our second question dealing with how a man can be kept from performing an unsafe act.

It is obviously not practical for us at this moment to list each evidence of unfavorable behavior and to suggest how each one can be handled. It is our opinion that if Ann Landers were giving this talk, she would from this point on entertain you with a series of clever and insightful suggestions as to how to deal with the man who is overly zealous in ogling the girls, who complains too much, who goes to the dispensary too often or who engages in some other unfavorable behavior. Rather than emulate Ann, we think it is more appropriate for us to recognize our journalistic limitations and to take the more prosaic approach of suggesting some useful principles and guides so that the next time you notice three of the boys loitering in the washroom or in a corner of the warehouse, you will not immediately instruct the service department to prepare a sign that reads "Severe Penalty for People Found Loitering in This Vicinity."

Have you ever noticed that some bosses seem to have more difficulty in handling employees than other bosses have? Why is it that the majority of the people in manager A's department always seem to get along well whereas the majority of the people in manager B's department seem to be so-called problem employees?

If you watch manager B very closely, you may observe that he pays little or no attention to the early manifestation of a problem situation. In other words, he may not pay much attention to that first complaint, that first tardiness, that first extended absence, that first trip to the medical department, that first mistake in judgment, or that first evidence of restlessness. As the behavior is repeated, however, it begins to dawn on him or it is brought to his attention that his new man complains too much, is tardy too often, is absent too often, is making frequent trips to the nurse, repeats mistakes, or is constantly restless. At this point B decides he has a problem employee and that he must do something about it. Since he was not alert to observing the first symptoms, you can be reasonably sure that he may not exhibit a high degree of expertness in correcting the situation.

If you watch manager A very closely, you may find him alert to symptoms. He finds out either casually or formally, whichever way suits him better, what that first complaint is about. He finds out why his man was tardy or absent that first time. He shows interest in his man's health the first time he has to go to the medical department. He talks to his man about that first mistake. What we are saying is that manager A is alert to symptoms, to situations that may eventually develop into brain-wracking problems, and he copes with them right now. He does not let a situation become serious before deciding that he has to take steps to do something about the problem.

The next step in our thinking regarding the employee with a problem involves our own knowledge, skills and attitudes. In other words, how can we conduct ourselves as bosses so that we will not create problems in our staff or so that we will not provoke a latent condition to blossom into a problem?

The answer to this question is constantly being explored in discussions of the qualities of effective leadership. Most of us have read or listened to much about what a leader should or should not do. We have been told of the leader's need for high mental ability, for sound technical and general knowledge, for adequate appearance and grooming, for social ability, for skill in planning and organizing, for communications skills, and for other traits and abilities. Probably one of the most important of these assets is the ability to communicate. A boss has been described as a person who gets his job done through others. If he is to succeed in this, he has to be able to communicate his goals, his desires and his instructions.

Let us not limit our concept of communications skills simply to the ability to speak and write correct English. It is conceivable that an expert in the use of the English language can be most inadequate in communications skills as they apply to the managerial function. It is also conceivable that a man whose ability to use correct English may be quite inadequate, may still be very effective as a boss communicating with his men. It has been estimated that during 4/5th of our working day, we are communicating, that is, we are trying to understand someone or trying to make him understand us.

The bottlenecks and plugged pipe lines in the communications system have been brought to our attention, sometimes seriously and at other times humorously. We take the liberty of mentioning some of the types of communicators described by Lydia Strong in an American Management Association publication as follows:

1. The Jolly Good Fellow. Talks golf, relatives, and the bright sayings of his children. As you leave, he says casually: "By the way, your department is being transferred to Puerto Rico."

2. The Roller Coaster. Sometimes he's up, sometimes he's down. If you want to stay with him, fasten your seat belt.

3. The Three-Belled Grapple. His desk is so full of a number of things, how can he possibly concentrate on you. His phones ring constantly, and he takes every call himself. In between, he barks over the intercom and dictates in snatches to his secretary. But he hears every word you are saying. Huh? How was that?

4. The Double-Dotted "I". Hands you the same kind of job you've done all these years, then tells you in minute detail how to do it. Thirty minutes later you have full instructions for cleaning the last speck of dust on the assembling room floor, but you have forgotten what you were going to assemble.

5. The Sounding Brass. First he whispers, then he shouts. But why is the whisper a compliment and the shout a reprimand?

6. The Commandant. Communicate? Nonsense! Push the right button and they'll jump. That's what they are paid for, isn't it?

There are other types, but these samples may be sufficient to help us recognize why the manager who exhibits such behavior is likely to find that he has not one but many so-called problem employees in his department.

Are we guilty of exaggeration when we imply that some bosses fall into a so-called rogues gallery of communicators? Perhaps. However, let us consider what the effect is on the average worker when his boss acts somewhat like one of the types we have mentioned.

What happens, for example, when a boss gives a worker a new assignment without explaining the reasons for it and getting him to accept these reasons as significant?

What happens in a department where the boss is the type who is congenial one day and on his high horse the next day?

What happens in a department where the boss is too busy to pay attention to what he regards as the trivial problems of his so-called little people?

What happens when a boss degrades a man's knowledge and skills by going minutely over every single detail of an assignment which the man has done well many times before?

What happens in a department where people correctly state that "The boss never tells me when I have done a good job; the only time he tells me about my work is when I have made a mistake"?

What happens in a department where people are just ordered around and made to feel more like Pavlov's conditioned dogs than human beings?

At the risk of being a Double-Dotted "I" in our communications with you, let us consider how a boss can keep a man from per-

forming an unsafe act by using effective communications skills. Since part of this matter of communications is listening, the boss must be a good listener. When a man starts to talk to his boss about a problem that he has, or to complain about something that is either related or not related to his job, or to make a suggestion, the good boss assumes the role of attentive listener until his man is fairly well talked out.

We should not pretend to be listening while letting our minds wander over some other problems that at the time we may regard as more important. Partial listening is inadequate. The best way to stop little grievances from growing into big ones is to listen to them. There is much evidence to support the belief that there is value in letting people blow off steam. There is also much evidence to support the belief that feelings get hurt when one person does not pay attention to what another person is saying. It is also true that it makes a man feel important when he can express an opinion and know it has been heard. Moreover, if a man has a good idea, his boss should not be reluctant to use it.

Listening is important because it is one of the best means we have of learning what a man is thinking about. If we don't listen the first time he begins to say something, we may never get a second chance. If we don't listen, we don't get to know the nature of his problem. Not knowing what his problem is, how can we proceed to eliminate it?

An attentive listener looks at the speaker and not at the window. He tries to detect underlying feelings. He recognizes that a man may not talk immediately about what is really bothering him. A man may make a few superficial observations which appear to be and usually are quite unimportant. If he discovers, as he is making these unimportant remarks, that his hearer is an attentive listener, he may go on to more significant things.

An effective listener does not interrupt a man immediately if he hears a statement that he feels is wrong. In fact, such a statement should whet his appetite for continued listening so that he can get the full picture of what is on the man's mind.

The listener should think of himself as a diagnostician. To get an insight into the nature of a problem, the boss should try to diagnose a man just as a doctor diagnoses a patient. The doctor checks all observable symptoms in trying to determine the physical condition of his patient. Having made his diagnosis, he has a logical basis for prescribing a remedy.

Similarly, when a boss has put together as many observable clues as he can, he is in a position to determine how he should handle the employee with a problem, the employee who may be on the verge of performing an unsafe act. In other words, he can determine whether he is able to assume the task of handling the situation himself; or whether he should enlist the aid of other resources in his company such as his own superior, the personnel staff, the medical staff, the psychological staff if the company has one, or even one or more of his subordinates; or whether he should enlist the aid of resources outside of the company such as the local family counseling service, a psychiatrist, a doctor, a lawyer, an AA group, a priest, a minister, a rabbi, or one of the other several resources which may be available and appropriate for helping solve the problem under consideration.

What we have said so far is concerned with identifying the person who may perform an unsafe act and with handling him in such a manner that he may sincerely try to avoid performing such an act because he is happy with his work and he wants to do it well. Realizing that both the boss and his worker are human beings and that because of this both have imperfections, we cannot expect a boss to create the ideal climate for his people nor can we expect that a worker will continuously avoid exposing himself to the possibility of having an accident. Therefore, how should the boss handle a man who has performed an unsafe act?

The answer to this question leads us into the area of discipline. Discipline has to be constructive. It should suggest what a person must do in order to perform an activity correctly. In this matter, there is one significant human failing shared by too many workers, namely, that accidents happen to the other guy but not to me. It is characteristic of most of us to feel that we are among those who will not have an accident because we know when to take chances and when not to take them.

When a man has, therefore, performed an unsafe act and is admonished by his boss,

he may take it lightly. Noticing this, a boss may feel that he has to go into a series of gory details regarding the results of accidents. Some of the experts tell us that this is a less effective procedure than a down-to-earth and moderately toned appeal. As the seasoned boss points out to Joe the safe way of doing a job, he may refer to Pete who also thought that an accident would never happen to him but who went through the pain of an injured foot or a sprained back. He points out that accidents don't just happen. They are caused. He talks to Joe in a friendly and positive manner. He does not belittle him in front of the other men.

There is evidence that a firm approach will work. One Eastern company found that a so-called hard-nosed demand that each individual meet his responsibilities to work productively and safely resulted in a change from a bad record to an excellent safety record for a large group of heavy maintenance and construction workers. In this group the men with severe emotional or health problems were also given medical and psychiatric care.

The objective of discipline is not fault finding but the prevention of the recurrence of unsafe behavior. This is accomplished by having an understanding of what is expected and by accurately stating the consequences of deviation. We favor a "Dutch Uncle" approach in which a boss sincerely, firmly and without exaggeration states the case for the need to work safely. This is not the occasion for sarcasm or ridicule. Rather it is the occasion to make an earnest presentation of facts in such a manner that their importance may somehow be recognized by the worker.

Let us give one illustration of what we mean by facts. First of all, let us agree that a long and involved list of statistics may not be impressive. However, we can assume that the presentation of one pertinent fact may help. For example, a few years ago the traffic engineering and safety department of the American Automobile Association published a report of driving errors made by 10,860 licensed passengar car drivers. Among the most common errors were keeping the clutch pedal depressed while waiting at a traffic signal; coasting down grade, up to stop signs and traffic lights; placing hands in an unstable position on the steering wheel; failing to look in all directions at intersections; failing to observe the courtesy of signaling; and shifting gears while turning.

Let us assume that, as a fleet supervisor, you observe one of these errors, such as the failure to look in all directions, being committed by one of your drivers. You point out that this is not an uncommon error among passenger car drivers because in a five mile test it was made 117 times per 100 drivers. As a defensive measure, therefore, you tell your driver, that he must be considerably more skilled and alert to the need for driving safely so as not to become involved in an accident with a passenger car driver who makes such a common error. In such an approach you are not belittling the driver by telling him that he is too careless, but you are impressing him with the fact that, if he is going to avoid an accident, he has to be constantly on the alert for the carelessness of other drivers.

The fact that you are letting your driver know that you are placing him among the group of expert vehicle operators who have to drive defensively in order to avoid becoming involved in an accident, the fact that you insist that his error not be repeated, and the fact that you explore with him the possible consequences of committing the same errors as non-professional drivers, may have a favorable effect on your driver. What we are saying here is that if a boss praises a man for the things he does well and if he exhibits pride in having a man under him who works well, it may just happen that the man himself will develop a feeling of pride in a job well done.

This presentation far from exhausts the list of suggestions that can be made regarding the employee who is likely to perform or who actually performs an unsafe act. We have brought out the need to identify the man who exhibits in his behavior the symptoms of an emotional problem, having in mind that there is a close relationship between accident frequency and the existence of such problems in individuals. We have pointed up the need for alertness and immediate action on the part of a boss when the first symptom of a problem appears. Suggestions have been made regarding the conduct of a boss, particularly in his communications with his men, so that he will not create a problem or provoke a latent condition to blossom into a problem. Particular

emphasis has been placed on the importance of effective listening so that a boss may accurately diagnose the nature and the severity of a problem in order to use whatever resources may be available, both in and outside of his company, in solving the problem.

The suggestion has been made that discipline be constructive when a man has been found performing an unsafe act. The disciplining should be done in a firm, friendly and positive manner which spells out what is safe behavior, what is expected of the worker, and what constitutes a reasonable statement of the consequences of performing an unsafe act.

What we have been saying is that a boss must work continuously and expertly at the task of doing an effective job of handling people. There is no panacea of easy solutions that can be offered to management for the improvement of loss prevention. Moreover, within the general framework of the principles and practices recommended in this presentation, it should be obvious that there are specifics that can be developed by each individual boss only when he takes into account his own temperament and skills when handling a particular individual who also has his own peculiarities, desires, outlook, knowledge and skills.

HOW TO INSPECT FOR ACCIDENT PREVENTION PHYSICAL CONDITIONS OF BUILDINGS

By ROBERT L. MOORE
Sup. of Engineers, Lumbermans Mutual Casualty Co., Chicago

We all must agree that a sound program for the maintenance of buildings will conserve company funds. It will also project and maintain facilities to assure scheduled operation regardless of weather or season. It should also have a desirable result in the important area of accident prevention.

When a commercial building is constructed, the owner is very careful in his selection of a well qualified maintenance superintendent. In many cases this person may have worked on the construction of the building. The quality of service that is or is not achieved by his work will either result in tenant satisfaction or in a constant turn-over and high-cost operation. In the strong competition of today, every effort is being made to put older buildings in good condition to keep present tenants satisfied and to encourage others to fill vacant space.

Industrial buildings are generally occupied by the owner. Often the interest in upkeep does not equal that found in commerical buildings, and such buildings are given little attention beyond cleaning until serious trouble arises. The trouble that does arise either in the commercial building or in the industrial building may be an accident that would involve a member of the public, an employee, or simply the building itself. In any case of serious trouble, a lot of money must be spent to correct the unsatisfactory conditions. Various insurance coverages, such as workmen's compensation, public liability, property damage, and even business interruption insurance may be involved.

Care should be the watch word to make certain that after the conditions are corrected, the same old neglect routine is not resumed. General inattention and lackadaisical inspection procedures may cause the same trouble over again, causing more expense. Reasonable precautions will save part, if not all, of this money and will go a long way toward the prevention of accidents.

Since the problem involves both the maintenance inspection and the safety inspection of buildings, it is only natural that there should be close liaison between the maintenance or plant engineer and the safety engineer. In many plants, both work together as a team in making systematic inspections of plant structures.

A logical approach to the problem of an accident prevention inspection to determine the condition of a building is an inch-by-inch

survey of the entire physical property and its appurtenances. It has been found that such a detailed survey is greatly facilitated by first developing a guide or check list of the many phases to be studied.

Basic elements for inclusion in the survey guide will be covered in this discussion. In each instance, three fundamental questions must be asked:

1. Do the physical conditions noted contain potential accident hazards?

2. What practical measures can and should be taken to remove such hazards or failure points?

3. Is there any catastrophe hazard present that warrants immediate corrective measures?

The survey guide will give the maintenance engineer and the safety engineer a check list that will assure a thorough check of all areas where maintenance may be required for the safety of both the building and the people in it. The safety engineer should be impressed with the fact that no check list can completely cover all the areas that may need attention and also that the reminder listings may require further research. For that reason, a cross-referenced check list has been compiled to give the safety engineer additional research and reference material.

Both the safety engineer and the maintenance engineer when making an inspection of the building should be always on the lookout for the catastrophe hazards as well as the run-of-the mill minor items that are important on the check list. The most common causes of building collapse are as follows: Foundation failure; structural deterioration; overloading; alterations; and fire and explosion.

These five items will be covered later in this discussion, but should be kept in mind as we cover even the minor items in the inspection procedure.

A well planned inspection depends on knowing where to look and what to look for. An adequate check list will call attention to the following items and conditions.

Grounds: Parking lots, roadways and sidewalks need frequent inspection for cracks, holes, breaks and tripping hazards. Any defects that are found should be corrected immediately to prevent them from becoming major and costly jobs. Traffic flow should be considered in the inspection. Plant grounds should be checked for proper drainage. Low spots must be filled in to prevent erosion and to prevent icy surfaces in winter time. All yard drains should be inspected periodically and blockages removed at once to prevent damage to grounds.

Loading and Shipping Platforms: Loading and shipping platforms, and docks get severe use from trucks and heavy traffic. Guard rails are needed to prevent damage from tail ends of trucks. Fork lift trucks are also severe on loading platform doors and floors. Tripping hazards and floor condition must be checked. Canopies over the platforms should be inspected. For sloping loading ramps, the condition of the driveway and water drainage should be checked. Access ladders and stairways should be checked for condition of rungs, steps and handrails.

Outside Structures: Small isolated buildings should be inspected the same way as the larger plant buildings. Plant fencing should be inspected for damage by tanks, cars and other causes as well as corrosion and painting. Floodlighting and company-owned electric roof signs should be inspected by a qualified electrician fully familiar with the specialized requirements and applicable codes.

Railroad Tracks: Railroad sidings that are company owned require regular inspection for washouts, condition of rails, clearance, missing joint plates and spikes, rotted ties and the need for additional ballast.

Floors: Industrial floors are made of a variety of materials. Most commonly used are concrete or wood block. Office and lobby floors may be concrete, terrazzo, asphalt, rubber or plastic tile. Each kind of floor has its own maintenance problem. Floors, regardless of construction, should be carefully inspected, especially in areas subject to heavy traffic. Slipperiness of floors should receive special study and floor treatment. Some of the items to check are:

1. Are the surfaces wearing too rapidly?
2. Is shrinkage present?
3. Is the surface damaged or worn?
4. Are there slippery surfaces?
5. Are there hazards to trucking or walking such as holes or ungnarded openings?
6. Are there indications of cracks, sagging or warping?

7. Are replacements necessary due to deterioration, etc.?

Stairways: Stairways should be checked to determine:

1. Are treads and risers in good condition and of uniform width and height?

2. Are standard handrails provided and are they in good condition and secure?

3. Is lighting on stairs satisfactory?

4. Is there any material stored on stairs?

Housekeeping: The general housekeeping throughout the plant should be checked to see if it is satisfactory. Aisles should be marked off with painted lines and material kept out of aisle width. Material storage and waste disposal should be checked. Housekeeping and cleanliness in the locker and washrooms should also be analyzed.

Overhead Cranes: Overhead cranes and industrial hoists are now standard equipment in automotive plants and machine shops. In inspecting for accident prevention, overloading, improper installations, lack of maintenance, and misuse are the principal sources of accidents to look for. It is unfortunate that many crane and hoist manufacturers' representatives, presumably on their own, stress the ability of the products to stand up under twice their rated load. Due to the many factors involved, this information is very wrong. We must consider not only the crane and hoist units, but also the strength of bridge beams, runner beams, hangers, columns, trusses, joists and other supporting members.

In the physical plant survey, accurate knowledge of the weight of all lifts is required. Compare these values with the rated capacities of the cranes, hoists and their supporting members. Again, specialized engineering knowledge in the plant or shop should be called upon where necessary.

Many cranes and hoists installed in plants and shops have been hung from members already loaded to their designed capacity. In other cases, hangers suspended from individual wood floor joists support crane beams and hoists. Where this condition exists, a timber spreader, perferably 4 in. x 6 in., can be added to distribute the load over at least four to six joists.

A periodic survey of cranes and hoists every two months plays an important part in insuring the availability of sound equipment at all times. This maintenance check should include the operating controls, wiring, cables, hangers, supporting members and other important parts.

A crane or hoist is normally designed only for a vertical lift. Where front, rear or lateral pulls are undertaken because the load is not under the hook, stresses develop for which the equipment is not designed.

Yard cranes require protection against possible damage by severe windstorms. There are numerous histories where this equipment was strained, overturned, or blown off its tracks by the action of high winds.

The driving motor and service brake on overhead cranes are not always powerful enough to resist high wind velocities. Locking bars, manual or automatic latches, crane traps, and chains are the most common suitable types of anchorages for severe wind protection.

Electrical Installations: Every year over 700 persons are electrocuted by accidents involving less than 750 volts. Some of these fatalities and many shocks occur on 110 volts. Electrical failures also cause numerous costly plant fires and explosions. Unfortunately it is not generally appreciated that contact with so-called "low voltage" circuits (less than 750 volts) can produce fatal electric shock. Voltage alone is not the measure of dosage of electricity through the body which determines the severity of shock. Actual quantity of current, the path of the current, and the time the current flows through the body are factors which also must be considered.

The survey should include a periodic inspection of all plant wiring. Loose connections at plugs and receptacles, worn or broken insulation and poor splices are responsible for most human contact with current carrying wire. Defective permanent plant wiring has caused numerous plant fires.

Insufficient or widely spaced electrical outlets in plant assembly departments require long, portable extension lights, and motor and machine testing. Considering the abuse these cords must normally take and the resultant exposure to insulation damage, the physical plant survey should check the adequacy and location of power outlets.

Where production demands call for increased power, electrical systems have some-

times been overloaded by increasing the size of working fuses. This naturally sacrifices important protection. A survey of all fuses in relation to electrical installation capacity is a noteworthy inclusion in the physical plant inspection.

This survey should include an examination of transformer and switchboard installations. The oil-filled transformer is the most common type used and the most vulnerable to fire. The survey should particularly examine existing maintenance procedures as regards oil, operating temperatures, and bushings. The oil must be kept in good condition and maintained at its proper level. Where transformers are fully loaded, operating temperatures should be tested once a month. Bushings should be kept clean and free of dust and dirt and should be tested frequently for cracks.

Because an electrical switchboard is usually the main point from which power is distributed, it is usually protected from damage. Where "live front" boards are in use, the physical survey should endeavor to encourage replacement by "dead front" equipment.

The survey should include an investigation of interior and outdoor illumination. The advantages of good illumination as regards efficient operation are many. In addition, poor lighting has been found to be an important contributing cause of accidents.

Good illumination can be summed up under quality, which includes the direction and diffusion of light and its color, and quantity. Lighting can be judged on the ability to see easily, accurately, and quickly.

The present lighting system may be made more efficient through simple maintenance procedures. The following are some of the points to consider in undertaking this phase of the survey:

1. Are reflectors cleaned regularly? Dirty lamps and reflectors may shut off 50 per cent of the available light.

2. Are there overhead lights without reflectors? Bare lamps waste useful light and cause glare.

3. Are there lights on machines or at benches which should be shielded? Unshielded lights at or near eye level cause eyestrain and fatig[redacted]

4. Are any lights placed so that the worker's shadow is on his work? Relocating the light or increasing the number of light sources decreases shadows.

5. Is there reflected glare from shiny machinery surfaces or highly polished machinery parts? A flat machine paint reduces reflected glare. Reflected glare on a bench work is best controlled by placing light sources behind the worker.

6. Are lights in storage areas and on stairways in working order?

7. Are walls and ceilings kept clean? Clean walls and ceilings help to get the greatest return from a lighting system.

8. Is color used for identification? Systems of color identification on pipes, aisle marks, levers, guards, trucks, conveyors, columns, stairs, doors, obstructions, etc., will promote safety, prevent errors.

Although a complete lighting survey requires the services of a competent illuminating engineer, a portable photoelectric illumination meter will indicate general illumination levels in your plant. Comparison of this data with recommended "good practice" values adopted by the Society of Illuminating Engineers can be used as an appraisal of the adequacy of plant lighting systems.

Elevators: The efficient and safe operation of plant elevators is an important physical survey determination. The inspections of insurance company personnel and municipal and state agencies is valuable to assure a maximum of operating control, but the plant management should be urged to include elevator maintenance as a regular function of the maintenance department. Many large industrial plants have highly qualified and trained elevator mechanics who are in a position to make their own inspection and repairs. However, many small and medium sized plants and even some of the larger plants contract elevator inspection and repair to the company that built and installed the original equipment.

A survey should include the conditions of cables and gears, the maintenance of machinery, the operation of hoistway and car doors or gates, the operation of car safeties, illumination, and the condition of pits. Shear protection on hoistway projections should be provided.

Accurate knowledge of the weights of all loads to be carried is essential in assuring that the elevator equipment is not being overloaded.

Roofs: A specialized item in the survey is roof anchorage. The lifting of unanchored roofs accounts for a large percentage of the total wind damage loss to American industry. In inspecting for accident prevention, determine whether or not the roofs of all buildings are securely anchored. Anchors can be readily installed and the cost is reasonably low. In most cases, anchorage requires nothing more than bolting one end of a strap, plate or rod to the roof and the other end to the building.

The entire roof area should be checked for openings, nail holes, bulges, separation of seams, dry areas, and other signs of deterioration. Flashings, gutters, strainers, downspouts and other water conductors should not be overlooked. A check should be made for any debris or stored material on the roof which can be picked up by the wind and blown to the ground. Defective cornices or overhanging ornamental tiling can be hazardous.

The biggest single liability verdict in history, amounting to $1,100,000, was recently awarded in the case of a boy who was struck by a screen which fell from the roof of a candy factory. The boy was paralyzed from the waist down.

Factory Chimney-Stacks: Each year many chimney-stacks become structurally critical or are the cause of fires. Perhaps the major reason for this is that numerous older chimneys and stacks now in use were erected using inferior designs, materials and workmanship.

Weathering, high winds, lightning, foundation settlement and corrosive flue gases are the principal sources of chimney deterioration. A thorough periodic annual inspection by a competent person will uncover minor damages before they progress too far and become critical conditions.

Factory chimneys usually extend well above plant buildings and are therefore more likely to be struck by lightning. Brick and concrete chimneys can be protected by lightning-rod conductors of low resistance and ample carrying capacity which extend from the top of the chimney to a good ground. Lightning rods can be readily installed on existing unrodded chimneys when repairs necessitate the erection of scaffolding. Underground water pipes or buried copper plates afford good ground connections.

Catastrophe Hazards

Let us analyze the common causes of building collapse, which can be classed as the catastrophe hazards. The following five causes, mentioned before, can develop into the catastrophe that can catapult your plant or your company right into the headlines of the newspapers or over the air on radio and television:

I. Foundation Failure.
II. Structural Deterioration.
III. Overloading.
VI. Alterations.
V. Fire and Explosion.

A catastrophe which can be classed as a disaster or failure involves multiple injuries to employees or to members of the public. A catastrophe, as considered in insurance circles, is an accident in which three or more people are killed or permanently injured. Every safety engineer and every maintenance or plant engineer must consider the possibility of a catastrophe within the plant or building which can involve people.

I. Foundation Failure.

In order to appreciate the importance of a stable foundation for a building or other structure, let me cite the classic example of all foundation failures, the Leaning Tower of Pisa. When talking about foundation failures, no one will argue that this is the "grand-daddy of them all." The foundation upon which it was built, is of a deep, saturated volcanic ash. Settlement started before it reached a height of 40 ft. and ultimately it reached a total height of 179 ft. Construction started in the year 1155 and it was not completed until 1350 under the direction of the fourth architect; the first three had given up in disgust. In 1959 the tower was 17 ft. 2½ in. out of plumb in its height of 179 ft. It attracts tourists at the rate of 350,000 per year.

Foundations can fail for any number of reasons and causes:

1. Removal of lateral support.

(a) The greatest number of serious foundation failures occur as the result of excavations that remove lateral support of the

subsoil under the foundation of a building. Most of these failures occur to existing buildings next to buildings under construction. Usually it is found that the excavation for the new building has been carried several feet below the foundation of the existing building.

2. Flow of Subsoil.

(a) An occasional failure may be due to the flow of subsoil from under a building due to location and to the superimposed weight. Because of their frequent location on city waterfronts and their very heavy loading per square foot, grain elevators seem to be particularly susceptible to this type of failure.

3. Insufficient Consideration of Subsoil.

(a) Settlement or sometimes even complete failure may occur because of neglect in finding out what the subsoil is, or, in having this information and not using it wisely. Soils mechanics science has progressed tremendously in the last 20 to 30 years and proper test borings and soils analysis will reveal the true capabilities of the subsoil as a support for buildings or other structures.

4. Tipping of Buildings.

(a) This is a very complex and interesting phase of foundation failure, although not too applicable to the majority of safety engineers. However, if your operations include grain elevators with their heavy loads, there may be cause for alarm. These structures on one end may be loaded to capacity with very little load on the opposite end. Therefore, there is an overload on part of the soil and perhaps an uplift on the opposite end.

5. Destruction of Wood Piles.

Some people mistakenly believe that wood piles kept continuously under water will rot out. As a matter of fact, just the opposite is true. Wood kept continuously immersed will last for centuries.

In fact, trouble will occur in a comparatively short time if wood is exposed to alternate wetting or drying. For this reason, the tops of wood piles decay when the water table is covered.

Quite a number of years ago, the lowering of the water table in the Chicago River caused the uncovering of the tops of the piles under the foundations of an eight-story Chicago warehouse. Settling and cracking of the warehouse walls prompted an investigation, which revealed that the building was in imminent danger of collapse due to the almost complete decay of the tops of the wooden piles.

6. Subsidence.

Very serious subsidence conditions caused by lowering of ground water level imperiled the larger buildings of the Missouri River town of Elk Point, S. D., in 1956. One of the most seriously affected buildings was the high school, where buckled walls forced the evacuation of the school and immediate shoring. Cracks 4 to 8 in. wide opened between the walls and floor of one of the churches.

The citizens placed the blame on the construction of the Fort Randall Dam and the Gavins Point Dam, 75 and 40 miles up the river from Elk Point, stating that the water level in the river had been lower since those two dams were built. Army engineers, however, disputed this and blamed a long drought, as the rainfall had been below normal every month for more than two years.

7. Failure of Foundation.

On rare occasions, the failure of a building is caused by the failure of the foundation itself, not from any external cause, but because the foundation was not strong enough to stand up under the load placed upon it.

(a) Today, when mergers of companies seem to be the order of the day, there is the increasing desire and need to put an extra story or two on existing office and plant buildings. A full engineering and soils analysis is indicated before this can be done.

II. Structural Deterioration.

Various types of structural deterioration can take place in a building such as:

1. Corrosion of steel beams and columns.
2. Dry rot of wooden pile foundations caused by a lowering of the water table.
3. Spalling and cracking of concrete members (floors, beams, columns) exposing steel reinforcing to rust and corrosion.
4. Bearing capacity of brick walls or stone work changing as the result of cement aging (if any was used).

5. Natural deterioration of wood and steel in the structure itself.

What causes some of the structural deterioration that can be so dangerous to the stability of a building or other structure? For example, inside a fertilizer plant, corrosion grew progressively worse in an area in which sulfuric, phosphoric and other acids are manufactured and handled.

Although tremendous damage can result from the corrosive action on steel by acid fumes, it should be stated that there are protective coatings that can be applied such as rust resistant paints.

Steel dowels in masonry and terra cotta walls have shown evidence of abnormal rusting. Cracks in the terra cotta facing had allowed seepage of water into walls and rusting action went on unnoticed until corrected.

III. Overloading.

In undertaking a survey of the physical characteristics of a building, a prime factor is floor loading. Experience has shown that the most serious floor loading problem encountered arises from the tendency of plant management to look upon warehouse or storage space as an unproductive evil. Carried to the extreme, this usually results in overloading of floors, unstable piling of raw stock and finished parts, and difficult and costly materials handling.

In recent years, production demands have resulted in the replacement of much warehouse space by machine tools and assembly departments. In plants where this has occurred extensively, the remaining storage areas have been seriously overloaded. A recent plant survey showed that, in many instances, outmoded multi-story structures with light floor load capacities should be dismantled. A modern wing is more effective in meeting present day production needs at lower maintenance costs, and it's much safer too!

In plant expansions, many light mill buildings have been acquired for heavy manufacturing purposes, although they are not designed for such usage. It is not unusual to find that such buildings formerly housed process industries, wherein acid attack, corrosion, and rot had caused the floors and their supports to deteriorate. For safe loading, this would necessitate a reduction in allowable design stress values and a corresponding lowering of allowable loads. The alternate—serious overloading.

Mechanized materials handling has introduced floor load problems because of the heavy dead weight of platform and lift trucks. In past years the records include not only wood floor failures but also seriously damaged reinforced concrete floors directly attributable to lift truck operation. The suspension of overhead cranes and hoists from wood ceiling joists has severely taxed many floor and roof members.

Accurate data on floor load capacity is a prime requisite for a physical plant survey. If this data is not already known or not readily obtainable from building plans, a structural analysis by a competent engineer may be necessary. Rough estimates based upon experience or conclusions arrived at by a casual glance in a handbook are dangerous.

The correct determination of existing floor loads in a plant building depends on several factors. A thorough knowledge of the weights of materials, machines and equipment is necessary. Particularly important are the weights of machine tools, oddly shaped castings, built-up machine bed plates, bar stock, motors, reeves, steel plates, bundles of sheet metal, and lumber. In a machine shop recently surveyed, 3 in. maple was piled eight feet high on a pattern department floor with a 100 lb. per sq. ft. load capacity. A simple check showed the existing floor load was in excess of 300 lb. per sq. ft.

A second factor is load distribution. This is often a complex problem. Most buildings are designed to carry uniform loads. A concentrated load throws twice as much stress on supporting members as a uniform load of equal weight. It is for this reason that most heavily concentrated loads such as machines are placed directly over beams or girders rather than on slabs or joists.

Simple rules to properly appraise concentrated load distribution are not dependable. This is a typical example where the safety engineer should avail himself of the knowledge of specialized plant engineering personnel.

The relationship between design load capacity and actual floor loading will provide a scientific answer as to whether a floor is safely loaded or is overloaded.

Visual evidence of overloading, although

not always apparent, should be looked for in the survey of the physical plant. Deflection is the most common evidence of overloading in wood and steel beams. Wood beams will show checking and cracking. Concrete will spall and fall away from the tensile steel in reinforced concrete beams and girders. Wood floors will puncture through and flat concrete slabs will crack and spall. Timber columns will split and crack and concrete columns will spall, the concrete falling away from the reinforcing; steel columns will show overload by the twisting of flanges. Bearing walls of masonry will show extensive cracking, disintegration of the bricks, and bulges. Floor joists pull away from masonry walls under excessive loading.

Although, fortunately, the frequency of plant floor collapses has not been great, the serious results which would follow, should such a catastrophe occur, more than justify a close check on the floor loading problem.

IV. *Alterations.*

When a building under construction is involved in a formwork collapse, a failure of a temporary structure such as a scaffold or material hoist, the incident makes the news media nationally. We must recognize the many safe construction jobs being performed by the responsible general contractor, and that on some operations the contractor has but one time to do the job and it has to be done right the first time. However, on projects such as high-rise construction, the contractor does a repetitive type operation, somewhat similar to the operator of a manufacturing process in the industrial plant. He can obtain perfection by repetition and improvement in the operations as he goes along, but the construction method must be near letter perfect the first time it is performed.

The general contractor is the specialist in construction techniques and his talents should certainly be called upon when alterations are contemplated within the plant or on any building. The civil engineer and architect should never be overlooked.

Many buildings are remodeled or renovated to suit new or changing operations. Buildings originally designed for floor loads of 40 pounds per sq. ft. are being used for light manufacturing with loads of 125, and even as high as 200 pounds per sq. ft. A qualified architect or structural engineer should check the entire floor system to determine what extra bracing and additional supporting members are needed for the new allowable floor loads. The safety engineer should examine the plans with the architect or engineer so that his recommendations can be incorporated before alterations are made.

Many examples of building failures could be given to emphasize the meaning to the handyman, the do-it-yourselfer, jack-leg carpenter, or the jerry-built operator. All these terms have real meaning and a definite tie-in to the possibility of the dangerous conditions that can develop if professional advice is not sought on even the simplest little alteration job. So, to be on the safe side, we as safety engineers should seek out the advice of professional people and get qualified engineers and architects into the act.

V. *Fire and Explosion.*

Fire and explosion hazards must be included in the physical plant survey.

An effective plant survey requires knowledge of extinguishing methods for different classes of fires, such as ordinary combustibles, flammable liquids, and electrical equipment. The characteristics of various types of fire extinguishers and their adaptability for various types of fires are "must" information.

The physical plant survey should not only determine whether the right extinguishing equipment is readily accessible for each particular fire potential involved, but also whether a foolproof maintenance procedure is scheduled to insure that the extinguishers are always fully charged.

In order to fully realize the adequacy of the physical plant, a complete knowledge of the flammable liquids used for removing oil or grease from metal parts is important. Where gasoline, naphtha, or similar flammable liquids cannot be effectively replaced by alkaline compounds, non-flammable solvents, vapor degreasing or banking, noncombustible, well cut-off, properly ventilated rooms are recommended for protection.

The physical plant survey should investigate the storage of lacquers, japan, paints and varnishes; the design layout; and the maintenance of spray booths, dip tanks, dipping and spreading machines, recovery

and circulating systems, and drying and baking ovens.

However, these are special hazards presented in a relatively small number of plants and the inspection should not overlook the main fire causes, which are:

Causes	Frequency	Severity
Heating and cooking	24.2%	20.5%
Electrical	18.4	22.4
Smoking and Matches	16.8	9.3
Total	57.4%	52.2%

Ventilating equipment, electrical protection, cleaning and maintenance schedules, and fire-fighting equipment should be investigated. There is a great deal of sound data available to effectively appraise these problems in the physical plant survey.

Fire doors partitioning off departments and rooms are particularly effective in localizing fires. However, the record of fire doors which did not function properly in emergencies is a long one. The survey should include a periodic examination of door suspensions, counterweight movement, and the condition of fusible links to insure their workability during a possible fire. Boxing in counterweights with a sheet metal enclosure is a simple but effective method of guaranteeing their freedom of movement.

The survey should include an examination of fire escapes, where they exist. Due to their outdoor location, fire escapes are subject to extensive weathering and corrosion. A thorough annual inspection of the structural members and their building supports, together with an annual maintenance and painting program, will insure their long life in sound condition. As the lift sections are particularly vulnerable, a quarterly inspection of these sections seems justified.

The physical plant survey should include a periodic examination of fire pumps, where they exist. A fire pump is valuable only if ready to operate when needed. As this equipment is so important in a fire emergency, the physical plant survey should call for weekly or at least monthly test operation of these pumps. The test should include an examination of the pump and its driving mechanism (electric motor, steam turbine or gasoline engine), the production of the rated amount of water at the required pressure, driving speed, suction, and all other pertinent performance requirements.

In a large number of plants there is a tendency to obstruct passageways, exit doors, stairs, and landings by storing miscellaneous items of all kinds. A monthly inspection of all exits for obstructions will soon let all plant personnel know that these areas are out of bounds for such purposes.

Automatic sprinklers are the best single safeguard against disastrous fires. Sprinklers, however, must have an ample supply of water at the heads continuously. Weekly inspections are not too frequent to insure that sprinkler controlling valves are kept open.

If the automatic sprinklers that protect the plant are of the type with water always in the pipes, the plant survey should make certain that every area of every building has enough heat so that even under severe weather conditions the temperature will be always at least 40 degrees above zero.

We see a lot of posters which carry the message, "Don't Let Fire Put You Out of Your Job!" or "Don't Let Fire Destroy Your Pay Check!" Some employees may take this admonition lightly but my thoughts were forcefully directed to the basic reasoning behind this thought when I saw, during Fire Prevention Week this year in Chicago, a long line of employees, on the morning after a serious fire in their one-story plant, waiting to see if they were going to get in to go to work. The fire was out, but one of the fire engines was still there and the employees were lined up waiting to get in; it was on a Friday morning, and they could have been waiting for their pay checks, which were probably their last ones for a while, as the inside of the plant was gutted by fire and the rebuilding of the interior was still in progress nearly three weeks after the fire.

When your plant is involved in a catastrophe which is caused by an external explosion, it makes the headlines just as quickly as if it had happened within the confines of your firm's plant property. Such an explosion took place about two years ago here in Chicago on October 18, 1961, when there was an explosion within the plant owned by a cosmetics manufacturing firm. The devastation within this plaint included demolition of the building where the explosion took place and also the roof collapse of an adjoining warehouse along with

some blown out concrete block walls and others which were badly cracked.

But what happened right across the street is part and parcel of this same story. A large plant owned by a prominent radio and television manufacturer was affected to the extent that there were multiple injuries, one death, and plant destruction which was beyond anyone's wildest imagination when their own exposures were regularly evaluated. There were 390 persons injured and one death.

It must be realized that this is the spectacular and unusual, but there is one good reason for including this as an example just as there is in any other catastrophe possibility and that is:

"Have you evaluated your first aid, emergency and fire fighting procedures?"

Finally, let us agree that when we regularly make our physical plant surveys and inspections, we should be ever mindful that even when we overlook some little or trivial-appearing situation, we may be setting ourselves up for any one of the major causes of building collapse which can lead to a catastrophe.

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Evaluation of a Safety Program

A SAFETY CONTROL PROGRAM IN A CHEMICAL PLANT

By J. L. RICHMOND
General Supt., Miscellaneous Manufacturing Dept.,
E. I. du Pont de Nemours & Co., Inc., Deep Water, N.J.

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.

1. The plant was divided into sections of approximately equal activity and of a size that could be inspected in 15 minutes.

2. The frequency of inspection was established as once per week for some group of three sections to be selected at random.

3. The inspection team was made up of one senior supervisor and three members of lower supervision to be selected at random.

4. The day of the week and the time for the inspection was also to be selected at random.

5. In addition, the area superintendent or his assistant accompanied the group, to support the program but to make personal contacts only.

6. A meeting of the group after the inspection permitted a review of items observed, the resolution of any questionable observations, and the development of the average number of observations to be reported.

7. The statistical clerk then entered this number on the safety control chart.

After a number of inspections, it is possible to establish upper and lower control limits based on previous experience. Of course, perfection would be "no observation."

What is a permissible number of deviations can only be established by experience or correlation with the units' safety performance.

If the plant has been properly sub-divided and if the inspections are well carried out and the rules faithfully adhered to, then a meaningful control chart is developed. This control chart can be watched by the area management and it will signal significant changes in the safety attitude or morale before serious safety problems are presented.

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 inspection. Do not permit interference with the random selections, etc., once established.

11. Later add any innovations you deem worthwhile. Try out or discard as your need may be. Eventually, as qualified and interested wageroll personnel are available, include them in the program to widen participation.

I believe that if care is taken in organizing the S.C.P. program and in training all the participants, a valuable evaluation method is obtained which has the additional feature of continuity. It enables the manager not only to determine where the plant is in its safety effort but also in what direction it is moving.

SAFETY PROGRAMMING IS MY RESPONSIBILITY

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

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 performances. An audit, by definition, is an examination in general: producing the records and examining the substantiating data in general to prove that certain standards or goals have been met.

If you would perform an audit, then it presupposes that certain limits, guideposts, or requirements have been prepared and published and the audit will then prove that your activities meet, exceed, or fall short of your various measuring units.

To establish these standards, or requirements, we must have a safety program, but how do we know if we have an *effective* safety program? Let me illustrate this with a story I read the other day: a sculptor working on a statue of an elephant was asked by a curious young lad, "how do you expect to get an elephant out of that big piece of rock?" The sculptor answered, "that's easy, son, every time I look at this rock and I see a piece that doesn't look like an elephant, I knock it off. When all the pieces I don't want are knocked off, I'll have an elephant."

In a way, an effective safety program is just that — a work plan that has the extra pieces "knocked off" until it becomes a safety program.

To better understand the safety program that is in effect at U. S. Steel, let me quickly review the development of the pieces that have been retained.

In 1948, recognizing that our safety program was operating in the manner of a shot-gun pattern, we felt we needed a more direct approach to those areas where injuries were occurring, so a program was developed which was called "single objective safety."

This approach was a review of our injury experience over the preceding 12 months. We recorded onto a single tally sheet for each department the occupation and the specific act that was being done at the time the injury occurred. When we examined one year's experience on a single sheet, these tabulations showed that in each plant there were specific occupations which accounted for ⅜ to ¼ of the injuries, and within each occupation there were usually one or two specific acts which perdominated. With this knowledge, it was relatively easy to make a study of the job on the job, and correct the method of doing the job or establish a training sequence to increase the workman's awareness.

By this method, we:

1. Got the facts: this was on the tally sheets;

2. Spotted the critical situation: these were the outstanding injury jobs;

3. Determined objectives: where do we start to work;

4. Took action: this was a study of the job, on the job. This was a very effective program, for now our supervision could be trained in a method by which they could determine where to concentrate their efforts, and it outlined a method of approach: that of a "study of the job—on the job."

This program had one major failing, however, and this was that all the information was "after the fact" and to be effective, we had to wait until injuries occurred in order to spot the critical situations.

By 1952, four years later, it was apparent that we needed an indicator of where potential injuries could occur so that we could take action before the injury happened. Additional review of corporation injury reports brought our next management training program the three C's of safety, with a recognition that over 85 per cent of all injuries occurred from one of three actions:

1. A man was struck by an object.

2. A man struck against an object.

3. A man was caught between two objects.

In describing these objects we included solids, liquids, and gases or vapors. From this knowledge we were able to train our supervision to anticipate proable injury by describing everything which could contribute to injury and taking measures to eliminate, guard against or highlight these objects to the workmen.

By 1956 our audits indicated that there was still something missing and we felt that the missing link was employee participation and attitude. Our next development was called "operation attitude." This program involved training our supervision to lead conferences with three to five men in attendance, where we drew upon their background and experience to develop safe job procedures. This approach was designed to do three things.

First, and most important, by inviting participation of the men actually doing the job, we hoped that they would be willing to assume their responsibility in making the jobs safer. Second, by tapping their experience, we would gain the best possible analysis of ways of preventing injury. I am sure that all recognize that any group of people doing any specific job knows the details of that job better than the supervision. Third, the least important at the beginning but the one with the longest-range benefit, we wanted a written safe job procedure, developed by the workmen, and then reviewed by area supervision and approved by top management, to guide our future training of employees doing similar jobs. This has been a very effective program—one that will be continued and we expect it to continue to yield benefits.

By this time we, as top management, had developed and trained our supervisors and workmen in the basic techniques of safety. Now, our audits again showed that there was considerable deviation from area to area and plant to plant; more deviations than could be justified by the different local working conditions. Field contacts and inspection trips pointed out that there was considerable variation caused by the various

interpretations of our programs. Most of this was traced back to the lack of a uniform written guide that could be distributed to every management member.

The next step in our program was the establishment of "minimum requirements for an effective safety program." In this approach, we defined, on a corporation basis, the safety requirements for each level of management, including the staff responsibilities as well as the line responsibilities.

One of these requirements for general superintendents spelled out in the "minimum requirements" as a control feature is to make necessary field audits with the general supervisor of safety to appraise the program's effectiveness at departmental level; in other words, an audit of the job on the job, not just a review of statistics or injury frequencies.

In addition, we described and defined each of the elements of a safety program that we expected management to carry out on a planned basis.

A year's experience with "minimum requirements" indicated that due to the makeup of our management forces, some with 48 to 50 years' service and some with just recent college graduate training, we were not getting the understanding we needed to make a truly effective safety program. It was decided that we must develop a basic training program and that all members of management would thus be exposed to the same background training and program interpretation. "Principles of Accident Prevention in United States Steel" was written in 1958-59 and training classes for all supervisors started in July, 1959.

This program completed the standards or measuring devices we needed to make better audits. I would like at this point to take as a typical example one of my regular audits and explain how I do it and what I am looking for.

A couple of months ago I audited the sinter plant at the Gary Steel works. The date had been picked by my general supervisor of safety and he and I were scheduled to be three hours at the sinter plant. Here, as in all audits, we start with the superintendent reviewing his records of foremen's and wage earners' activities.

At this time, we ask general questions on the status of various elements of the plant program. We are particularly interested in the method used to determine that the men on the job are performing safely. How do we evaluate this? Certainly not by looking at frequency records alone. The fact that any given area has a low frequency experience is not enough to assume that everything is O.K. One of the most misleading thoughts any supervisor can have is that our safety program is good; we haven't had an injury for two years (or some such length of time). This is a good record, but it can be broken in an instant by an employee who has developed bad habits and has not been observed on the job regularly while the safety record was being established.

One of the greatest problems facing us today is communications, and this is particularly true in safety. How do we know the man understands what we are saying? The truth is that we don't, unless by actual observation of his work habits we see that he performs in a manner that demonstrates this understanding. This thought is the guiding force on our frequent and repetitive safety audits carried on by myself or my assistant superintendents. Our overall plan calls for an audit by myself once each month and additional audits by every division superintendent also each month. A major portion of our daily safety activity involves the foreman in planned observations of the men on the job.

At United States Steel each employee has an individual record card and by random spot checking of these records during an audit, I can see if he is being contacted on a planned basis or if the contacts are general or repetitive without covering the entire job requirements. This same card tells me the injury experience of the employee as well as the record of unsafe acts or rule violations observed by his foreman. A few cards from each occupation and each turn will point up any deficiency that may be present. Conversations with the superintendent and general foremen while we are examining the cards reveal their attitude and at the same time give me a clue to the safety attitude to be expected as we cover the second phase of our audit.

The second phase of our audit is an actual field inspection of the working areas, and observations of men actually doing their jobs.

As the old saying goes, "the proof of the pudding is the eating," so the action of the men at work is the proof of the safety program.

When you can walk up to a man and ask him to explain what he is doing and why he is doing it in a specific manner, and that employee can not only tell you what he is supposed to do but can explain how he can be injured if he does not do it in an approved manner, then I believe we have some "pretty good pudding." I don't want to imply that we have solved all of our safety problems, for this just isn't so, and I know it. But we have come a long way when the man doing the job not only knows what he is expected to do but also knows that he can be injured if he fails to do it properly.

While we are in the field, we are also examining the physical condition of the plant to determine if unsafe conditions exist. Some of these could be missing guards on conveyor belts or a coupling guard missing after a repair job, and the condition of hand tools, ladders or access platforms. All these come under very close scrutiny during an audit. Each of the observations becomes a part of a jigsaw puzzle, and when all are fitted together, they make a picture of the safety program in the area audited. The attitude of the superintendent, of the supervisors, and the attitudes and job knowledge displayed by the workmen along with the physical conditions of the area are the pieces of the puzzle.

What do I do as I finish an audit? First, I review the finding with the superintendent and where there are weaknesses or failures, I outline proposed activities to assist them in reaching full compliance of the safety program. Where the audit indicates good activity, then the discussion is centered on how to do a better job.

We know today we have not eliminated all injuries. In the instance where the safety program is functioning properly in a superintendent's area, we ask, what additional training or additional tools are needed to show improvement? We have recognized over the past few years that these regularly scheduled audits are our best method for developing the necessary aid to cover the blank spots in the supervisory activities. The areas where more can be done show up when the complete review and discussion with area supervision is completed.

Currently, a new situation has arisen in our plant. With the recent changes in our labor contracts establishing a plant-wide seniority group at labor levels, which involves the shifting of men from one area to another and the variation of operating levels experienced in the past couple of years, there has been a tremendous flow of employees up the scale to higher jobs during peak operations and back down again when operations are reduced.

This has pointed out a greater need for a more complete record of every man's safety training. In addition to this, the jobs are becoming more complex in the steel industry every day and more specific training is needed.

As we shift men up and down in the job progression within a department or across departments, how does the foreman know the man's background or training? How can he concentrate on the man's needs so he can help train him properly instead of feeding him the same old safety stuff? This is part of what we are looking for during a safety audit. I feel sure that by talking to supervision and by checking with the men on the job, we will develop the key to the problem of what a man actually needs in training to enable him to work safely.

One approach is being tried now, and that is where a foreman asks the workman to show and tell him how a job is supposed to be done. If the man understands the job and can demonstrate the proper way to do it, then the foreman can justifiably hold him responsible for doing the job correctly each time in the future.

This method of approach gives the man a chance to "show off," so to speak, and the foreman a chance to compliment the man on his knowledge and at the same time build the man's sense of responsibility for his own actions. It gives the man a chance to demonstrate the level of training he has reached; this gives the foreman the chance to drop many repetitive contacts where he is always instructing a worker and never knowing the level of acceptance.

In the recent audit of the sintering plant, while we were making our field inspection, I asked one of the men on the job at the screening station how he protected himself

while changing screens. His answer demonstrated to me his knowledge and recognition of the hazards of the job. Since I knew that this area was one where we had tried the "ask" approach, I questioned the man on the safety contacts recently made by the foreman. His answer was very revealing. "The foreman asks me to show him how to do the job correctly instead of assuming I am dumb and telling me the same first-grade safety contacts he has told me for years. I know my job and I know I'll be the one to suffer if I get hurt, but it's only been since this new program that the foreman ever gave me a chance to show what I know."

With this recognition by a workman, I am sure the foreman knows he needs no longer tell the workman the repetitive safety contacts but, by regular observation of the man's working habits, he can assure himself that the man is working safely. However, it must be "by regular periodic observation," for I believe this is a basic requirement at all levels of supervision if we want to control injuries.

I have tried to point out several things. First, I, as a general superintendent, have a responsibility to see that an effective safety program is carried out in my plant within the scope and general outline of the United States Steel safety program. Second, to do this I have provided the management in my plant, through the corporation programs and training sessions, with the standards and requirements for an effective safety program. These have been clearly defined and explained to all persons concerned. Third, a periodic review of conditions in the field is a continuing requirement to assure that the program is being carried out so that our ultimate goal of frequency zero can be accomplished by a well-trained management and wage earner group.

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ADDENDUM

[The following paper, omitted from the published transactions of the 1963 National Safety Congress, should be inserted after page 32 in Volume 12]

SAFETY PROGRAM EVALUATION AS A GOVERNMENTAL FUNCTION

By M. F. BIANCARDI
Manager, Safety Services, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

(A talk delivered at the 51st National Safety Congress, October 29, 1963)

Much of my discussion this morning reflects the deliberations of the Committee on Government Regulations of the National Safety Council's Industrial Conference.

This Committee was formed to determine how the Industrial Conference might be concerned with the promulgation of state and federal safety regulations. Most of our work, so far, has centered about the U. S. Department of Labor's Walsh-Healey regulations.

In its analyses, the Committee has recognized the responsibility of governmental groups to provide safety leadership and to carry out their legal safety responsibilities—using enforcement measures where authorized. To support this I quote from the National Safety Council summary report of August 31, 1962 on the Walsh-Healey regulations:

> "Sound policy has been expressed in the Walsh-Healey Public Contracts Act which requires that supply contract work be performed under conditions which are safe for employes."

The Committee is exploring the practical use of performance standards as a governmental safety enforcement tool and as a device to aid government leadership in the promotion of balanced safety programs.

The Committee, in its approach, is trying to reflect the importance of the two major accident causation factors—unsafe acts of people and unsafe conditions—as well as the need for the acceptance of their respective safety responsibilities by management and non-management people.

We all recognize that ingredients of a program to reduce unsafe acts and control physical conditions include: Management leadership and support, acceptance of supervisory responsibility, employe cooperation, adequate safety education and training of all, a sound record-keeping system, adequate plant, tool and methods engineering, equipment and facilities maintenance, accident investigation and thorough safety inspections.

Others may word these factors differently, but I think we can all agree that these are typical of the basic ingredients of a constructive safety program. It would be unusual for any one of these factors alone to bring about effective employe protection. Efficient accident prevention is dependent on stimulating each of these factors. It is also believed that an over-emphasis of any one of these may mislead people into believing that the others are not important. An over-emphasis by the government or any other group on the control of physical conditions may have eventual adverse effect on the safety movement.

While I recognize the need for government regulations and their enforcement, I believe also in strengthening the effective use of the voluntary system which has brought us a long way and which recognizes that control of physical conditions is only a part of the total safety program.

I believe that we are all sincerely seeking the same objective—the maximum safety compatible with current social demand, technical knowhow and economic capabilities. Some people, however, seem to believe that safety varies in direct proportion to the number of rigid governmental regulations and codes, disregarding the fact that a primarily voluntary safety movement has brought this country top safety success.

On the other hand, there are a good number of people who think that we can over-regulate with rigid codes and that such a situation has a stifling effect, leaves little room for creativeness—for alternatives.

Yet, we tend to go on making more such regulations in our laudable desire to protect people—our fellow man. The safety professional has contributed to this situation as much as any other group.

Perhaps the true appeal of these regulations has other bases. Perhaps they relieve us of the need for confidence in other people, allow us to dilute our own responsibility and accountability, give us a crutch to lean on when we find someone who doesn't readily agree with our ideas, analyses and methods.

But there is a limiting aspect to rigid regulations that should be given much consideration. We may forget that as we control by means of specific requirements, we inadvertently put a ceiling on performance. The so-called minimum requirements contained in regulations provide a stopping point for people who are looking for an easy way out. Gradually, what was intended to be a minimum, becomes the accepted way—and safety progress suffers. Relying solely on specification type regulations waters down responsibility because they provide a set of rules that one can follow and then wash his hands of the whole business, even though they may not produce the desired accident prevention results. Experience in some of the regulations oriented European countries supports this opinion.

Safety requirements which are set by the government should be flexible so that they will readily accommodate increasingly higher safety performance as our knowledge, desire and economic capability increase. Ultimately, safety performance—by this I mean results and accomplishments in terms of life and property protection—is the measure that counts.

Therefore, many people have suggested that our regulation for safety be performance stimulating, rather than methods limiting. I subscribe to the performance "school." I believe that performance requirements better assure the safety results that we want.

A performance system requires that government regulations be stated in terms of the performance required. Latitude is provided in the method for accomplishing the results.

Meaningful performance requirements are not easy to come by, but they are possible and practical. They can provide either broad or specific requirements.

For the broad indicator, the safety engineer and others have been and still are looking for the one measure that would indicate reliably that all of the safety program factors (that I mentioned previously) are so well meshed with one another that a good program exists. The most popular system for such measurement is the ASA Z16.1 standard—and it provides for at least two measures, injury frequency and injury severity.

I'm not here to stump for Z16.1 or any other measuring system. I have used it because, so far, it is the only nationally accepted system. Furthermore, I have nothing else that I can use with greater practicality or confidence. I'm hopeful that some day we will refine it further or even find a better measure. It certainly is not the perfect answer.

The performance principle of regulations might well be built around over-all safety performance indicators such as frequency and severity. As a better measure or measures are developed, these might be substituted.

Under such a system, enforcement programs would be guided by over-all plant performance — a performance measure or measures that would reasonably reflect the soundness and effectiveness of the plant safety program. Thus a greater share of the enforcement effort would be directed toward the poor performers. Such a system provides an incentive for good performance, and at the same time, enforcement measures are used where they have the potential of producing the greatest amount of safety improvement—with the bad actor.

To some of you this might sound good—but even with these people, I can hear the challenge, "Fine, but how would it work? Be more specific."

Although all of the bugs haven't been worked out, I think we have the makings of a workable plan. Let's apply it to the safety administration of the Walsh-Healey Act, which concerns manufacturers receiving government contracts in the amount of $10,000 or more.

Here it is suggested that the following might hold:

First, use primarily the contractor's actual experience to judge compliance or non-compliance with the objective stated in the law.

In this respect, injury rates might be used for pre-contract determination of the level of

safety attained by contractors to determine their eligibility for contracts subject to the Walsh-Healey Act.

Think of the incentive to keep records, the spur to initiate programs, to make self-evaluations.

In addition, injury rates would be used to direct enforcement pressure onto high accident rate operations.

Now, with regard to regulations governing physical conditions, there would be the following:

1. Recognition of that portion of the Act that makes reference to state codes.

2. Where it is determined that state requirements are inadequate, and if there is authority to establish higher standards to attain the objective of the Act, there should be reliance on general physical performance requirements.

In these instances, where there are standards and codes produced by American Standards Association, National Fire Protection Association and similar groups, a contractor's compliance with such codes would be considered to be compliance with the general performance requirement. If a contractor is not in compliance with such standards or codes, the contractor would be allowed to show that an existing condition is not hazardous.

Finally, where standards and codes of the above types do not exist, the recommendations of trade and professional associations and other qualified organizations, and the judgment of professional engineers would be utilized to determine whether a specific set of conditions is hazardous under the actual circumstances of operation.

Please notice that this system is built around an everchanging set of indicators and standards. The measure of average frequency and severity would change as we improve our individual performances. Theoretically, we would never catch up until the average became zero. Therefore, automatically, pressure is on everbody to improve.

Further, the voluntary standards referred to are continually changing as our know-how increases. Thus the needed levels of performance, in this respect, grows continually higher, too.

This is a thumbnail sketch of a performance oriented system.

I've given the Walsh-Healey situation as an example. In our committee work we are considering not only Walsh-Healey but all state and federal safety regulations and evaluating the applicability of performance standards to them.

Should we be able to harness performance standards and particularly those that measure and evaluate total program effectiveness—to assist governmental safety leadership and enforcement, the following benefits will accure:

1. Promote the keeping of records.

2. Promote initiation of new safety programs.

3. Promote program self-evaluation by plants.

4. Direct enforcement procedures to poor performing establishments.

I believe that these possible benefits to the advancement of accident prevention are so great that any system that might bring them about should be explored with an open mind —not only by the National Safety Council but by other groups including business, unions, professionals and the government.

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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. Maximum acceptable, allowable, or permissible values are in my thinking, just what the name implies—maximum 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 basically 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 base 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.

THE PROBLEMS IN THE APPLICATION OF DIRECT READING INSTRUMENTS OR DEVICES FOR THE EVALUATION OF HEALTH PROBLEMS*

By H. F. SCHULTE

Dir., Industrial Hygiene, Los Alamos Scientific Laboratory, Los Alamos, New Mexico

Before dealing with the problem of instruments, we must first give some consideration to the type of problem we wish to solve with these instruments. What hazards in industry are we looking at and trying to evaluate? There is a fairly conventional outline of such hazards which is useful as a framework for our discussion.

The most numerous hazards are chemical in nature and these are conveniently divided into the particulates and the gases or vapors. Particulates are mixtures or dispersions of solid or liquid particles in air. These include dusts, smoke, mists and similar materials. Some of these are practically insoluble in body fluids and exert their effect directly in the lungs while others are soluble and produce systemic poisoning.

Direct reading instruments for the insoluble materials are difficult to make since such instruments must count or otherwise determine the number or quantity of particles suspended in air. Some data regarding particle size are also desirable. Direct reading instruments for this purpose do exist but they are very expensive and often quite bulky. These usually work on the principle of light scattering, measuring the light scattered at right angles to the beam or in the forward direction.

Gases and vapors can be determined more readily by direct reading instruments since they form more homogeneous mixtures with air and actual separation is often unnecessary. This group includes such common materials as carbon monoxide, mercury vapor, hydrogen cyanide, benzol, carbon tetrachloride and many others. Here one often has to make a choice between direct reading instruments or samples collected for laboratory analysis.

Another broad group of hazards requiring analysis are the physical hazards. These include problems of heat and cold, ionizing and non-ionizing radiation such as microwaves, noise and vibration, abnormal pressures and others. In this field, practically all instruments are direct reading. In the field of ionizing radiation alone, we have literally hundreds of instruments, most of which have been developed in the past 10 years. It is interesting that in this field two groups of workers have appeared — the strict instrument reader, usually called a monitor, and the professional health physicist who interprets the results from the monitor plus other technical considerations.

Finally, there are biological hazards in certain industries and occupations. These include many forms of bacteria, virus, molds and fungi. The presence and concentration of these materials may be important but their determination is strictly a job requiring laboratory facilities. No direct reading instruments are available. It also should be noted that there are no instruments at all for the evaluation of such common potential hazards as skin burns, dermatitis, skin infection, allergic reactions, ingestion of poisons, beryllium embedded in the skin, fatigue, etc. Here, experience and knowledge function in place of instruments.

A new area for study is that of mixed exposures or multiple stresses. It is assumed that stresses on the organism are additive in some fashion but not always directly. One stress may conceivably counteract another in part — or two stresses may produce a greater effect than would be expected from the simple sum of them. This is known as a "synergistic effect" and is only now beginning to be studied. Examples of mixed stresses include ionizing radiation plus dust, high temperature plus toxic vapors, fatigue with toxic chemicals and noise affecting accident proneness. Here, no instrument can give a simple evaluation of the problem.

Having looked at the broad outline of

*This work was presented under the auspices of the U. S. Atomic Energy Commission.

possible health hazards in industry and recognizing that some are not capable of being evaluated by instruments or even by laboratory analysis, what is the technique to be used where measurements can be made? How do we evaluate a hazard?

First, of course, we must know that a potential hazard exists. This is like the old recipe for rabbit stew — the first step is to catch a rabbit. We also must know something about how serious the problem could be. This requires some knowledge of toxicology and the maximum allowable concentration or the threshold limit value (TLV). However, we also must know that benzol with a threshold limit value of 25 parts per million (ppm) is much more dangerous under conditions of chronic exposure than hydrogen chloride with a TLV of only 1 ppm.

How far beyond the limit can one go for short periods, and what is the likelihood of a few individuals being injured at less than the limit? With every threshold limit, there is an implied recognition that is represents the concentration that has the highest probability of being the maximum safe concentration for a large number of people. The investigator recognizes that a few people require a lower concentration and some can stand a somewhat higher concentration. In other words, if we plot probability of being just safe against concentration, we will get an approximation to the well-known bell shaped curve with a maximum value at the TLV. The width of this curve, known as the dispersion or standard deviation, varies from one substance to another.

Of course, what we really wish to measure usually is the dosage the man receives — how much toxic material does he take into his body? Thus, duration of exposure, as well as concentration, is important. For the concentration measurement, we must make the test on the air the man actually breathes, that is, in his breathing zone. This often presents difficulties and there usually are two choices available. In some cases, we can attach the measuring instrument directly on the man and have him carry it throughout the working day as we do with a film badge for measuring radiation exposure. Relatively few samplers are available at present for taking such continuous samples in the breathing zone. The other technique is to measure concentration in the breathing zone over carefully selected intervals, then average the results and weigh each measurement according to the length of exposure to the concentration represented by that measurement. The result is a daily weighted average concentration. Hence, it seems obvious that a few spot samples usually will not give results permitting a good evaluation.

Having obtained a satisfactory average exposure measurement on a particular day, one must consider how this is affected by changes from day shift to night shift, winter to summer with their ventilation difference, routine changes in plant operations, daily changes in rate and direction of air movement. Also, he must consider whether the presence of the sampler alters the routine of the operation in any manner.

Next, one must consider the physical form of the contaminant — is it soluble or insoluble in body fluids? What is its particle size distribution and in what portion of the respiratory tract is it likely to deposit? What is its chemical nature? Arsenic as arsine is quite different from arsenic as the oxide. Organic mercury is different from mercury vapor, which is different from mercury oxide. One also must consider factors which possibly require a revision of the standards — high temperatures, high altitudes, etc. Finally, are there limitations on the peak dose rates as there are for beryllium and some other compounds? These are all considerations in evaluating a hazard.

Now, let us look at some of the specific types of instruments available. We can distinguish certain classes. The first general class is that which gives a reading on a dial, frequently an electrical meter of some sort. These usually involve some electronic circuitry. Right here I wish to insert a warning — be as skeptical as the village atheist. Remember the elaborate countdown that precedes a rocket launching. This is done to check out the electronic circuits. Do the same with your electronic instruments, and if you have many such instruments be prepared to hire a full time maintenance man to keep them in working order.

This class of instruments includes many types operating on a variety of principles. The combustible gas indicator and the carbon monoxide indicator are based on a measurement of the heat produced by oxidation of these materials, although the method

of doing this is different in the two instruments. Mercury vapor in the air can be measured by absorption of ultraviolet light of a specific wave length. The same technique also has been used for certain chlorinated hydrocarbons.

Ionizing radiation is measured by the amount of ionization produced in an ion chamber containing a known volume of gas. Highly sensitive detection of certain hydrocarbons has been accomplished by measuring their effect on the ionization produced by a hydrogen flame. Oxygen is measured by the reduction in polarization produced at a sensitive electrode. There are many more such devices varying widely in sensitivity, reliability and ease of maintenance. All require some reliable method of calibration to be applied prior to each time it is used in the field.

The second class of direct reading instruments are those which produce a color change in a sensitive chemical through which the air to be tested is drawn. This is a more numerous class and one which has had a great deal of development in recent years. These devices depend on a comparison of the colors produced against a set of standard colors or the measurement of the length of the stain produced in a tube packed with reacting chemical.

There is now available a wide assortment of tubes for use on many common chemicals in the atmosphere. These include tubes for hydrogen sulfide, aromatic hydrocarbons, hydrogen cyanide, carbon monoxide, trichloroethylene, tolylene diisocyanate, mercury vapor and others. Manufacturers of these tubes supply lengthy lists of chemicals which may be detected by such tubes. Such lists sometimes give an exaggerated impression of the versatility of this technique since compounds are often included for which the tubes have only a limited sensitivity.

We must consider the intrinsic limitations of these various instruments. We have already mentioned some of the problems with the electrical devices — maintenance, component unreliability, and calibration requirements. To these should be added poisoning of catalysts by interfering substances in the atmosphere, changes in air flow rates and volumes, and battery replacement. For these reasons, a routine schedule of maintenance and calibration is a necessity.

The colorimetric tubes and papers present a somewhat different problem. They are deceptively simple to operate and, hence, one is tempted to ignore their limitations. Air is usually drawn through the tube with a squeeze bulb so there is no motor to fail or battery to replace. Nevertheless, they do produce many problems as will be confirmed by anyone who has made studies on them using known concentrations for calibration.

There have been and still are variations from one tube to another due to manufacturing conditions which have not been controlled. This is hardly surprising in a new field such as this where the makers are still discovering factors which must be controlled. There has been improvement in practically all tubes as experience has been gained by users and makers, and some tubes have been withdrawn from production. The manufacturer can benefit by the user's experience only if he hears of the results and if these results are viewed critically.

One form of variability which has been troublesome, but is obvious to the user, is that produced by non-uniformity in particle size of the media, usually silica gel, which supports the reacting chemical. The result in some tubes is that in transportation the gel fractionates into various sizes by gravity and the line between stain and no stain is not sharp but stretches irregularly across the tube and may extend much further on one side than the other. It is impossible to obtain an accurate reading with such a tube.

The tubes vary considerably in their degree of chemical stability, which also is not surprising to the trained chemist. The useful storage life of most tubes can be prolonged considerably by storage in the refrigerator. However, the purchaser may have no way of knowing how long the tubes have been on the supplier's shelf and what have been the storage conditions. Recognizing this, most manufacturers are now putting an expiration date on their tubes.

Rates of chemical reaction are very dependent on temperature and, hence, many tubes will give incorrect readings at high or low temperatures. When tubes must be used in cold locations, it is a good practice to carry them in an inside pocket next to the body where they can be kept warm. They must be used quickly after removing them from the pocket. The air drawn through the

tube is cold and, hence, results obtained with such a tube still must be used with caution. Extreme temperatures change the volume of air drawn through the tube, also affecting the results.

If more than one substance is present in the atmosphere, it may cause interference with the accuracy of the tube, giving either a color which cannot be matched with a standard or an incorrect reading. Some tubes come with detailed instructions for their use including a list of possible interfering substances. Unfortunately, many people fail to read the instructions completely or they are unaware of the presence of interferences. There is considerable variation among suppliers in the amount of information which is given.

The air flow through the tube usually is produced by either a squeeze bulb or a hand pump. The squeeze bulb is subject to volume variations depending on how tightly it is squeezed. The hand pump is less variable, but leaks in valves or past the piston can give false results unless the air volume drawn is checked periodically.

New precision-made pumps are a recent development which is helping to lessen this difficulty. Many tubes are affected by the rate of air flow as well as by the total volume drawn through the tube. This flow rate usually is regulated by a fixed or variable orifice and must be checked regularly. Dusty conditions will quickly plug such orifices, giving low air flow rates.

Color blindness, which may be unsuspected by the operator, can lead to false results, especially where colors must be matched against standards. Finally, the cost of these devices must be studied carefully. The initial cost usually is low as compared with an electronic instrument or a pump and bubbler system for taking samples for laboratory analysis. The simplicity of sampling, however, may result in careless use of tubes or in the taking of an excessive number of samples. It may be necessary to take many samples to obtain information equivalent to a single integrated sample for laboratory analysis. Unless usage rates are well known, many tubes may need to be discarded because they have reached their expiration date. Careful study of these factors may yield surprising results in terms of costs.

Calibration of the instruments is not difficult but requires facilities not always available in the industrial plant. It is necessary to have some type of chamber and to produce in the chamber an atmosphere containing a known concentration of the contaminant. Since a tube once used for calibration is worthless for further use, this method does not give complete reassurance about the accuracy of measurements with other tubes. In this the color tube method differs from electronic devices or collection of samples for laboratory analysis. The best that can be done is to test a definite number of tubes from each lot produced by the manufacturer. If the number of tubes used does not justify purchase of a considerable number from a given production lot, the cost of tubes used for such calibration may make their use unjustified.

The dangers from improper use of direct reading instruments or from false readings on color-indicating tubes are fairly obvious. As a result of a few measurements of high concentration, an inadequately trained man making a hazard evaluation may shut down an operation resulting in considerable financial loss. On the other hand, with insufficient attention to limitations of these instruments, it is quite possible to get low, seemingly safe readings and still have a real hazard leading to occupational disease and excessive work losses.

Let us look at an actual case which illustrates some of the distinctions between direct reading and laboratory analysis. There is no real qualitative distinction between these techniques, and in some cases they grade into one another. At Los Alamos, we had an operation involving the release of hydrogen chloride into the working area. In order to measure the air concentration, the industrial hygienist could have the chemist make up a solution containing known amounts of sodium hydroxide in a series of bubblers or impingers. The contaminated air could be drawn through each bubbler at a measured rate for a fixed period of time and the samplers returned to the laboratory. There, the excess sodium hydroxide would be back-titrated by the chemist with hydrochloric acid and the air concentrations of hydrogen chloride calculated. This then would be the laboratory analysis method.

In this particular situation, however, the industrial hygienist decided to use a different

technique. He had the chemist use a smaller quantity of sodium hydroxide in each bubbler and place an indicator in the solution. In the field, then, the industrial hygienist drew air through the solution at a known rate and measured the time it took to obtain a color change in the bubbler. From the volume of air drawn through, he was able to determine the air concentration of hydrogen chloride by a very simple calculation. This, then, is essentially a direct reading method.

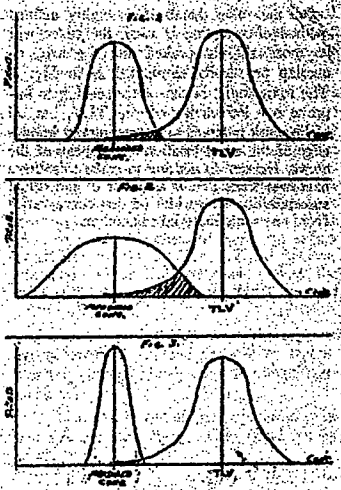
Both methods are adequate for measuring the air concentration at the point of sampling. It should be noted that in both methods the reagents were prepared by a trained chemist. In one case the industrial hygienist took a sample for a fixed period of time, in the other he sampled until he saw a color change. Essentially, no difference in skills is required. In the "direct reading" method, he can now take his second sample with the facts about his first result already on hand.

This is the crucial difference between the methods and this is where the user of the direct method must be wary. He may be led on a trail of seeking higher or lower concentrations and away from his objective of measuring the man's exposure under truly typical conditions. A certain impartiality is created by ignorance of the immediately preceding results. A more representative sample may be obtained. On the other hand, a trained industrial hygienist can utilize this progressively increasing knowledge of results to sharpen the precision of sampling.

Safety engineers have been using direct reading instruments for many years to detect combustible and explosive gases and have saved many lives as a result. Should not this experience qualify them for a similar use of direct reading devices for lead or carbon tetrachloride? Note that in the case of explosive gases we are looking for peak concentrations *not* related to a man's exposure. Also, explosive limits are physical constants which can be modified only within narrow limits.

Threshold limit values must be interpreted broadly, recognizing that the value really varies considerably from one individual to another with breathing rate, individual defense mechanisms, excretion rate, nutrition factors, infection, use of alcohol, temperature and other conditions, some of which are unknown. A factor of safety adequate to protect the most susceptible worker may be economically penalizing to the plant. Hence, the limit must be applied in conjunction with results from prior analyses, physical examinations and other procedures to detect hypersensitivity.

The extent of the problem is best illustrated by reference to a series of graphs in which the ordinates show the probability of a given measurement being absolutely correct and the abscissas represent concentrations of contaminant. When one makes a concentration measurement or averages a series of concentrations, the result he obtains, at best, is the one having the highest probability of being correct. Higher or lower figures are less probable but still possible. If one could actually measure this degree of probability, he would obtain a graph similar to the left hand curve of Fig. 1. The width of this curve is a measure of the accuracy of the sampling method.



The right hand curve of Fig. 1 expresses our knowledge of the threshold limit value for the substance under investigation. The peak of the curve, its point of highest probability, is the value of the TLV which is given in the tables of the American Con-

ference of Governmental Industrial Hygienists. It is the value which is just safe for the largest number of individuals. For a lesser number of individuals the value which is safe may be higher or lower than this value. Note that in this particular case there is a small area of overlap of the areas under these curves. The size of this area of overlap represents the probability of the measured concentration being excessive in this situation.

Now consider the use of a sampling system of lesser accuracy than this one as represented by the left hand curve in Fig. 2. Here the curve is broader and lower while the TLV curve remains the same. The indicated concentration represented by the peak remains the same but the overlapping area is much larger. This type of result may be typical of that obtained by a color-indicating tube and it is obvious that the probability of excessive exposure is larger than with a better sampling method.

On the other hand, if a highly refined method of sampling is used, the curve will be more sharply peaked and the area of overlap practically eliminated as in Fig. 3. The toxicologist is constantly seeking to improve our knowledge of the TLV, but all of his work is aimed at improving our knowledge of the exact location of the peak of the curve. He can do nothing to make this curve narrower since that is a matter of individual susceptibility. The width of this curve varies from one toxic material to another.

With a full knowledge of all of these facts, the trained industrial hygienist is in a position to utilize direct reading instruments to considerable advantage. He can take more samples, get closer to the breathing zone, screen out areas for more detailed study, search out specific sources of air contamination and do a good job of evaluating the worker's exposure. Under careful direction, a non-professional industrial hygiene technician can obtain results to be evaluated by the industrial hygienist just as the industrial hygienist can report possible unsafe areas of potential accidents to the safety engineer for his professional study and evaluation.

In summary, the direct reading instrument gives a measure of the concentration at the point and time of sampling. If the samples are collected at the right places and combined with a time study of the worker's activity, they give a measure of the average worker's intake of the toxic substance.

Whether direct reading or other techniques are to be used is a matter of professional judgment and the results obtained must be compared with threshold limit values with a full knowledge of the latter's limitation and consideration of other factors in the situation. Urine assays add to the available facts in making an evaluation of exposure. These, in turn, must be combined with knowledge obtained by the physician directing an adequate medical program. All this serves to emphasize the basic teamwork approach of the industrial health program.

Multi-Plant Safety Administration

SAFETY IN THE MULTI-OPERATION COMPANY

By CHARLES O. WRIGHT
Mgr., Industrial Relations, MacMillan, Bloedel & Powell River, Ltd., Vancouver, B.C., Canada

When I was asked to participate in the "Multi-plant Safety" session, I was at somewhat of a loss as to what the title of my talk should be. The term "multi-plant" would not fit due to the fact that, in addition to the many plants operated by my company, it is also engaged in the logging business, the towboat business, and the shipping business. We are even partners in a small flying company known as Forest Industries Flying Tankers Limited. This consists of an air force of one converted Martin Mars flying boat which is used in water bombing forest fires. These activities, I am sure you will agree, are too broad and diversified to be classified as plant activities. I therefore chose the title "Safety in the Multi-operation Company".

Before getting into the vital subject of safety, I would like to tell you just a little more about our company and its varied activities. I do so, not for the purpose of trying to impress, but rather to illustrate the many completely different types of businesses we are engaged in and, thus, the problems in establishing an over-all policy approach to safety.

The company, with headquarters in Vancouver, B.C., owns and operates five saw mills, two plywood plants, three pulp and paper mills, seven packaging plants, 17 logging camps, one fine paper plant, two cedar shingle mills, 16 sales offices and warehouses in Canadian cities, one towboat subsidiary which operates ten tugs and sixteen barges, one shipping company, and, as I said, before, we are partners in a one-plane air force used in fire suppression.

We have three sales offices in the U.S.A. (New York, Birmingham and Portland) and agents in important countries throughout the world.

In addition, we provide market services to important wood product manufacturers in western Canada.

We have approximately 14,000 employees, 129 managers, 125 superintendents, and 650 foremen.

Our gross sales in 1962 were approximately $330,000,000 and our net earnings were $36,000,000.

You may be surprised to learn that in spite of all this activity, we have but one safety coordinator. This, however, does not in any way reflect a lack of interest in safety. On the contrary, there is a good reason for it.

Our company, like many others in Canada and the U.S.A., has grown and expanded tremendously over the past 10 to 15 years. This is the result of natural growth and also of two important mergers. In the days when the company was smaller, one or two safety men could visit each operation at least once a month. They could attend plant safety committee meetings, carry out inspections, and investigate major accidents. A few years ago, however, as the company was substantially expanded, it became obvious that we could not continue to do the safety work from the head office. We had to organize and divisionalise safety, as has been the case with other management functions, and set up controls.

Those of us involved in reviewing our safety program for the purpose of recommending changes slowly came to several conclusions:

1. That safety and efficient operation were one and the same thing. They could not be separated.

2. That safety is primarily a line management responsibility.

3. That the company must declare company policy with respect to safety and spell it out to operating management who would, in turn, instruct subordinates in their responsibility for production and safety.

4. That objectives in the form of frequency rates should be established for each plant at the beginning of each year, and reviewed annually.

5. That controls in the form of consolidated reports should be prepared for senior management once each month, showing objectives and performance to date, comparisons with previous periods, and also with groups of companies in their class.

6. That the company must undertake the training of supervisors which would provide them with a systematic approach to job analysis, emphasizing hazards and establishing correct work procedures. It was decided that competent people would be selected from each division for special training to serve as instructors for their particular operation. They, in turn, would instruct the supervisory group at their operation.

With the objective of having the company's philosophy towards safety clearly understood, the Chairman and Chief Executive Officer of the company, The Honorable J. V. Clyne, made this declaration: "The company believes that with good management and well trained and efficient supervisors, accidents can be eliminated".

With this philosophy established by the chairman, the president then called a meeting of operating managers to inform them of the company's views on safety and to instruct them in their responsibilities. He said:

"The key to accident prevention is the quality and know-how of management and supervision. They must accept the responsibility for:

"(a) Training and directing the working forces in production and safety.

"(b) Ensuring that our operations and equipment are safe, well maintained, and efficient.

"Our company considers safety one of the main functions of management; we cannot accept poor safety records. Safety is a subject of vital concern to everyone.

"We must accept responsibility for the safety of the men and women who work under our direction. This responsibility extends from the Chairman of the Board to every member of the management team. If a plant can operate accident free for 100 days, it can operate accident free forever."

Having adopted the principle that safety is a management responsibility, and mindful of our president's declaration that the key to accident prevention is the quality and know-how of management and supervision, the next thing to do was to develop a safety program accordingly.

Separate management meetings of various product groups were held, at which time the past performance of each operation within the group was reviewed and the president's views restated. Report of past accidents were analysed, using workshop procedures to determine the real cause of the accidents. In practically all cases, it was determined that with better training, supervision and planning, these accidents need not have occurred. At these meetings, objectives were established for each group for the forthcoming year.

The current objectives are as follows: Frequency rate—Plywood, 4.5; sawmills, 9; shingle, 9; pulp & paper, 4; and logging, 20.

It might well be argued that we were approaching the matter of objectives from a defeatist point of view, and that our frequency objectives should be established at zero. While I am sure that someday we will fix our objectives at zero and achieve them, it did seem unrealistic to do so in the beginning. Objectives are under review each year, however, and they are reduced where it is practical to do so.

Each operation manager was now on his own. He knew what the company wanted in safety performance, and he knew what his objective was. He knew that his safety record would be reviewed along with his costs and productivity. He also understood that his safety record would be a factor for consideration in his appraisal for possible promotion and/or salary review.

On the question of costs, and as an added incentive to cost-conscious production men, the potential savings as a result of an effective safety program were pointed out. As we all know, the reduction of accidents, and thereby compensation costs, reflects in lower premiums or assessments. In 1943, the compensation assessment rate in logging was 11½ percent of payroll. Today, the rate is 6 percent. On an annual payroll of $77,000,000, this savings potential is tremendous.

In other words, on the basis of each $1,000,000 of payroll, each one percent reduction

in the assessment rate is worth $10,000 in actual cash savings. We all know that the compensation costs of accidents are fractional compared to the actual costs.

At this point, it became the plant manager's responsibility to develop a safety program tailored to the needs of his particular operation. He had to impress on his superintendent and foremen that they were responsible and accountable for safety. Foremen could no longer take the view that production was their problem and safety belonged to someone else. Foremen were informed that they were, in effect, running a business and were responsible for all aspects of it.

The manager's responsibility for the safety program does not end with the establishment of the safety organization and approval of its activities.

The manager must:

a) Accept full responsibility for the results of the divisions' accident prevention activities.

b) Establish a divisional policy in relation to these activities.

c) Promote in his management group a true sense of obligation to these responsibilities.

d) Promote attitudes at all levels of his organization which will contribute to accident-free operations.

e) Establish necessary controls to assess results and to assist key personnel in improving their performances.

f) Insure adequate training for supervisors and hourly employees to develop good leaders in the field of safety as well as production.

g) Establish controls to ensure that the operation is maintained and guarded in accordance with Workmen's Compensation Board regulations.

Many of the foremen required training in job analysis and job instruction. This is where the accident prevention coordinator and training department fitted in. Selected men, usually from the supervisory group, were chosen for special training to fit them for the job of training their fellow foremen. Where the divisions were too small to conduct their own training program, workshops were set up at centrally located points where foremen from various types of operation could receive special instruction. It was very interesting to observe the enthusiasm with which these workshops were accepted, and equally interesting to note that, although foremen came from completely different types of operations, i.e., a paper bag plant as compared to a logging camp, the principles involved were identical.

Now, we had to get down to the grass roots—the relationship between the foremen and the men under his supervision. While the principles are the same throughout the country, variations in approach and technique have naturally developed. For example, logging men work in small groups, often miles away from each other under changing ground and weather conditions. Employees must be trained to exercise a high degree of initiative, alertness and good judgment. Close supervision, as we know it in our mills, is not feasible or practical in logging. It is vital that we teach them to think safety, and automatically analyse each situation for themselves.

In all operations, the foremen, together with the employees, either individually or in small groups, analyse each job coming under his jurisdiction. The jobs are broken down under three headings—"Steps", "Key Points", "Safety Instruction". When all jobs in the foreman's section are analysed, the breakdown sheets are placed in a binder and become the foreman's bible with respect to job instruction in his department. In introducing a new man to his job, this becomes a blueprint for him to follow in making sure that all factors are covered in the initial instruction. Follow up, of course, is vital. This is done by means of individual, day-to-day, on-the-job checking, and by means of periodic area safety meetings conducted by the foreman. Minutes of each such meetings are reviewed by either the plant personnel supervisor or the superintendent, as a control check.

Another useful tool is the foreman's critical factor list. Under this phase of the program, accident reports are circulated to other similiar divisions of the company. The receiving foremen, in groups, analyse the accident report and apply the list of some 24 critical factors to see which of them applies. By doing, they are benefiting by the mistakes of others.

In spite of the best of plans, sometimes the gears slip and we find a rash of accidents occurring in one operation or another. This

is where the company safety coordinator comes in. We regard him as somewhat of a diagnostician. He consults with the management group and tries to find out the cause of an accident. It nearly always develops that somewhere along the line there has been some relaxation. Perhaps the program had been going well and, as a result, had been allowed to coast. We know from experience that to obtain and hold good results, you have to keep working at it.

Each division, of course, uses employee incentives. This is an area where divisional managers try to outdo each other in good-natured rivalry. They promote contests of all kinds with suitable prizes and awards, all of which are aimed at promoting employee enthusiasm.

Under the heading of incentives, we have the President's Safety Award. This is a particularly fine and specially designed silver trophy which is awarded annually to the division having the best record for the year. As the hazard factor in some operations is much higher than in others, we have developed a system of handicapping, so that they are compared on an equal basis. Last year, seven divisions in the company completed the year with a frequency rate of zero. In this case, the one with the greatest number of manhours of exposure, weighted by the hazard factor, won the trophy. I am proud to say that one of the divisions with a zero frequency was a logging camp.

One of the key figures in the safety program is the company safety director, or accident prevention coordinator, as we call him. He is responsible for assisting line management in planning and organizing all phases of the program.

He must maintain liaison with the Workmen's Compensation Board and the various industry associations to which the company belongs. He must prepare suitable comprehensive reports for the information of senior management, and must set up controls. He establishes suitable training programs, keeps up to date on available safety data, such as pamphlets, posters, etc., and generally assists in stimulating interest where necessary. He is the liaison man between divisions, and is the constant advisor to camp and plant managers. He is the number one trouble shooter and, as I said before, diagnostician.

So far my talk has concerned itself with programs, theories, organization, statistics, costs and gimmicks, and has not touched at all on the human factors involved. We hope that we have not mechanized our thinking to the point that we have overlooked the fact that the curve on the frequency rate chart represents human suffering. On the contrary, we are acutely conscious of the fact that it represents untold misery and hardship. It represents broken homes, where the breadwinner is killed. It represents tears, heartaches and broken bones.

We are most anxious to reduce our accident frequency rates and bring our costs down, but our prime objective is to eliminate human suffering. In all cases where serious accidents occur, our senior management insists on being informed at once, and review in detail the accident investigation report. They are not satisfied until the true cause of the accident is established, and see to it that appropriate action is taken. Over the years, we have achieved some successes, but we still have a long way to go. Sometimes, in spite of our best efforts, we suffer temporary failure. But, by continual hard work and planning and the ever available help from our friends in the National Safety Council, we look forward to the day when accidents are completely eliminated from our operations.

Audio-Visuals Pep Up Pallid Programs

BASIC PRINCIPLES FOR THE EFFECTIVE PRODUCTION AND USE OF VISUALS

By RAYMOND W. TRIMBLE
Education Specialist, Ninth Naval District, Great Lakes Naval Training Station, Great Lakes, Ill.

As a figure of speech, do words mean what you intend them to mean?

One of the greatest problems in speaking is the illusion that understanding has been achieved.

Most of us feel that whatever is obvious to ourselves should also be obvious to anyone else. We take for granted that our own personal way of expression is clear and easily understood. Anyone of this opinion is of course wrong, for all people see all things in may different ways.

I have selected five true-life situations which I will use to further explain my point. These situations involve known personalities from the fields of education, journalism, sports and the military.

First of all we have a local personality, Dr. Daniel Q. Posin, of DePaul University. He has given us five rules for clear teaching and speaking, what he calls speaking "meaningfully and clearly".

He says first, "avoid jargon". The dictionary lists jargon as "confused, unintelligible speech". I think Dr. Posin means here to choose words and phrases according to the level of the group to which you are speaking. I have watched him on television as he has spoken to groups of five-year-olds and to groups of college seniors. He handles each with equal ease and effectiveness.

Secondly, he says "utilize apparatus, charts and visual aids". In other words, show your group what you are talking about in order to be interpreted accurately and completely.

Thirdly, relate the subject matter to the founders, etc. This is the motivation and interest-getting factor. Getting a group interested in the subject about which you are speaking is paramount in effective speaking, and is an objective which must constantly be striven for in any presentation. Stories on the early beginnings, successes and failures, and persons involved, will tend to capture and stimulate audience interest.

This motivation factor is further enhanced when the speaker is himself alive, and appears to enjoy the subject through his own dramatizations of it.

And lastly, we give no argument to the proposition of rule No. 5, that being an expert in the subject is extremely helpful to the speaker.

(At this point Mr. Trimble showed reprints of items described below.) Now we hear from Sidney J. Harris, who is a journalist and editorial writer for the *Chicago Daily News*. In his article, the "Real Meaning Behind Words," he raises "antics with semantics" by describing how we use self-deprecatory statements when we plan to imply or say just the opposite.

My next item was taken from Bill Veeck's book, *Veeck as in Wreck*. In his book, Mr. Veeck speaks of his being in such great demand as a banquet speaker. He has given literally hundreds of speeches to groups of all types during the past few years. He kiddingly claims that this great demand stems from the fact that he is the most inexpensive speaker in the country. He doesn't charge a cent. Here he discusses himself as a speaker.

"One thing I have no egotism about at all is my ability as a speaker. A professor of speech once stood at the back of the hall and graded my performance. He reported that I did everything wrong, that my voice was weak, my delivery pitiful and my organization impossible. I also, I learned, had the lamentable habit of twisting my finger through my hair as I talked, and scratching my wrist. "If you were a student of mine," he said, "I'd have to flunk you. The only thing I can say for you is that you seem to be completely effective."

The next idea came from this book by Wittich and Schuller, *Audio-Visual Materials —Their Nature and Use.* Chapter two, "How People Learn," tells the story of three drawings which were inspired by the same verbal description of an animal called the "aardvark". The story tells of the editors of *Parade* magazine calling together three of their staff artist-illustrators. These three artists were experts. They made their living by visualizing ideas. They were given a verbal description of the aardvark, and each was asked to draw it according to his own interpretation of this description. The editors of *Parade* reported that their artists were rather befuddled in their efforts, and proved, "that even the most precise words do not convey an idea as graphically as a single picture."

My next item of interest is Navy in origin, so I purposely and fittingly have reserved it for the last. This item appeared in a Navy Bureau of Ships information letter. This article told of a particular office where some concern existed about official correspondence which was going out to the field and being misinterpreted. This was obvious by the answers they were receiving back in the office.

So the Navy officer-in-charge circulated this article to all persons responsible for originating correspondence. This article is titled "Proper Selection of Words Insures Accurate Understanding".

A plumber wrote to the Bureau of Ships explaining that he had found hydrochloric acid good for cleaning out clogged drains.

The Bureau replied:

"The efficacy of hydrochloric acid is indisputable, but the corrosive residue is incompatible with metallic permanence."

The plumber wrote back that he was glad the Bureau agreed with him.

To which the Bureau responded:

"We cannot assume responsibility for the production of toxic and noxious residue with hydrochloric acid and suggest you use an alternative procedure."

By return mail the plumber wrote he was glad the government thought his idea ok.

Finally realizing its failure to get the intended information across, the Bureau wrote:

"Don't use hydrochloric acid. It eats hell out of the pipes!"

BASIC PRINCIPLES IN THE PRODUCTION AND USE OF VISUALS

By W. J. CONNELLY
Mgr. of Advertising, Union Carbide Plastics Div., New York City;
National Pres., Industrial Audio-Visual Assn.

Sift your visuals through a simplification sieve. Keep them free of minutiae. Discard any details that aren't absolutely necessary. If you have to explain a visual—it's the wrong visual!

Regardless of importance of the information, it is never necessary to jam a slide or a chart or a flockboard with an overpowering mass of information.

You really cause confusion when your visual has too much on it. And, consistently, the more your visual has on it, the harder it is to lead your audience. They'll be busy reading the slide—and not paying any attention to what you're saying.

Figures and comparisons should be broken down into related series or sequences and presented as individual units. There should not be enough material on the slide to justify their wandering away from what you're saying, just so they can read all the material on the slide.

Color in visuals is a real help. With a poorly designed slide, the audience may see better than 99 per cent white reflected light from the screen. Less than 1 per cent of what they see in the black lines, is the visual that is to aid the speaker. If the slide had been designed correctly in the first place to use up the available space and a negative, rather than a positive print had been used, the lines could have been colored by hand with transparent inks and a 10¢ paint brush and the result would be a superior slide. It's

easier on the audience and it concentrates their attention where you want it to be.

Color is an effective tool, in many ways, in visuals. It can lend emphasis, provide contrast, and it can also help set moods. In an illustration of fear . . . anger . . . or forcefulness, the judicious use of color—just the addition of a thin sheet of colored film in the slide—and you have heightened the impact of the illustration by so-called mood colors.

By the way, did you ever see a speaker look at a slide on the screen and sort of falter in his talk . . . and look at it for quite a while before he says anything? Many times he's startled by the actual size, never having run through a rehearsal of the talk—in fact he may never have seen the slide projected before . . . and can't find the item he's talking about.

This leads us to our next point. Memorize your visual's important points. Most speakers spend too much time looking at their own visuals instead of looking at their audience. Audiences are never impressed by the back of the speaker and they want you to talk to them—not the screen. If you don't memorize the points, at least have an exact copy of the slide's contents in front of you with your notes so you can talk about the slide on the screen as if you, too, were viewing it from the audience.

It is very important that you check the slide on the screen out of the corner of your eye to be sure that you are talking about the right slide in the right sequence or, if you are using a projectionist, that he hasn't decided to brighten up your talk with bright ideas of his own.

Give your audience a chance to "digest" your visuals. Permit your audience to quickly read or absorb your visual before you attempt to drive home your point or points. If you don't, the audience will either "tune you out" as they read your visual . . . or miss the point you are making.

While this presentation is based on slides, because of the size of the room and the audience, everything I have said, up to this point, applies to any presentation. It is only my last point that deals exclusively with projected visual presentations.

Don't have a "flickering presentation!" When you use projected visuals, plan the presentation so that you do not have the house lights off, on, off, on, throughout. You will create an increasingly restless audience that does not like to constantly adjust its eyes to *your* convenience. You should make it easy for them.

MOTION PICTURES—SILENT AND SOUND

By ARNOLD MIDLASH

Mgr., Creative Services, International Minerals & Chemical Corp., Skokie, Ill.

As a motion picture writer and producer, one of several functions I am called upon to perform for the Marketing Division of International Minerals and Chemical Corporation, I am compelled to tell you, *do not* make a motion picture . . . put away that camera . . . save the effort . . . save your money.

VOICE FROM TAPE: But a picture is worth 10,000 words!

A.M.: We have heard that one before.

TAPE: There are 24 pictures projected every second.

A.M.: . . . and 1440 visual impressions ricocheting off the retina every minute; and 14,400 pictures in a 10 minute film. Multiply that by 10,000 words, add music, narration, dialogue and there is an imposing argument in favor of motion pictures.

TAPE: You still say don't make a motion picture?

A.M.: I haven't the audacity to pass off a premise as a conclusion—to have you believe that a picture was ever worth 10,000 words. The fact is, I can think of words that 10,000 pictures have never fully cov-

ered. I can think of many words. Words like love, faith, beauty, man, woman, work, hate, democracy, justice, infinity, safety. How many pictures have you seen on these very same subjects? Is any one so definitive that you can say, "That did justice to the word?"

While I am being honest let me debunk some other ideas. There is no such thing as motion pictures. Those 24 pictures per second reflecting from the screen give you, the viewer, the illusion of continuing motion. Your eye with its built in memory, your physiology, is being tricked.

TAPE: But I want a motion picture.

A.M.: Some people never give up. Alright, you know one word. The word is safety. More specifically, safety as it applies to your business or situation. If I could read your minds, I would be looking at completely different pictures of safety. To each of you safety means something completely different.

TAPE: I want to make a motion picture.

A.M.: If you insist, then make a *right* motion picture. Let the moving image do for you what no other medium can ever attempt. Let it appeal to the emotions, and through the emotions to your physiology.

The motion picture can make you cry, feel happy and feel sad, can make you like and dislike. If you make a motion picture which fails to appeal to the emotions, you have a dull epic—a costly one—that should never have been made in the first place.

TAPE: (Musing) A motion picture should appeal to the emotions?

A.M.: Hasn't that been the problem right along? Isn't this where we might be missing the boat? Haven't surveys already carefully told us that the accident is something that happens to the other guy—not me.

TAPE: "I drive fast, but I am careful."

". . . and I have been driving for 25 years without seat belts. Who needs them?"

"I have been pruning trees for 20 years without eye-glasses and I still have 20-20 vision."

"I wouldn't be caught dead without high heels, even at work."

A.M.: How do you break these barriers accept through the emotions?

TAPE: That's what I have been saying right along. We not only want a motion picture, we need a motion picture. Can you help us?

A.M.: Start at the very beginning. What is your audience? Who is your audience? Where is your audience, and when you define your audience, don't be too myopic. Don't be overly restrictive, there may be others who could take advantage of the film you have made. Turn the project over to a trained psychologist. Let him tell you the most effective motivations to be employed in your film.

TAPE: Who is going to produce this film? The psychologist? We want to make it ourselves.

A.M.: Do you know enough about the mechanics of motion picture production? Do you have the equipment at your disposal? Have you the talent and trained personnel to operate the equipment, act in front of it, and the laboratory know-how to put your processed film together?

TAPE: Actors? Who needs actors? Who can afford actors?

A.M.: Can you afford *not* to use actors, particularly in key roles? What you seek in a good "safety film" is *empathy*, the ability of a viewer to project himself into the situation of another. A good motion picture removes the viewer from a purely passive position of "onlooker" and makes him a participant. The viewer must be able to identify himself with someone believable, someone convincing, someone with whom he can experience that something that happens to the other guy. On your selection of the right person—a competent actor—rest the whole foundation of a good film. Only on rare occasions can the viewer identify himself with a film character who doesn't speak. So a good actor can save you money in the amount of film you throw away. A good actor (and actress) can bring you another interpretation, new movements to improve the film.

TAPE: We have some cameras and other production equipment, or can rent it . . . and we have a photographer on our staff.

A.M.: Does he shoot motion pictures all the time? Would you trust him to film the talent that costs you $125 per day, per man?

TAPE: That much?

A.M.: Who will direct the talent to get the right amount of empathetic strength the film deserves? The right visual continuity to make the entire presentation convincing and ready for editing? The wrong direction can penalize you financially . . . at the editing stage. The motion picture is a team effort requiring more than you and your photographer. The team needs the experience of working together that studio teams have had.

TAPE: Maybe, maybe you're right. But the cost!

A.M.: It may surprise you. Don't be frightened by the advertising that points to the costs of recent Hollywood productions.

TAPE: Alright, start us at the beginning and walk us through the production of our motion picture. What about our audience?

A.M.: If your audience is to be reached in the motion picture theater, your film must be produced in 35mm. And you may choose 35mm cameras and film for the inherent quality you get from your 16mm versions, particularly if you'll be making hundreds of prints. Don't skimp on production costs if you expect to be spending over $25,000 for prints and distribution charges.

TAPE: Our audience is for smaller . . .

A.M.: Then 16mm is adequate. And whether your film is sound or silent, shoot it at sound speed—24 frames per second. You can never tell when you may want to add sound at a later date. Your 16mm sound print is suitable for every non-theatrical showing—in the company, at schools, clubs, or what have you.

TAPE: What about those new 8mm projectors?

A.M.: Fine, for small audiences and for portability. But set your 8mm sound projector where distractions are few. Under no circumstance should you contemplate the production of the original film in 8mm. Duplicates are sub-standard. Any 8mm release print can be made from either a 16 or 35mm original.

TAPE: We have decided upon 16mm . . . for production . . .

A.M.: to be shot at sound speed . . .

TAPE: . . . to be shot at 24 frames per second. Do we head for a film studio?

A.M.: Yes and no. You may not know your film solution, but you do know the problem. Write it up . . . the problem, I mean. If you feel you know the film medium well enough to have dared to produce your film in its entirety, start right here by writing the scenario. Perhaps you prefer to introduce the studio or a free-lance, well-pedigreed writer. The free-lance writer can provide you with an approved script, which—like a building blueprint—will enable you to get production bids.

TAPE: Bids! I never thought of that!

A.M.: But like building a house or remodelling, don't necessarily buy the lowest bid. Buy proven studio quality, buy previous history. You can ask for and get recommendations, too, for improving that original script. Techniques that were passed up or not clearly specified. Let the studios suggest the devices they would employ to gain mood, pacing, or other improvements. Let them recommend talent, the music they would employ. But the best, not the cheapest.

TAPE: But that cost!

A.M.: A good studio will recommend cost-cutting devices. Maybe there is available stock footage (existing footage) that they can get hold of to be absorbed in your production. And remember that scene your VP insisted upon that would require a crew waiting for hours in a duck blind until the precise moment when a formation of wild geese would fly overhead from the north-northwest? If you thought that company or free-lance photographer could do the job for you, let him film this one. Let the studio recommend the proper film and emulsion to use. If he doesn't do the job as you would want him to, you're only out one scene, not an entire film. Think of the studio as your insurance of a job done well.

TAPE: It sounds like a cooperative undertaking.

A.M.: It always is. It takes your time and effort no matter who produces your film. And the more assistance you give the producer, the lower the cost can be.

TAPE: "Do the basic research."

A.M.: Provide the studio or free-lance writer with a statement of the basic problem. Provide him with specific contacts (names and telephone numbers, please) to

enable him to add to your information. It's a good idea to introduce this film architect to his sources of information, and make sure that these introductions include all those people who have the authority to torpedo the project. Why wait until the script is completed before that "top man" says "NO."

TAPE: Take the shooting script to several studios for bids . . .

A.M.: And ask for recommendations to enhance the script. You are not looking for a film factory but an art source that will take your basic idea and embellish it—with your basic objectives and audience in mind.

TAPE: Right! We'll have a movie—that will do more for us than any other device in our entire safety program.

A.M.: Wrong! You'll have just one more tool, that in the total communications program will contribute to the results you desire. No one picture will ever establish the desired attitude in the minds of your audience. No one motion picture—no one slide-film, chart or other presentation—can bring about the "safe results" you wish.

TAPE: Why make a motion picture?

A.M.: That's what I said. And the answer is: Make a motion picture to add one more effective aid to the entire communications program. To the other media already described, add motion pictures—good film, right film—to a basic plan that makes safety a constant thing. That will state the message clearly, and "Say It Again" and again.

JOINT SESSION WITH AMERICAN MEDICAL ASSN.

WHY PHYSICIANS AND NURSES 'MEDDLE' IN SAFETY

Introduction

By HENRY F. HOWE, M.D.

Secy., Council on Occupational Health, and Dir., Dept. of Occupational Health, American Medical Assn., Chicago

The members of the Council on Occupational Health, like industrial physicians generally, have long appreciated the importance of teamwork among the various personnel responsible for safety programs in industry. Forty years ago, physicians and nurses often ran their industrial medical programs quite separately from the accident prevention efforts of safety directors and personnel managers. In this modern generation, we are all aware that no one can work in a vacuum, and that safe operation can only be accomplished by the cooperative efforts of all of us.

The title of this panel, "Why Physicians and Nurses 'Meddle' in Safety," is perhaps a bit facetious. The word "meddle" has been criticized by several people involved in the preparation of this program as too critical a word to apply to the relationships within the safety team. Somehow no one seemed to come up with a substitute word that would carry the challenging implication intended, so we kept it in the title. But let me assure you that it was not intended to imply that teamwork among our various professions really involves interference with each other's functions. No one group of us here has any monopoly on the desire to promote industrial safety, and by the same token, each of our professions has a specific contribution to make through our special skills in the enhancement of safety.

In former days, the emphasis in industrial medicine used to be on the treatment of industrial injuries and diseases. Far greater emphasis is now placed on those medical techniques which can help to prevent industrial accidents and diseases from happening. The physician and the nurse ideally go into the plant and conduct their medical work in direct relation to the working conditions of employees right alongside the safety directors and industrial hygienists in the mutual attempt to reduce accident rates, absenteeism, the human factors, and toxic or mechanical hazards that cause them. A few individuals have occasionally regarded this intrusion of the health professions into the plant as "meddling," though not very often. Sometimes physicians in their high and mighty way have left this impression through their own failure to be good team workers. Physicians and nurses are really, however, your fellow workers in the vineyard of safety, and we hope to be able to demonstrate this.

We have chosen today to present to you three speakers, two of them industrial physicians, and one, an industrial nurse. Dr. Braun, Assistant Medical Director of the United States Steel Corporation, is prepared to discuss the ways in which plant physicians in large industry can work with the safety team of a large plant to improve the effectiveness of its safety programs. Miss Schwartz, Industrial Nurse at Employers Mutuals of Wausau, will speak to you on the ways in which industrial nurses can implement the medical aspects of a good safety program, through the special relationships which the plant nurse develops in the counseling and health education of the employees in any plant, large or small.

Dr. Sutter, a member of the Council on Occupational Health, who conducts an industrial medical clinic for many small industries in St. Louis, will discuss with you how the physician and nurse can be helpful in the development of a safety program in industries too small to have an elaborate safety staff. In these small plant situations, which are so common in American indus-

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
United States Steel Corp., Pittsburgh, Pa.

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.

How this team approach is achieved in a large industrial organization is the assignment given to me, and it should perhaps be pointed out at once that in many respects the *large* organization or company is merely an aggregation of *small* plants, the problems of which have already been discussed. Viewed in this light, even the very large corporation can be regarded as merely a group of departments or subdivisions, except that in this case there is one safety department and one medical department for the whole.

Against this background, then, let us now examine the motives of these "meddling" doctors and nurses who devote part of their efforts to safety in a large industrial organization.

To those of us who have spent years in this effort, the activities and goals of safety present a vastly changed picture from that of a few years ago. Because of the effective, dedicated work of the safety engineer, the frequency rate of industrial accidents has dropped to a point that once was almost undreamed of. In fact, in my own company, our management would not today tolerate a rate which only 10 years ago was considered almost unattainable. Now we talk seriously of "frequency zero," a target which once would have been only a brave slogan.

Standing between us and our goal of perfection is only a stubborn, fractional frequency, and I think it is clear to all of us that we have reached a point where engineering, guarding of machinery, analysis of jobs and areas for inherent hazards, and developing safer ways of doing each job must inevitably yield diminishing returns in comparison to the effort expended. This, of course, does not mean that these approaches should be neglected or slowed—on the contrary, they shall require extra diligence and vigilance—but it seems obvious that we must now give added attention to the individual and to those forces which lead him, either occasionally or habitually, to ignore the safeguards, the training and the personal protection with which he has been provided, as a result of our work to date.

In other words, the *personal* element of the remaining industrial accidents seems to offer a most fertile field for additional future safety effort. You, as safety engineers, can, and in most cases have, made it possible to perform the ordinary job without injury, but effective as your efforts have been, you just cannot make a job so safe that it is *impossible* for a workman to hurt himself. It is in this area, I think, that the industrial doctor and nurse are justified in "meddling" in safety.

All of us have at times used, or at least heard, the expression "accident-prone" applied to the person who just can't seem to keep from getting hurt. Recently there has been objection to this term, and I think it unimportant to argue this point. The fact remains, however, that all of us, and some of us more than others, occasionally have our attention distracted or our minds occupied otherwise than with the safe and proper way to do whatever it is that we are doing at the moment. When this happens in an industrial plant, it sometimes means an accident, regardless of the best safety procedures that can be devised.

The point I wish to make is that very often, such distraction or inattention has a medical, or at least a psychological basis. It can be the result of a personality trait such as excessive aggressiveness, or from an illness which is accompanied by discomfort or worry. Or it may spring from some more subtle source such as the familiar "argument with the wife," from worry about an illness in the family, or simply from neglecting to eat a proper breakfast. In all such cases, the medical department is a source of invaluable safety assistance through examination and counsel of workers before they reach the stage of stress and temporary "accident-proneness."

The matter of anatomical physical impairment—that is to say, a static deformity, as the loss of a leg, as contrasted to illness—is probably less important a factor in personal failure as a cause of accidents, but only if such an individual has been placed with due regard for his physical handicap. This is one of the most important conditions the industrial physician can make toward the success of the safety program. In order to achieve it he must know the physical requirements of the jobs in his plant and which physical incapacities are compatible or incompatible with such jobs.

While we are speaking of the placement of workers, particularly of those workers who have some abnormality, it may be pointed out that the tendency of courts and accident boards to regard aggravation of pre-existing conditions as compensable accidents, and to so regard also the results of illness, makes the physician's role in safety even more important.

But I referred earlier to the team approach to safety. In the large company, the members of this team include the safety engineers, the training supervisor, the industrial hygiene engineer, and, I insist, the nurse and the physician. These are the staff organization, using the term staff in its literal sense as something to "lean upon." In the final analysis, safety is a *line* responsibility and the various staff members of the team formulate programs only as procedures for line management to use.

How does this team (which includes the nurse and the doctor) work with the line operations management to achieve safety? In the large industry, it works in the following ways:

To begin with, in our corporation the safety department, the medical department and the industrial hygiene department, each headed by a director, report to the vice president of health services, who is a physician trained and certified in occupational medicine and with long practical experience in the field. Each division has a safety director although many do not have their own medical director, and in my capacity as assistant medical director, divisions and associated subsidiaries, I work closely with these division safety experts.

In each plant there is daily contact between the plant medical director and the general supervisor of safety. The plant physician attends all safety meeting at general superintendent's level, and I may say that, in the plant with which I was formerly associated, these occur daily. He takes part in safety conferences as well as management training courses, and he and the industrial hygiene engineer work with safety and line management in the conduct of engineering surveys and the determination of potentially toxic materials in the work environment.

Our medical departments take an active part in accident prevention both before and after the fact. In addition to the examination, selection, and placement of workers previously mentioned, they periodically examine workers in certain jobs which affect the safety of other workers—crane operator and operator of moving equipment are examples. Workers who may possibly be affected by changes in the work environment and those who are attaining older age levels are also under continuous surveillance. At the same time the medical records of sickness and accidents are reviewed in what may be described as the epidemiological approach to injury prevention.

In spite of all efforts, we do still have accidental injuries, and our medical facilities are therefore still concerned with this "after-the-fact" aspect, in which our contribution is nowise different from that made by the industrial medical department long before it was recognized that it had a part in the preventive aspect. The traditional nature of this curative, reconstructive, or rehabilitative phase of the medical department's work does not lessen its importance as a contribution to the safety effort. Prompt and proper treatment of injuries and intelligent rehabilitation means lower severity rates, as well as shortened periods of suffering. Accurate diagnosis of occupational disease, in addition, offers our best defense against future cases from the same cause.

Working with line management to effect the early return of an injured man to some modified type of work consistent with his disability, when proper, works to the advantage of everyone. Knowing when it is wiser to defer return to work is equally important. Constructive counselling of the individual while he is receiving treatment for a recent injury, and is thereby considerably more interested and receptive, can do more good than the same advice before it "has happened to him."

All that has been said here points up, I think, the absolute necessity of having nurses and physicians who are truly *industrial* nurses and physicians. Medical training, however excellent, does by itself qualify a physician for the type of contribution we have been talking about. The industrial physician must first of all forego his traditional authoritarian role and learn to function as part of a team. He must be

willing to understand the practical problems and the objectives of operating people. He must acquire at least fundamental knowledge in the fields of chemistry and engineering. He must think in terms of groups of people instead of the individual patient, and be willing to apply the disciplines of epidemiology and biostatistics in his work. And he, must do all this without losing recognition of his primary responsibility to the individual patient.

The properly oriented industrial physician will know that accident prevention is a part of his responsibility and he will cooperate in every possible way, not only with safety, but with all other departments. On the other hand, he will at the same time refuse to compromise his principles or to expose the patient to added risk for the sake of preserving a safety "record."

One area in which there are too often somewhat less than completely satisfactory relations between medicine and safety is that in which the physician is asked to decide whether a given individual can or cannot be placed in a certain job. Physicians in private practice almost universally sidestep such an issue and this is understandable when one realizes that they have little, or no knowledge of the physical demands of specific jobs or of the environmental factors. Frequently, however, physicians in industry, who should be knowledgeable in these areas, will not take a firm stand, much to the dismay of safety and operating personnel.

I have heard doctors justify this attitude on the basis that they do not wish to "play God," but I submit that they must be willing to give an objective opinion, based on their professional knowledge of both the worker and his job, if the team approach to safety we have been discussing is to succeed. It needs to be emphasized, I think, that the physician has this kind of responsibility, also, with respect to accident determinations. For example, the Z-16 Code of the American Standards Association states plainly that "in case of doubt as to the degree of disability, the classification of an injury shall be based upon the decision of the physician engaged or authorized by the employer." I am unable to concede that the physician can, in good conscience, either avoid or relinquish the responsibility here implied.

In summary, if the physician and nurse are going to be effective members of the safety team, they must be prepared to accept their full share of responsibility. They must welcome requests from the safety and operating people and they must identify themselves as members of a team with a common objective. If such medical "meddling" can contribute to the realization of our goal of frequency zero, then I am sure you will agree that we must continue to "meddle in safety!"

THE NURSE'S ROLE IN THE RELATIONSHIP BETWEEN MEDICAL AND SAFETY DEPARTMENTS

By CLARE B. SCHWARTZ, R.N.
Employers Mutuals of Wausau, River Forest, Ill.

As a nursing consultant for a large workmen's compensation insurance carrier, I have had occasion to work with occupational health nurses in a variety of manufacturing industries and business organizations. From this experience, I can truthfully say that occupational health nurses must get involved in safety. As a member of the health and safety team, it is their function to protect and improve the well-being of people entrusted to their care.

Safety is inherent in the functions of all nurses by virtue of their professional preparation and their dedication to preserve human life and health. From earliest training days, nurses are made cognizant of their responsibility in maintaining a safe, healthy environment for (1) themselves, (2) fellow-

workers, (3) visitors, and (4) above all, their patients.

Because many hospitals have no organized safety program, each individual nurse must accept responsibility for safety in the aforementioned areas. More and more hospitals are developing active safety programs, and nurses play an extremely important role in them.

Functions of analyzing causes of accidents, evaluating general safety conditions and studying specific problems are similar to those in any other industry. However, much more could be done to give student nurses a more realistic preparation for the jobs they are going to hold in other fields of nursing.

In public health nursing, there is an increasing awareness of the accident situations which exist in the home, particularly among the chronically ill and elderly patients. A recent study in New York of 122 public health nursing records revealed 26 included information about accidents. However, the nurses had not always recorded the causes of these accidents nor suggested methods of prevention. From this study, it was felt that a method could be developed to help the public health nurse assess the accident potential of each chronically ill patient. This plan would prevent the incidence and severity of accidents in the home. Additional suffering, expense and disability of homebound patients would be decreased.

School nurses have endless opportunities for teaching safety to children and parents. Childhood is the opportune time for establishing safety habits and making them a way of life.

In the early days of occupational health nursing, employee health services consisted chiefly of giving emergency care to injured workers. Since World War II, there has been a steady growth of these programs from first aid to health maintenance, with emphasis on the prevention of accidents and disease.

The Occupational Health Nurses' section of the American Nurses' Association, The Council on Occupational Health of the American Medical Association, and the American Association of Industrial Nurses have prepared statements of functions, standards and qualifications for nurses in the occupational health nursing field. These statements were developed on the premise that the nurse works as a member of the health and safety team. Of course, the nurse must assume responsibility for the application of these principles in order to maintain the highest standards of service.

When a nurse enters the occupational health field, she finds herself confronted with an entirely new and different concept of her profession than she was accustomed to during her years of training and work in the hospital and health agencies. The largest percentage of occupational health nurses are employed in a one-nurse service. Often her scope of activity in the safety field is not clearly spelled out. Consequently, she gets involved because no one else is specifically assigned to safety. When an accident happens, she becomes conscious of the lack of safety precautions and violation of safety rules. In her efforts to bring about correction of such conditions, she must first convince management that she is there to cooperate with personnel, safety and production departments, who, at times, accuse her of "meddling."

This dilemma for the nurse can be avoided if:

1. Management provides administrative policies for the health and safety program.

2. The nurse participates in formulating these policies.

3. The physician provides dated and signed medical directives.

4. The nurse's position in the safety program is clearly defined.

5. A manual for the employee health services department is compiled which contains medical and administrative policies, directives for procedure and nursing responsibilities.

Before considering the role of the occupational health nurse in her relationship between the medical and safety departments, it is important to point out that management should make every effort to select a well-qualified nurse.

In addition to the skills and experience associated with nursing, the occupational health nurse should be a person with good health, emotional stability, initiative, resourcefulness, sound judgment and a sincere interest in people. Additional attributes include some knowledge of workmen's com-

pensation laws and insurance, state and federal health and safety laws, occupational diseases, sanitation, counseling techniques, communication skills, teaching methods, record keeping, business practices and, above all, the state's Nurse Practice Act.

It is a big order and you may well ask, "Where will I find such a well-qualified nurse?" It isn't easy, with the shortage of nurses in all fields. However, the Nurse Placement and Counseling Service of the American Nurses' Association and advertisements in professional nursing magazines such as the *American Journal of Nursing, Nursing Outlook*, and others, may be of help to you.

The role of the occupational health nurse has many aspects related to safety, beginning with the first introduction to a new employee, which usually occurs after the personnel or employment department has finished their screening for aptitudes and job skills. She introduces the employee to the *health services of the company. Next*, she will perform a health history. This will be the beginning of a permanent health record, which will be kept up throughout employment. She may do a simple vision and audiometric screening as a part of the pre-placement physical examination.

The physician will then take over, whether in the plant medical department or outside the plant in his office. The nurse may, by careful inquiry, discover physical or mental conditions which might preclude employing the worker for a specific job. The final decision as to whether a prospective employee meets the job's health standards rests with the examining physician.

The nurse's activities take place in two major areas:

1. Dealing with the human characteristics from the time of the first health interview to retirement counseling;

2. Being concerned about environmental characteristics from plant housekeeping to specific exposure to hazards resulting in injuries.

Whether the nurse works in a large industry under full time direct medical supervision or under part time and on call medical direction, she must be concerned with these characteristics if her program is to be successful. She is the first assistant to the physician who is responsible for keeping the working force in optimum health, as well as the first assistant to the safety director charged with keeping plant environment safe.

Before the nurse can perform her role effectively, she must have clear knowledge of the following:

1. Background information on the company.

2. Products manufactured or services rendered.

3. Types of physical, biological and chemical hazards present.

4. Lines of responsibility and authority between departments.

In the large industry, this information is generally readily available from procedure manuals and survey reports by safety and hygiene specialists. In the small plant without these services on the premises, the nurse may conduct her own study of environmental characteristics by frequent trips through the plant and conferences with the safety director. Or, she relies on the plant manager, foremen and workers for information regarding work hazards and turns to them for help in an effort to correct dangerous conditions.

Plant personnel should cooperate with the nurse in giving her correct information, realizing that she is attempting to protect the health and safety of everyone concerned.

A well informed nurse will be alert to her duty of reporting her observations of a change in environmental characteristics to the proper safety management. These changes may relate to lighting, ventilation, housekeeping or atmospheric conditions. Frequently an unhealthy condition is brought to her attention by employees who visit her department because of an injury or illness. They may report a bad situation to her before they tell their foreman. It becomes her duty then to tactfully discuss the problem with the foreman and the safety director.

The nurse will likewise refer for medical attention employees showing changes in personal characteristics, such as change in skin appearance, gait, speech, visual acuity or emotional balance. Both situations may set the stage for an accident or occupational disease.

When dangerous chemicals or other toxic materials are being used, the nurse should

have a working knowledge of how they enter the body and are absorbed into the system. When detecting early signs of harmful accumulation, she should refer the problem to the physician for medical investigation and to the safety department for investigation of engineering controls.

She must not, however, pass judgment on the situation as this is not her realm. For example, a nurse working in an industry where there is a lead exposure may observe in a worker such early signs of possible lead intoxication as grayish pallor of skin and lips associated with vague gastro-intestinal complaints, headache, weakness and loss of appetite. She may also notice certain blood and urine changes on laboratory reports.

Prompt reporting of these early signs and symptoms to the physician for diagnosis and to the industrial hygienist or safety director for investigation of atmospheric conditions and work practices may easily prevent lead intoxication problems.

A common potential health hazard is exposure to the hundreds of organic solvents in use today. The responsibility of evaluating and controlling solvent exposures rests primarily with industrial hygienists and safety engineers. However, when controls are inadequate or workers fail to use precautionary measures, the problems resulting frequently come, first of all, to the nurse's attention.

Recently a plant nurse reported that a solvent exposure caused a worker to have abdominal cramps and to "pass out." His family physician hospitalized him for treatment and diagnosis of a possible coronary attack. It wasn't until two more workers from the same department reported to her with similar complaints that the nurse questioned the foreman of the department regarding the work exposures.

It was revealed that trichlorethylene and carbon tetrachloride were being used for cleaning machines and equipment. Her findings were reported to the plant manager and to the patient's physician, who then understood why his patient recovered so rapidly from his symptoms. The danger of using these solvents without controls or protection was pointed out to management and the foreman. A safer cleaning agent is now being used.

It may be well to bring out here that the nurse might inform the servicing physician of the type of toxic materials being used in the plant so that he can be prepared for proper handling of emergencies. She might point out to management the importance of asking the physician to tour the plant in order to familiarize himself with total plant operations, and particularly the hazardous ones.

Perhaps one of the most troublesome and costly conditions resulting from exposure to irritating substances is dermatitis. It is said that skin troubles cost American industry close to $200,000,000 annually. A worker's attitude and work habits have a lot to do with his likelihood of developing dermatitis. Educational and persuasive efforts on the part of the nurse and supervisors will go a long way in controlling the problem. Off-the-job contacts must also be considered, since about 35 per cent of all industrial dermatitis cases are traced to non-occupational causes. The nurse can do a great deal in eliciting this information by careful questioning. She can also be most helpful in promoting preventive measures in the following ways:

1. Seeking out the potential skin irritants.
2. Assisting with the selection and use of protective clothing and skin creams.
3. Assisting management in providing proper washing facilities and keeping them in sanitary condition.
4. Educating workers on the importance of keeping themselves and the work place clean.
5. Urging immediate reporting to the employee health services department the very first symptoms of skin trouble.
6. Early referring of skin disorders to a dermatologist for correct diagnosis and treatment.
7. Assisting with proper placement of employees pre-disposed to skin troubles and with job transfers when this is recommended by the dermatologist.

One of the most essential phases of an Employee Health Program is care of the eyes. It has a threefold objective:

1. To assure that workers have vision meeting job demands.
2. To protect workers' eyes against hazards of the job.

3. To provide workers sustaining eye injuries and diseases with authorized care.

It requires the cooperation of physician, nurse, safety director, supervisors and employees to have an effective program. The nurse may aid the program in the following ways:

1. Educational work in eye health and safety with new employees as well as throughout employment.

2. Pre-placement visual screening as well as periodic screening, followed by referral to eye specialist if necessary.

3. Maintaining a record of all eye injuries and diseases.

4. From these records, analyze causes of eye injuries with safety engineer in order to correct environmental hazards.

5. Assist in establishing a program of eye protection and proper maintenance of protective devices.

6. Provide nursing care in emergencies, referral to eye specialists, and follow-up care as indicated.

Extreme caution is necessary in giving eye care, since infections can easily develop from minor injuries. Infections may also be carried from one person to another via safety goggles, eye cups, droppers, medications, or hands. A newer hazard has moved onto the scene of eye safety with the prevalence of contact lenses. The nurse should alert management and workers to the danger of wearing them while performing hazardous industrial operations. Ophthalmologists warn against wearing them where chemical or foreign bodies are prevalent.

The occupational health nurse who helps in instituting and maintaining a sound eye health program in the plant performs priceless service to employees and management.

Statistics prove that controllable causes of accidents can be eliminated. The human factors are much more complex to deal with. Psychological problems come up in any place of employment and soon show up on the production record, perhaps on the health and injury record, and quite often in problems of absenteeism and inter-personal relations.

Modern man, living in a busy, restless world, is subjected to unusual physical and mental stress from which he finds it hard to escape. Many workers do not have the capacity to keep up with the pace that is expected of them at work, at home, and in their social life. Mounting tensions frequently build up to serious emotional and mental conflicts which result in disturbed interpersonal relations among workers, supervisors and management.

It is these personal human problems which constantly come to a nurse's attention. She is in a unique position to observe early signs of stress, emotional instability, anxiety and even psychotic tendencies which may lead to accidents. She realizes that the worker who is pre-occupied with family difficulties, financial worries or personal unhappiness loses his mental alertness and, sooner or later, suffers an injury.

People with extreme emotional problems may lose their desire to live and place themselves in situations dangerous to their safety and even life itself.

Because of her training and experience with sick and troubled people, the nurse is able to judge the seriousness of a person's anxiety. Her best tool for helping these emotionally disturbed people is listening. Employees with these personal and family problems often will open the "safety valve" to the nurse. They will pour out feelings of worry, frustration, resentment and hostility toward employer and fellow-workers because, somehow, they feel safe in unloading to her. The sympathetic nurse can help immeasurably by patient listening. It is felt that 85 to 90 per cent of emotionally disturbed persons can find a solution to their problems by talking things over. When this fails, the nurse can be instrumental in making proper referrals for specialized treatment.

An increasingly serious problem in industry is alcoholism. The problem drinker costs industry millions of dollars due to inefficiency, waste, accidents and loss of production. The occupational health nurse may make a significant contribution to the alcoholism programs in industry. She has basic health information about employees and generally good inter-personal relations with them as well as with management. She has the opportunity of early identification of the problem drinker, counseling with him, and referring him for proper care. The nurse many times is instrumental in having management establish a policy regarding an alcoholism program.

Emotional conflicts often arise during the pre-retirement years. The alert nurse will become aware of this and by her counseling, assist the person who has developed a wearing-out defect such as high blood pressure, heart disease, arthritis or symptoms of nervous disorders. She should encourage him to see his physician. She may show the way to slowing down by reasonably controlled activity, thus resulting in preserving health and greater enjoyment of life.

Physicians and nurses have a wealth of information available in their records of injury cases, occupational diseases and general health status of employees. From this information, helpful statistics can be compiled to assist management in pinpointing injury trends and trouble spots in human relations. The nurse should make every effort to make her records as meaningful as possible. Not only should she make careful entry of work-connected injuries but non-occupational illnesses, physical and mental disorders should be recorded.

A trend in an employee's health and injury record may indicate a change in general well-being or a specific change in physical ability, such as loss of visual acuity, loss of hearing, emotional instability, or a disease process. Such information is helpful in follow-up counseling and job adjustment.

The confidentiality of health records must be carefully guarded. The nurse must use good judgment in her interpretation of medical and health information to other departments. When a health condition involves a work situation, the nurse should enlist the employee's cooperation in discussing it with management.

Recently, many nurses have become concerned about employees who are under specific medication such as tranquilizers, antihistamines, anti-spasmodics and anti-coagulants. These may have side effects and reactions which make a worker less alert and cautious and therefore more susceptible to injury. A worker under anti-coagulant medication may be more subject to bleeding if injured. They should be noted on the employee's health record. It is also important to alert the on-call physician, who does not have access to employee health records, when an employee under certain medications is sent to him for treatment.

People seem to have lost respect for drugs, as evidenced by the many tragic end results from their misuse. The occupational health nurse has an excellent opportunity of instructing employees to follow their physician's directions and reporting to him any side effects from medication. Above all, she must adhere closely to her medical directives regarding the dispensing of drugs from her department to employees on the job.

A challenging and important phase of the occupational health nurse's role is that of a teacher. Education is the strongest tool to develop safe working habits and to maintain a healthy and safe environment. Teaching may be done on an individual or group instruction basis. The individual contact with employees is the most effective method to get a message across. An opportune time for this type of instruction is during the initial health interview, during treatment of an injury or illness, or when the worker seeks help regarding a specific personal or family health problem.

Group instruction may be carried on in safety meetings, in supervisors' meetings, or with a department where a specific hazard exists; for example, in seeing that new employees are educated on the proper methods of lifting, or in collaborating on planning and implementing a first aid instruction course for auxiliary attendants on night shifts.

In addition to her person-to-person and group instruction, the nurse may use leaflets, bulletins, posters and contributions to the company paper. She should work closely with the safety department and, ideally, serve as a member of the safety committee.

From all this, it is obvious that the functions of the medical department, safety department, and the occupational health nurse are closely allied. They must work together as a team to gain the greatest benefit from their services.

Management has the responsibility of providing the proper climate for the nurse's activities. The nurse has the responsibility of developing and maintaining smooth working relationships and proper communication between health personnel and the various plant groups.

Keeping up to date on professional nursing advances, as well as on the newer concepts

in the related fields of safety and industrial hygiene, requires nurses to do endless reading and studying. It necessitates exchanging ideas with fellow nurses, physicians and safety specialists concerning mutual problems, such as we are doing at this safety congress. But most of all, it requires nurses to be examples of good health and to acquire a safety attitude themselves.

If nurses conscientiously apply safety principles in their own daily activities, they will fulfill the function of active participation in safety in their own work environment and in their community. This type of involvement in safety requires constant vigilance and offers nurses real satisfaction in carrying out their total employee health services program.

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A MODERN MEDICAL PROGRAM FOR THE SMALL PLANT

By RICHARD A. SUTTER, M.D.
Sutter Clinic, St. Louis, Mo.

There are many disciplines involved in the operation of effective safety and occupational health programs designed for accident prevention and health maintenance in industry.

A list would include: management, safety engineers, industrial hygienists, physicians, nurses, personnel directors, engineers and other specialists in the safety field. Within this group, management is the one always on the job, for management is necessary regardless of whether the plant is large or small.

Though management's responsibility in safety and accident prevention is paramount, as safety engineers, nurses, industrial hygienists and physicians employed by industry, it is our job to assist management in the promotion of the physical well being and health of its personnel — by the use of techniques designed to prevent occupational diseases and accidents.

Where industrial plants are large, we find well trained specialists in all of these fields. In most small plants, we find but one or two of these groups represented. Small industry, however is coming to the realization that it must afford the specialized services of this group even though on a limited scale.

In 1960 the American Medical Association's "Survey of Physician Services in Small Plant Occupational Health Programs" showed that by far the greatest initiative was exerted by management in the development of small plant occupational health programs served by physicians in private practice, most usually by general practitioners, either part time or on call, rather than by full time medical directors.

It has been my experience that those primarily concerned with safety as a profession have been the ones who have pressed management hardest for the establishment of these more adequate modern, small plant medical programs. This is an important development

because fully 75 per cent of our work force is employed in so called small industry — those employing 500 or less. This development is doubly important because these small industrial firms normally have an accident frequency rate two and a half times (9.91/3.84) that of large plants. This is according to the very latest figures available and as yet unpublished from the National Safety Council. It can be said that though the need for medical services is greatest in small plants, as a general rule, they have afforded themselves the least until very recently.

Modern plant medical programs, regardless of size, ideally are composed of elements and services designed to maintain the health of the work force; to prevent or control occupational and non-occupational diseases and accidents and to prevent and lower disability and time loss resulting therefrom. Our small plant medical programs *should*, according to the Council on Occupational Health of the American Medical Association in its publication "A Guide to Small Plant Occupational Health Programs," provide for:

1. Maintenance of healthful environment
2. Health examinations
3. Diagnosis and treatment
4. Immunization program
5. Medical records
6. Health education and counseling

How can we implement medical programs designed to accomplish these objectives in our small plants? If the management of a small industry believes that it cannot afford, nor closely imitate the large plant supervised full time by physicians, nurses, industrial hygienists and safety engineers, it should turn to a consideration of an alternative.

Under these circumstances, I would suggest that you assist your management in the tailoring of your small plant medical programs primarily to meet your individual needs, within the framework of the philosophy of your company in regard to the extent of provision of medical care for non-industrial conditions.

My own compilation of the services constituting a good plant medical program for health maintenance and accident prevention which I call my "Ten Commandments for a Plant Medical Program" includes:

1. Industrial hygiene survey (Plant hazard inventory)
2. Pre-employment screening (Health inventory)
3. Pre-placement physical examination (This is the same as our old pre-employment physical examination)
4. Health counseling
5. Periodic health examinations and examinations prior to return to work
6. Health education
7. Constructive medicine
8. Safety activities
9. Records and reports
10. Care of industrial accidents & diseases (First aid, emergency care, definitive medical care)

Though all these services are important, I shall elaborate only on those most closely allied with safety, in which physicians may "*meddle*" *constructively*.

Plant industrial hygiene survey or plant hazard inventory. Before the industrial physician can perform his role effectively in the operation of the health maintenance program, he must have the proper background information. He must have a clear knowledge of the hazards within the plant and take inventory of them. To acquire this knowledge, he must familiarize himself with plant processes, jobs and job requirements.

Industrial hygiene surveys are surveys of plants made from the health and medical standpoints. I refer to them as plant hazard inventories. Ideally, the conduct of the medical aspects of these surveys is supervised by the occupational or industrial physician or by the industrial hygienist. It is not unusual for these specialists to be assisted by engineers, safety experts, industrial nurses, toxicologists, chemists, physiologists and private and governmental agencies. Their intent is to study the environment and operations of the plant and to discover, inventory, predict and correct all plant hazards affecting the health and safety of the worker. Typically, these work hazards may include excess noise, faulty lighting, heat humidity, exhaust and ventilation, sanitation, concentration of dusts and toxic substances in excess of established threshold limit values, and chemical and mechanical hazards.

Lacking special assistants, however, the industrial physician must conduct his own survey by finding out all he can from any-

one who can give him pertinent information and by observation and inquiry when he visits or inspects the plant. He then enlists aid in correcting the environmental hazards noted. He will make effective his knowledge that poor housekeeping results in increased accidents and conversely that good housekeeping will reduce accidents.

He will enforce his knowledge that proper sanitation is of extreme importance in the maintenance of health; that in-plant dining facilities must be inspected and deficiencies corrected; that proper washing and toilet facilities and locker rooms must be present and maintained in a sanitary and safe condition.

He learns that there are particular health hazards peculiar to certain jobs, and that even though these hazards are seemingly controlled, he must give special attention to the men so employed so that he will recognize the earliest change and take immediate steps to correct its progress, to effect cures and, most important, to restore controls and prevent recurrences.

When the physician has, through use of the technique of the industrial hygiene survey, familiarized himself with the operations of a specific plant, has acquainted himself with this inventory of hazards to health and safety, knows something of the techniques used and the disciplines available for their correction or elimination, understands the skills, physical and mental requirements of various jobs, he has the background for playing a most effective role in the successful conduct of the other basic elements and services of the health maintenance and accident prevention program.

Pre-employment screening or health inventory, is a combined function of the personnel department, employment office and the occupational physician. Enough men must be employed to operate the company profitably. Those selected must meet the standards of job skills and health requirements designed to operate the company most efficiently. The ultimate level of their efficiency is dependent upon their proper selection, proper placement, training and maintenance.

The industrial physician should design or procure a good pre-employment physical examination form which provides for tactful inquiry into medical history. He can, by using such forms, discover many conditions which in themselves might preclude the employment of an applicant for a specific job. Many conditions inherently make the man an unsafe worker in certain jobs. It is apparent that if a man is occupationally blind or is color blind, he should not be given an opportunity to injure himself or others before the condition is detected.

Likewise, hypertensive employees may black out, become dizzy or fall, break their backs or otherwise injure themselves in the absence of knowledge of their susceptibilities. If, in the applicant's answers to specific inquiries, the patient states that he has epilepsy or "fits" uncontrolled, he cannot qualify for a vast number of jobs. If any employee admits having had a recent heart attack, demonstrated by electrocardiographic examination, has had a prolonged period of hospitalization and is continuing therapy, it is reasonable for the personnel department to reject that applicant for current employment on scaffolding, as an unrestricted crane operator, hard laborer, or perhaps even for less arduous jobs.

After these data concerning medical history have been recorded, the medical examination form represents a fairly complete health inventory for the doctor's further consideration.

Pre-placement physical examinations. After preliminary screening by the personnel department or the industrial nurse, the applicants are scheduled for examination by part-time plant physicians or sent to the physician's office for completion of the pre-placement physical examination. It is the responsibility of the physician to review and to complete the health inventory section of the pre-employment questionnaire and to complete the actual physical examination. He may delegate those parts of the physical examination normally done by his nurses and technicians. He must, however, assume complete responsibility for them.

Periodic health examinations and examinations prior to return to work are done at intervals varying from months to years and are useful tools in checking to see whether treatment has been obtained for remediable conditions noted on the preplacement or a previous physical examination. They are especially useful in the older age groups, where degenerative diseases are most likely to be found.

For instance, changes in an employee's mental ability as a result of organic change from arteriosclerosis or other diseases can constitute a serious health hazard, especially where this condition results in unsafe work practices. Also, changes in hearing and in visual acuity frequently occur in later years, with descent to levels that make the worker unsafe to himself and those about him.

Hypertension, of course, is a danger not only to the worker but to the safety of those about him. I have seen a good many men who have been injured in falls at floor levels and from high levels whose falls were not due to missteps but to blackouts, unconscious states or paralysis, the result of hypertension and cerebral accidents. Recognition of this condition, with treatment, proper placement or retirement will help prevent such accidents.

The importance of early recognition of coronary disease and other heart conditions which may be the cause of accidents is self evident. Diabetes frequently is found developing relatively late in life. Its proper diagnosis and treatment is of paramount importance to the individual's health and safety.

Where individuals are exposed to special hazards, the periodic examination is mandatory. The industrial physician who has provided himself with the proper background knows who these men are, what jobs they are on and the hazards of those jobs.

Examinations prior to return to work are usually done following periods of time lost due to illness or accident and especially following prolonged periods of time lost from non-industrially connected illnesses and accidents. We must assure ourselves that these employees have recovered sufficiently, that they offer no hazard to themselves or those about them.

Safety activities are properly the primary concern of those of you who are knowledgeable in this field; however, much help can be secured by indoctrination of your first aiders, nurses and physicians as well as your employees. They will soon gain an appreciation of the efficacy of your techniques. Your job is to make them genuinely enthusiastic about safety and to make them part of your team.

It is the responsibility of the small plant medical department to cooperate with those in charge of safety by reporting serious hazards and unsafe working practices as quickly as they are discovered.

Records and reports are a necessary part of all the other nine services of a good medical program. Comprehensive records must be kept and reports rendered in order that management be informed in their continuing responsibility for health and safety, and the employees kept informed of the degree of success afforded by their cooperation. Records and reports are necessary to direct and evaluate preventive medical and safety engineering techniques. They are necessary to chart progress in the reduction of accidents in our plants.

Adequate records are necessary for the compilation of statistics. Illustrative of the importance of adequate records is this statement found on the inside of the cover of the Safety Council's booklet "Accident Facts," 1962 edition:

"To those who work in accident prevention, statistics are the cornerstone on which such programs are structured. How many accidents occur each year? Where? How? To whom do they occur? These are the facts that must be put to use to help man solve one of his most serious survival problems. These are *Accident Facts.*"

Care of industrial accidents and diseases can best be furnished by a combination of a well trained first aider, a knowledgeable industrial nurse, and a competent physician, assisted by those interested in safety. However, few small plants have full time in-plant nursing service and, of course, even fewer have full time medical service.

Fortunately, your plant physician does not need to be a specialist in this field. It is certainly true that most industrial injuries can be cared for by general practitioners. However, where in addition to the responsibility for rendering competent care of industrial injuries, interested physicians have taken the time to become knowledgeable in regard to the other nine elements of our ten basic principles, an improved plant medical program can be expected.

Those of you in safety can help up-grade your small plant medical programs by stimulating your company physicians to become acquainted with and to provide as many of these 10 elements or basic services of a modern plant occupational medical program as possible.

Those physicians who have demonstrated that they have, or who indicate to you that they are willing to acquire special knowledge in order to assist you and serve you competently, are in an excellent position to participate effectively in this rapidly growing field of medicine. They will enjoy with you, who are interested in safety, the rewards that go with successful accident prevention, and maintaining and building health in our small plants, rather than simply repairing it, and they will be knowledgeable enough to "meddle" constructively in your safety programs.

Motivation

MOTIVATION STRATEGY IN INDUCING SAFE BEHAVIOR

By WILLARD A. KERR
Prof. of Psychology, Illinois Institute of Technology, Chicago

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 we might well give major attention in this discussion. It is psychological climate theory which holds that the quality of behavior and the level of alertness rise according to the rewards given for alertness. In business and industry, this of course, means that a true opportunity climate elicits a high level of operational intelligence. This theory holds that the individual must feel free and indeed, enticed, to set a wide pattern of short and long-term goal ambitions which he feels to be reasonably attainable with striving; such striving makes for alertness if the climate truly is one of opportunity, if the rewards really are there and reasonably attainable.

Implementing such a theory to induce motivation for safe behavior follows as businesslike procedure. Many existing company policies and basic assumptions in personnel relations must be re-examined to determine if they are psychologically sound, for, ultimately, if they are not psychologically sound, neither are they economically sound. Basic to this discussion is the important fact: an accident is merely a low quality behavior. If the accident happens to materials, it is called scrappage, but the causation is the same, and it is the same for a host of low quality human behaviors that are not called accidents. Low quality behavior tends to be the result of not using the brain to exploit environmental opportunity in a high quality manner. High genetic intelligence is no guarantee against low quality behavior, including accidents; but high *operational intelligence* is a guarantee.

The problem, then, seems to hinge very much on eliciting high operational intelligence in the work situation. How can this be done? Antiquity didn't even try; it institutionalized slavery and allowed its main workforce to retreat mentally into operational dullness, staying just alert enough to avoid the overseer's whip. The slave's retreat into dullness

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 from single individuals working alone. As individuals are added to unit size (up to 49), productivity declines as a straight-line function. When personnel are treated collectively they tend to settle down into a dull lethargy in which an accident is a misunderstood intruder, detected too late, when accorded individual status and dignity with rewards automatic with performance, their volume of high quality, safe behavior rises.

Some management's collectivistic orientation toward personnel (manifested by such subtle indications as painting all machines and workspaces identical colors, forbidding display on desks of such personal matters as family photos, pin-ups, etc., arranging offices and workroom in the style of Mediterranean slave galleys, etc.) typically results in personnel responding with a collectivistic attitude toward management. Management must abandon this dangerous orientation and not just preach individualism but actively apply it at all levels of personnel. Lockers should bear names, not just numbers. Desks and work locations should reveal the unique individuality of each employee. Workers should not be thrown together like cattle but should be assigned separate cubicles, labs, offices, and partitioned work locations to the extent that practical efficiency permits. Self-respect and the respect of others constitute alerting rewards of a non-monetary nature. No man's work is really safe unless he feels that both he and his work are important. The lowest man feels, as you and I, that that which is of little value can be handled with little care. That, pathetically, but all too frequently includes himself.

9. Breaking in a new employee must allow for successful initial experience. Half a century of research on setting of aspiration levels reveals that if a new task or job is expected to be easy and found to be easy, the aspiration level and subsequent performance rise. If it is expected to be easy and is found to be difficult, the aspiration level drops. If it is expected to be difficult and is found to be difficult, the aspiration level holds steady or even rises. The astonishing behavior of aspiration levels, however, has to do with the casual, rather accidental way in which they are initially set followed by the dogged tendency toward permanence of the initial setting. This permanence tendency is so strong and frightening that management will do well to adhere to two rules in introducing

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 the worker may be going about his work in the wrong manner. If both factors operate at the same time, you can be sure that the injury rate will be just short of astronomical. The foreman then needs to know where his operation stands in relation to the plant as a whole. If the injuries in his notebook center about a certain operation, he should take a critical look at that factor before he spends time in interviewing. A few years ago, when we started this, we found that the men engaged in taking hot castings off a moving belt with the use of hooks were reporting frequently with thermal burns of the forearms, due to the men touching the iron as they reached across the belt. No interview was needed to put an end to this.

What

After the obvious job factors are corrected, the foreman wants to know what other factors are present that have escaped him. I am sure that we can assume that the honest workers' desires are the same as management's, namely the ability to work all day every day with as little interruption as possible. Furthermore, the man who is on the job day after day knows the rough spots of his assignment as well as you know the difficult areas of yours. It is this information that the foreman is after. Either there is a job factor in the situation or the worker is going about it in the wrong manner.

How

Now as to How best get the information. There is one way I am sure won't work. I mention it only to dispose of it. If the foreman takes his page and berates the man, in effect calling him stupid for getting hurt so often, the channel of communication will be effectively blocked. If, on the other hand, he shows him the page and with a sincere interest says, in effect, "Joe, I don't like the injuries any more than you do. How can we get around them?", he is using a bit of honest flattery, if there is such a thing. The foreman is asking the worker to be the teacher for a moment. If there is a job hazard, this will bring it into the open for solution.

Where the worker is at fault the question puts him on the defensive, of course. He will likely make allegations that just aren't true and then a demonstration of his method

of working will give the foreman a chance to suggest he try the proper method and still retain his cooperation.

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 layoff, 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 improve, he is telling him what will happen if he doesn't. None of us respond well when we're told we *have* to do thus and so. We will react much better if we are given a choice. At the conclusion of the period the forecast must come true. If it doesn't, the foreman is a paper tiger. He's lost face not with one, but with all of the men. By the same token, when he succeeds in curing one, there will be six more who see the handwriting on the wall and correct themselves.

Summary

The foreman can do an effective job of eliminating injuries by counseling. To be effective there is certain background information he must have. He needs to know where his operation stands in comparison with the plant as a whole and which parts of it are productive of injuries. He must be able to recognize job hazards that are operating and correct or minimize them. He needs to know what constitutes the average frequency of injury in his plant and which of his men are exceeding it. There is no better subject matter for a safety contact than injuries the man has had. These must form the subject of a productive interchange of information. In the case of a chronic malperformer, there may be a worry that is at the root of it, or it may be a personality defect relating to previous or nonexistent training. He may have to assume the role of a stable and just foster parent in an attempt to correct the situation.

Associations Safety Sessions

SMALL ASSOCIATION SAFETY PROGRAM

By J. NEIL MOORE
Secretary, Greater Chicago Hotel and Motel Assn., Chicago

Be it large industry or small business, never underestimate the purpose of a sound safety program. The purpose of any sound safety program is to save lives and minimize the injuries and loss of property; to remove and/or correct accident hazards; to reduce the number of accidents; and, to ultimately reduce the cost of insurance.

Before outlining our own safety story, I am proud to say that Robert F. Quain, Senior Vice President, Hilton Corporation, a past president of our association, and also an active supporter of the National Safety Council, saw the need of our current program in 1964. Credit is due to those directly responsible for safety in each participating hotel and motel, and for the continuing success in the reduction of accidents, their severities and the reduction of workmen's compensation insurance costs. Furthermore, these very safety minded, safety imbued hotel-motel people are more or less solely responsible for the reduction of a beginning experience rating of 14.93 in 1954 to the current September, 1963 cumulative accident experience rating of 6.51. These figures are based upon the American Standard method of recording and measuring work injury experience.

At the inception of our safety program in 1954 we were, even at that time, hearing rumblings of unrest as to constantly mounting workmen's compensation insurance costs. Work man-hours were being seriously hampered due to the recurring incidence of employee accidents. Also, working conditions and employee morale seemed at a very low ebb. Therefore, the following preliminary steps were taken: We proposed a program patterned after the existing and successful New York City Hotel Association safety program, this having already been successfully operated for four or five years. We counseled with the National Safety Council and received considerable assistance and suggestions. We also researched various other safety programs. And, further, we counseled with nine of our major insurance carriers representing both our transient and residential member hotels. From all of this, we compiled a 16-page "Hotel Safety Program" brochure for committee consideration and approval.

Our next step was to form our general safety and accident reduction committee. This committee was composed of representatives of management, safety directors, engineers, and/or those responsible for safety in their individual hotels and motels. On your own general committee, you would want only those who could make final decisions, those who could underwrite the project, and those of key personnel or of supervisory capacity who are directly responsible for safety in your organization.

The outcome of the general committee's deliberations brought about the formation of what has proven to be a sound, basic hotel safety program, one that has acted as a go-between with employees and employers, and one that affords a factual consultation and accident service to both employees and employers. The program we set up was intended to, and did, include: policy, scope, objectives, units of operation, safety director responsibilities, an executive committee, our safety council, and a safety competition.

The outcome of additional committee meetings brought about the determination of primary objectives, policies and ideas to develop, individual hotel-motel safety programs, and plans for production of materials and supplies for use in conducting our own safety competition. We also designed the following forms and materials patterned to our own needs: monthly safety competition report forms, Greater Chicago Hotel and Motel Association questionnaire and entry blank forms, employee accident forms, guest accident forms, guest accident tabulation forms and our own safety inspection check list, designed to fit particular segments of our operations. Later on, we adopted the

use of the National Board of Fire Underwriters "inspection blank for hotels."

We then formed a safety council. This was found to be a vital segment of our working operations. Its purpose was to conduct quarterly luncheon sessions to discuss and study applications of all phases of safety and accidents in hotels and motels, to help advance the cause of employee and guest safety, and to help set up and assist in the promotion of educational safety and accident training for all owners, managers, key personnel and working employees. We also charged the safety council with the responsibility of assisting in the promotion of our safety competition. And, as a final assist, the safety council acts as a liaison in encouraging closer cooperation between insurance company engineers and the safety directors of participating hotels and motels.

Our safety council is composed of officers and working committees, such as a safety council chairman, a vice chairman, a council secretary, a safety engineers' committee, a luncheon program committee, an accident reporting committee, and special committees as required. The safety engineers' committee includes safety engineers of the various insurance companies and is charged with such duties as acting in an advisory capacity to the safety council and participating members, the analyzation of competitive reports and progress made in the interest of better rate classifications for properties, and making periodic hotel visits to assist with individual safety problems.

The luncheon and program committee was asked to assume the responsibility of preparing the program for quarterly "dutch-treat" luncheons. These programs include discussion periods with our insurance carriers, qualified speakers, sound slide films, and the various aspects of safety.

The accident reporting committee is charged with the responsibility of encouraging all participating hotels to submit monthly accident reports.

One of the most important functions of a sound safety program is the creation of a *Monthly Safety Bulletin* (or Newsletter), of which 112 have been published to date. The *Bulletin* contains monthly accident reporting, special occasions and events, council meeting reports, safety observances, national and local promotions, and facts and statistics. Its monthly publication is mandatory. A large portion of the success of the program is dependent upon such a medium. It provides for the dissemination of safety information, ideas, programs and other material aids. Factors for consideration are the determination of a format and type of publication, and the determination of place of publication and its editor. Of vital importance is the establishment of a safety library to provide for maintenance of safety information, safety facts, other safety publications, educational materials, slides, visual aids, speeches, etc.

I cannot stress to heavily the value of a safety competition. Our competition is second in importance only to our monthly bulletin. A sound, basic reason for a safety competition is to create employee inducements to cut down the incidence of thoughtless, unwarranted and careless accidents. The ways in which we accomplish this is by awarding, on a fair, competitive basis, suitable recognition for efforts made. Another sound reason for the competition is that it actually effectuates reductions in workmen's compensation insurance costs. Our competition was instituted six months after the start of our 1954 program. Proper advance promotion and preparation of materials and factors needed were first created. Next, fair competitive classifications for large and small participants were inaugurated. Because of the peculiarities of our particular business, we had our competition divided into four classifications according to the number of man-hours worked. At the close of each year's competition, awards in the form of handsomely engraved plaques were made to the first and second place winners in each division. We noted that these plaques are proudly displayed. We operate our competition on a 10-month basis, starting January 1 and ending October 31. The other two months are needed to compile reports, determine the award winners, and for the preparation of the engraved plaques.

Today, after nine years, 42 hotels and motels participate in our safety competition. Our combined experience rating of 6.51 points to a fine record, points to continuing progress. The program is, and has been, worth every hour spent on it.

The theme of our program is "Safety is no accident." Our safety program, carefully set up and operated, has improved the caliber

and integrity of employees, offered protection from unnecessary hazards leading to accidents, and helped property owners save in insurance costs.

In closing I would like to say that we have long since learned that the only way we can continue to make progress is to make everybody in our own hotel-motel industry aware of safety, aware that they must live with the idea constantly in the back of their minds, and that in so doing, they will be properly influenced in every decision they make and thing they do. Just in case you think you don't have a staff large enough to operate a safety program, let me say that my auditor spends approximately a day and a half, per month, clearing late reports and figuring percentages. I, of course, keep in touch with operations through the medium of our safety council, and edit the safety bulletin.

Always remember that accident prevention means more dollars in your pocket, and that employee welfare and improved working conditions are vital to successful business operations.

Safety is no accident.

STATE ASSOCIATION—STATE GOVERNMENT COOPERATIVE VENTURE

By EDMOND M. BOGGS

Commissioner, Virginia Department of Labor and Industry, Richmond, Va.

During the course of a person's life span, he is involved in diversified things, some of which he is not proud to have been party to and would prefer to forget completely. On the other hand, from time to time, feats for which you were partly responsible stand out in your mind, making one feel life has been worthwhile and the results of the leadership are standing out as a beacon light in a storm, offering refuge from the dangers involved in performing one's daily assignments in the industries of Virginia.

The accomplishment to which I refer and of which we are extremely proud is the industrial safety program operating in Virginia. Faced with an over-all high frequency rate for the state, we realized the need for action. It was evident our system of inspections and law enforcement were not obtaining the results desired.

About 1949, I invited 100 industrialists to the state capitol. In this meeting, we put our cards on the table face up, apprising management of the existing condition, asking them to assume part of the responsibility in safety promotion and to offer any suggestions. We were convinced that safety could not be legislated, but was a problem of educating management and workers that there was a panacea for their ills.

From this meeting came our decision to about-face in our operational setup. We switched from inspector enforcement routine to a consultative approach. Our field men were reclassified as safety representatives and given training in the field of consulting with management with regard to safety and health problems.

A letter went out over my signature to members of industry, telling them of the excessive number of workers being hurt while on the job and asking their cooperation in helping to curb this loss in human and material resources. We assured them our men were not coming in as police officers but as qualified safety people offering a valuable service to assist them in accident prevention which would save them and the employees sizable sums of money, as well as untold amounts of human suffering and agony.

Special industrial safety programs were promulgated, such as laundry, foundry, machine shops, automotive, restaurant, etc. This was done in cooperation with organizations such as the Restaurant Association, Automotive Trade Association, Institute of Launderers and Cleaners, etc. Booklets on various phases of safety applicable to the

trade were prepared and sent monthly along with a letter from their association.

Our field men began calling on top management in an effort to sell them a safety program, preferably a safety committee, offering to meet with the committee as often as possible once it was established to guide them in its operation, put on special programs and at times to conduct the entire meeting.

We received the cooperation of the industrial commission in getting the state legislature to amend its laws, making it possible for the department of labor and industry to get two copies of the first report of injuries. These reports are used by our statistical division in making industrial analyses and by the field personnel who make individual plant analyses for use in taking action necessary to prevent recurrence. It puts our man in the position of knowing the safety performance of individual plants. Also, it develops a better bargaining status. These reports are treated confidentially.

In the beginning of this program, we purchased one 16mm projector and a few safety films. This equipment was rotated between the field men. They would go to management trying to promote the program, asking that they be allowed to show a film to any group of employees. Many managements were skeptical and would not go along with the idea: others were more cooperative and tried the change. We continued this way until now each field representative is equipped with projectors and film. No longer do we have to sell this idea. On the contrary, it keeps our people busy filling requests for our services.

During 1962, 32,723 people viewed our educational film.

To further promote safety, our field representatives are armed with 35mm slide projectors and safety lectures on various subjects, such as attitudes, habits, falls, people, accident costs, better living through safety, gambling with fire, human relations and others. We have our own camera, making many scenes from individual plants as as well as drawings made by an artist for us. These lectures are designed by our safety division and are quite flexible, capable of being fitted into a meeting of any type or duration.

In promotion work, we also use demonstrations on fire prevention, eye protection, lifting, electrical hazards, etc. Speaking of demonstrations, let me give you an example:

Down in the eastern part of Virginia, the land is very flat and sandy with nary a hill in sight. A young fellow was raised in these parts and decided to be a minister. He attended school in the eastern part of the state, graduated and was assigned a church in this same flat country.

Later he was invited to a little town in the mountains of Virginia, known as Clifton Forge, to fill the pulpit of an absent pastor. In driving toward Clifton Forge and not being accustomed to the mountainous country, he lost control of his automobile, went over the mountain side, turning over several times, and landing approximately 100 feet below the roadway. For some reason, he was not injured and made his way back to the highway, hoping to catch a ride and continue his journey. A fellow traveller stopped and upon getting out of his car, the preacher could see that he had been imbibing rather freely of alcoholic spirits. The young man told the driver of the car how he had gone 100 feet over the bank and was trying to get to Clifton Forge and could he give him a lift.

The guy looked over the hillside, looked at the preacher and said, "you went over there and didn't get hurt? How do you account for that?" The young preacher told him the only way he could account for it was the Lord was riding with him, and in reply to that, the tipsy fellow said, "By golly, you had better let him ride with me. Dern if you won't kill him." This is a pretty good example of a demonstration.

Recognizing the fact the foremen and supervisors were the key men in any organization, we conceived the idea of a program to better educate them in their responsibilities with regard to safety performance and how they could fit into the puzzle of accident prevention.

Here again we sought the help and cooperation of another organization, the Virginia Manufacturers Association. Some people have asked how we can work with the manufacturers association. Our answer is, "How can you work without them?"

Through negotiations with them, they adopted our proposed safety course, agreeing to co-sponsor it, making it a local project,

since the classes were to be taken to the various areas of the state. A steering committee of members of the Association in the area is appointed to work with our field man in arranging for the class. The committee has the privilege of accepting or rejecting the training course. If accepted, their obligation is to provide a place to conduct the school, set the date and time of the classes, and lend moral support. This is a 20-hour course, operating four hours per day for five days and never has a committee declined to take advantage of it for their area.

The cost is borne by the Virginia Department of Labor and Industry and the Virginia Manufacturers Association. There is no charge to industry for this service. Our department follows up a letter from the Virginia Manufacturers Association to industry, advising the school will be held, with a personal contact to enroll one supervisor from each plant, and we endeavor to limit attendance to 25 persons. It will take about two weeks to assemble a class and instructors from the Department of Labor and Industry take over teaching the following subjects:

Supervisory responsibility	4 hours
Low voltage electrical hazards	4 hours
Material Handling	3 hours
Falls	1 hour
Fire prevention and control	4 hours
Housekeeping	2 hours
Eye protection	2 hours

Those completing the 20-hour course are given a certificate already framed for display at their place of employment.

Up to this time, by conducting one school each month, we have conducted 91 classes reaching 2641 supervisors. Of this number, 1736 completed the course and received certificates.

On request, we have held classes for individual plants, the most recent one in June for the U. S. Marine Corps, Quantico, Virginia, with 34 persons attending and completing the course.

Another service carried on by our safety division is the distribution by mail and handouts each month of approximately 40,000 pieces of safety material for use on bulletin boards. You may say, what has all this accomplished? We have been successful in getting corrections of numerous safety hazards. Records show an individual plant, after adopting the program, reduced frequency rate from 300 to zero. Another received $8,000 credit on its insurance premium.

Increased morale of people has been reported to us which, in turn, equals increased production with quality intact. The state frequency rate for 1962, with 1,933 firms reporting, employing 230,948 employees, continued to improve.

We are also proud of the excellent relations existing between industry and our safety division which makes it possible to reach goals not before attainable.

I would not have you believe the success of this program came about simply because a few of us conceived the idea. Rather, I think it could be paralleled to a court case in Roanoke, Virginia.

A civil case was being tried with quite a bit of money involved. A 12-year-old boy was the principal witness. Try as he may, the lawyer could not shake the boy's story. In desperation, he turned to the boy and said, "Young man, I suspect you have been coached as to what to say in this court." The boy replied, "Yes, sir." The lawyer says, "Hmm, just as I suspected. And who coached you, may I ask?" "My daddy," replied the young man. "Hmm, just as I suspected—now will you tell the court just what your daddy told you to say in this court?" "Yes, sir. He told me to stick to the truth, and you or no other shyster lawyer could break my story."

We have stuck to our story which is the truth and our 10 field men have done a marvelous job in selling themselves, the department and the program to management. Without their being fully sold to the cause, little would have been accomplished. We are quite grateful to them for this endeavor.

In the last session of Congress, we opposed two bills, known as Occupational Safety Acts, H. R. 11192 and H. R. 11451, and will oppose any other proposal of similar intent, because it is unnecessary and undesirable and would, in fact, prove harmful.

State legislation gives to the Virginia Department of Labor and Industry the personnel, the law and the budget needed to maintain an excellent safety program in Virginia. Our statutes authorize the safety codes commission to study and investigate all phases of safety and to formulate rules

and regulations to further protect and promote the safety and health of workers. We now have a safety codes commission with the authority to adopt safety rules and regulations in all phases of business.

It is readily apparent in Virginia that the Department of Labor and Industry has all of the law, regulation and cooperation that it needs to carry on a positive industrial safety program. Let me emphasize that cooperation at the local level and at the scene of the job is the most important aspect of safety, and our program enjoys maximum acceptance and cooperation. Federal intervention would hinder this program.

Safety is a non-controversial goal, and all involved can work together for its attainment. It is hard to believe that any state cannot afford what is required for an effective industrial safety program. In fact, no state can afford not to have it. The savings involved in life and money are worth many times what is required to maintain a good safety program.

Legislation being considered by the Congress is unnecessary and highly undesirable as regards the administration and promotion of industrial safety. Not only is Federal aid not needed, it is an unwanted intrusion of Federal Government into a field of state responsibility where local effort and cooperation have produced steady improvements in working conditions, generally.

The operations of the Virginia Department of Labor and Industry are versatile and complete in the field of job accident prevention. Our program involves direct contacts with employers and employees and safety programs designed for different types of industries as well as for individual plants. Our inspection services, consultation services, educational services, and enforcement all have the same common goal—to hold to a minimum the economic and human losses due to accidents and injuries. The safety schools for supervisors and safety personnel, conducted throughout Virginia with the full cooperation of industry and county and city governments, have achieved state-wide support and wide acclaim.

Virginia has, over the years, recorded a steady lowering of injury frequency rates, which is positive proof of the over-all effectiveness of our accident prevention efforts. We maintain, in Virginia, a modern system of accident reporting. Our accident data are compiled in accordance with the American standard method of compiling industrial injury rates.

The safety division of the department of labor and industry in Virginia enjoys the broadest possible cooperation from local and state governments; state and local safety associations; and trade and employers' associations. This close working relationship involves many years of dedicated effort and is based more on cooperation and positive effort than law or regulation. We all understand the necessity for the law and the regulations we have forged, but we appreciate that safety cannot, in fact, be legislated —that it thrives only on cooperation and local effort with a minimum of outside guidance, apparent or otherwise.

In our state, we have all of the law, all of the manpower, all of the authority, and all of the cooperation we need to discharge *our responsibility with regard to job safety.* Unneeded funds and unnecessary interference from the United States Department of Labor could only detract from the good program and the positive effort we have achieved in Virginia.

For these reasons, I hope that it will be the pleasure of the National Safety Congress to oppose any further Federal legislation dealing with occupational safety or anything similar to it.

ASSOCIATION AWARD PROGRAMS— THEIR LATENT POTENTIAL

By SANTO J. BARCA
Asst. Director, Can Manufacturers Institute, Inc., Washington, D. C.

If all of us in this room were asked to describe our jobs in as few words as possible, we'd likely answer somewhat along this line:

"Put our industry's good points before the public in a positive way."

Last year most of us passed up a program that would have done exactly that.

What is more, it looks like we're missing a good bet again this year.

We should begin to sit up and take notice. It's our job to boost our industry. We need every dignified device to do so. And there aren't so many around that we can afford to let a dandy one slip right through our fingers.

So let's take a few minutes to look at this idea of an Association Safety Award Program to see how we can capitalize on it for our members, and—as a nice by-product—for ourselves.

Maybe we ought to begin by sketching a picture in our minds of what an awards program should be.

Here's an outline we'd like to draw for your mind's eye:

An awards program is a distinguished way of giving special recognition to member companies for an outstanding achievement in accident prevention work.

Those are high-sounding words but nothing less will do, for the awards program should be put in the elite class and kept there. There shouldn't be any temptation to bend, or yield, or compromise. Keep it on a high plane. Let the key parts of that definition be applied literally.

Distinguished way means appropriate ceremony carried out in the best of taste;

Special recognition suggests handsome trophy, plaque, or certificate; and

Outstanding achievement carries with it an accomplishment that stands head and shoulders above the crowd.

It should be an achievement that safety men would point to with envy and say, "Gee, I wish we had done that."

Admittedly these are tough standards. But they are necessary to give the program a fair crack at success. The program must have substance, character and value to keep it out of the gimmick class.

Lower the standards and we'll be inviting a "Ho Hum" or "So What?" attitude that will make a mockery of the awards and may likely encourage employees to ridicule the entire safety program.

So, we say, make the awards attractive enough to stir the senses. Give them that exclusive touch by making them hard to get. Present them at important gatherings of our industry. Personalize the handling of an awards program as much as possible.

Take care of these basics and we'll have a program that'll arouse reactions like this,

"Hey, you oughta hear what our plant did and see what we got for it!"

With the thought that we now have a working understanding of what an awards program should be, let's talk about some of the resources we can mine out of it.

What we said in the early part of our talk is a good one to begin with: It's a tool we can use to tell the public the good things that our members are doing. In saying this we're not referring to a vague, formless public somewhere out there. We have in mind a public with a flesh-and-blood shape to it—home, neighborhood, community. In other words, people with a capital P. Safety touches their lives daily and they, therefore, have an understandable need to know what industry is doing to keep them safe everywhere. Ours is the obligation and duty of telling them.

An awards program is a distinctive way of letting them know. It is also an effective way of dramatizing the importance of safety and the key role it plays in our members'

operations. There is another plus to it. Awards are an eye-catching, attractive way of demonstrating the safety job industry is voluntarily doing to make its employees safer on the job. Through this we may well make allies of our audiences with the sideline benefit of their talking up safety at home.

Safety also needs rooting sections in our plants. It needs an activity that can build up and hold employee interest; a program that can create a safety atmosphere and develop safety awareness.

It requires an activity that can drill the name "safety" into our employees' minds, just as advertising serves to pound brand names in consumers' minds by repetition then some.

Advertising follows a technique that is given the catchy name of AIDA. Broken down it means: get attention; build interest; develop desire; and promote action.

AIDA—attention, interest, desire, action. Just the very things that can be put to good use in making our employees want to work safely. An awards program can fill the bill for safety just as advertising does for products.

Getting over into other benefits, let's explore together the field of insurance premiums and classification ratings to see if we can find any potential gains there.

We are told that among other things carriers take into account their client's accident experiences as they stack up against other companies of similar operations, hazard potentials, risk histories and size of plant.

An awards program sets up yardsticks for measuring achievements within an industry which the carrier can crank into his calculations. Once he knows the standards that have been set up for the awards, he can fix the company's relative standing in assessing premiums and ratings.

The awards program acts to set apart the cream of the industry. Preferred classifications and rebate checks have come about as a result. At least our members have told us so. And as frosting on the cake, they have done so from the floor at association meetings.

Which leads us to another benefit. We in association work look for dignified activities that will brighten up our meetings. If we can come up with events that will put the spotlight on more people, so much the better. An awards program is a versatile performer for our purposes. It is a program builder. It helps to make meetings more lively and interesting.

As mentioned earlier, it's a natural for home-town publicity. And it gets more people into the act, for it gives all companies—large, medium and small—an equal chance to get their day in the sun before their industrial colleagues. It also gives the officials down the safety line a chance to shine before their bosses.

We've had some exciting experiences come out of our awards presentation ceremonies that we'd like to share with you.

But first, to explain just a bit, we plan our awards ceremony for our annual meeting of members and give it the prestige that the achievements so richly deserve. Our companies respond by having their top officials there to accept the awards.

One company went a step farther. The plant manager was brought cross-country from California to accept the award in behalf of the company. You can imagine how proud he was to come front and center and represent his company before the industry. We don't imagine he was hurt one bit by standing in for his corporate boss who was there watching the proceedings.

Other companies brought their safety officials along to take part in the ceremonies as a way of giving credit where credit is due.

Appreciation for the leadership given by the safety committee was made a matter of record. One highly-placed company officer made it a point to call and congratulate the committee chairman. Since both are in the same company we can guess that gesture didn't hurt one bit, either.

Going beyond the presentation at association meetings, companies take the awards back and present them to plant personnel at an appropriate ceremony. We know that, for we have been privileged to take part in the tributes.

Let's recap what we've been talking about. An association safety award program can help us do our jobs. It is a reservoir of good will that, when opened, can make friends for our members.

It is a distinctive device for demonstrating to our employees, their families and neighbors the importance of safety to our industry.

It is also a cost-cutting, money-saving tool, because it plays a part in improving safety programs. It can stimulate employee interest in safety and can make them want to work safely. Wanting to work safely will influence them into choosing the safe way of doing a job. The more employees choose the safe way, the fewer the accidents. The fewer the accidents, the less accident and insurance costs.

It can build up individual and collective employee pride in their company.

On an association level, it can improve industry relations by providing a setting for recognition of achievements.

And it can help the persons who are helping the association.

These are the things we have seen an awards program do for us. Perhaps you can see something there for you.

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