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dried. We corresponded with practically every state highway department in the union, looking for ideas in regard to this matter. At that time, our experience had not been good from this operation. We obtained some very good ideas from some of this correspondence.

Finally, one of our district shops developed a machine which is now in use in each of the twenty-five districts of 10 or 11 counties each. We have found that this machine does a reasonably good job under most traffic conditions. Since we have started picking up markers in this manner, no injuries have occurred to the men on this operation.

We use unusually high red flag markers, as well as flashing lights on all equipment operating on the traveled surface, since we believe that the so-called second or third car can easily get in trouble behind a large truck when approaching this operation, either meeting or passing the equipment. This flag arrangement is so constructed that it will fold down when the machine is being transported from one location to another.

A supply pickup truck follows the paint striping machine closely in order to offer additional protection to the men on the rear of this machine by discouraging traffic from cutting in behind it.

The markers are dropped down a pipe which allows the men to be in a less hazardous position than if they placed them directly by hand. These small pyramids are approximately 5¼" in height and are used almost entirely in our state for protecting the fresh paint stripe. Sometimes, one or two 18" cones are used at the beginning of section of stripe to be protected.

In summary, I would like to say that we of the Texas Highway Department agree with what seems to be the general opinion that this is a hazardous operation requiring serious study, both from the standpoint of protection of employees and traveling public. We also agree that regardless of the type of markers used, a machine pick-up method of some kind should be used that will eliminate the hazard of retrieving these markers from bucket seats or similar practices.

Mr. Van Mechelen: (A motion picture was shown illustrating the Washington Department of Highways' system of retrieving traffic cones used to protect new highway striping. Mr. Van Mechelen then described some of the fire and explosion hazards of carrying striping materials.)

In addition to reducing hazard to employees by using mechanical methods to retrieve stripe markers the following safety measures should be observed.

All flammables whether liquid or solid not in actual use to be removed from deck of striper.

To reduce static spark hazard make certain all sources are either corrected or grounded. All components of the unit must be electrically bonded to each other. Chain grounds either for ground to ground or to ground components are not permissable as paint, rust etc., acts as insulation between links. Only continuous strip or cable bonds are permissable. Two grounds to ground should be used.

Solvent tanks should be pressurized only by use of a manually controlled valve which automatically cuts out when released. The pressurized vapor residual in the tank after each use should be bled off through a check valve and tubed directly into the compressor engine intake manifold to be burned as fuel.

All compressors should be of rotary type with apical pressure potential of 125 P.S.I. and equipped with not less than two blow-off valves. Both the compressor and truck engine stacks should be equipped with spark arrestors.

No smoking should be permitted near stripers whether operating or standing. This includes the cab. Extinguishers should be removed from brackets and kept ready near the machine during charging, cleanup etc. All tanks should meet A.S.M.E. requirements.

Battleship cleanliness and tidyness should be observed at all times. No material movement should be permitted while machine is moving. Service trucks which supply unit should be metallically bonded to unit prior to and during transfer of materials to unit.

HAZARDOUS MATERIALS CONTROL

By WILLIAM RETZER
Industrial Hygienist, Caterpillar Tractor Co.,
East Peoria, Ill.

Hazardous materials control is a vital part of our supervisory job. Whether it's in a large industrial plant like Caterpillar, in hospitals, in highway construction—no matter what the operation—large or small—our understanding of the materials we handle is extremely important to the safety of our employees.

In this discussion I will understandably dwell on our practices at Caterpillar because those are the ones I know about. I'm sure you'll agree, however, that similar practices can and should be observed—no matter where you work with hazardous materials.

Our first admonition to our supervisors is "know what you're using and how to handle it. If you don't know what the material is—don't handle it—leave it alone."

A few years ago we in the medical and safety divisions were awakened by the fact that the handling of hazardous materials in the plant was being taken much too lightly. Hazardous materials and chemicals were being used and stored indiscriminately. For instance, cyanide and acids were being stored next to each other, a situation which presented lethal possibilities. Wash tank operators were charging their tanks with caustic by the shovelful.

In the chemistry section of our Met lab we had an explosion in a perchloric acid hood, caused as the result of inadequate flushing of the hood. You know what happens when perchloric acid comes in contact with organic material. The explosion caused extensive damage to property in the laboratory, but luckily there was slight injury to personnel.

There was the case of the carbon tetrachloride: the stuff that has the 25 ppm maximum allowable concentration. A great deal of this solvent was being used throughout the plant with nearly as much abandon as if it were water. The word quickly got around that it could be obtained at the oil cribs and was very good for dry cleaning clothing.

There was supposedly good control over disbursement of carbon tet, yet when our safety manager sent our inspectors and investigators to the oil cribs to ask for a bottle of the solvent, they had little or no trouble obtaining it.

As a result of the foregoing, plus other evidences of loose practices in handling hazardous materials, the hazardous materials control committee was established. We refer to it as *hazmacoco*. But here I'll call it the committee. It consists of the manager of the safety division, the plant industrial hygienist and the chief of plant protection; all of whom are naturally concerned with the safety and well-being, not only of plant personnel, but company property as well.

The committee operates primarily under part "J" of the Health and Safety Act of Illinois. This act contains the rules and regulations relating to labeling in the use, handling and storage of substances harmful to the health and safety of employees. Since it is the state law, it is basic to all operations involving the use and handling of hazardous materials. Secondly, the committee operates according to Caterpillar procedure (P-14) for handling hazardous materials. This company procedure more or less follows the state law, but applies it specifically to Caterpillar operations.

It deals with:

1. selection of new materials, 2. labeling of containers, 3. storage of hazardous materials in disbursing cribs, 4. inspection of hazardous material containers, and 5. disbursing the hazardous material to the end user.

A hazardous materials safety manual is prepared by the committee as a guide for key personnel in the handling of these materials and in the conduct of hazardous operations.

Each manual is numbered and a register kept of the people who have copies. When new materials are introduced for use in the plant or procedures are established for hazardous operations, the information is sent immediately to the holders of the manual to be included in their copies. Thus the manual is kept current.

I would like to emphasize that distribution of the manual is done on a selective basis. Division heads indicate who of their personnel should receive the book and their recommendations are carefully scrutinized before releasing a copy. This is done simply to avoid promiscuous distribution of the manual to plant personnel who either have no use for it or would not know how to use it. Generally, the distribution is to the superintendent level and over.

Selection of new materials is an important and pretty basic function of the committee. When a new material is being considered for use in the plant, one of three things can happen. First, the buyer in the purchasing division obtains a sample of the material and forwards it to the committee. It is then sent to our Met lab where it is tested for its flash point, toxicity and corrosiveness. If the material is found to be extremely hazardous, permission for its use will no doubt be denied and recommendations made that a less dangerous substitute be found.

Upon examination in the laboratory, the material may be found to be hazardous but not to the extent that it can't be used safely under certain conditions. In these cases, permission is given for the material to be used, but at the same time specific instructions are given as to what protective measures must be taken. These may include protective clothing, ventilation, warning signs, etc. Then there is the third possibility that the material has been found to be relatively harmless. If this is the case, permission for use is granted, usually without restrictions.

Occasionally, after a material has been tested in our Met lab, it is considered wise to test its use under controlled conditions before releasing it for production use. In this case the Met lab will set up a pilot project so the material can be observed under actual production conditions.

In all our considerations of the degree of harard present in the use of any material, it must be kept in mind that our primary objective, at Caterpillar, is to produce in quantity, the best quality of our product, which is tractors. Therefore, if a material proves to be extremely hazardous, but is the only one which can be used to produce top quality work, permission is granted for its use. Very rigid protective measures are imposed and strict adherence to these measures is the rule.

Don't feel apologetic about placing warning labels on hazardous materials and chemicals. Take a forward looking attitude; think of labels as visual evidence of an obligation recognized and fulfilled. Adopting such a policy is like taking out insurance on the future of your products, personnel and property.

At first we considered it satisfactory to let the vendors who sell us our hazardous materials, take care of placing warning labels on the containers. It didn't take too long to discover that this plan was at best, uncertain. We found that in many cases the labels simply weren't there—perhaps they had come off in transit.

Many vendor's warning labels are so small that they represent no warning at all. They don't attract attention. In still other cases, the vendor places the warning label on the lid of the container. When the lid is removed, so is the label.

So many deficiencies were found in this method that it was decided that we would design our own warning labels and that they would be affixed to the containers by the receiving division when the material arrived at the plant.

Radioactive materials are being used in increasing numbers as time goes on. We've found that there is no need for concern about labeling of these products. The labels are placed on the containers by the supplier according to strict rulings of the atomic energy commission. They are adequate in size, shape and color, and are always placed so that there is no doubt of the nature and danger of the contents.

When considering control of hazardous materials, it is almost impossible to avoid getting into the field of controlling processes and procedures which involve these materials. For instance, in our manual we have included the committee's recommendations for: 1. use of respirators, 2. acid handling, 3. carbon dioxide welding, 4. welding on coated or painted surfaces, 5. manifolding of cylinders, 6. storage and handling of compressed gases, 7. cleaning paint booths, stacks, pits and tanks, 8. spraying of flammables, and 9. radiation safety and operating procedures.

This list will grow as the number of hazardous processes and procedures increase.

The committee is never arbitrary in its recommendations. When a hazardous situation arises which we feel needs safeguards, considerable research is done on the subject before commitments are made. But once the committee has made its recommendations, no deviation from them is permitted. That procedure stands as written.

Here is an illustration of what the committee recommends where hazardous conditions are involved in cleaning pits and tanks (underground and above ground). When a tank is to be cleaned, the safety division, industrial hygienist and plant protection are all immediately notified. The industrial hygienist and plant protection men test the atmosphere within the tank for flammability and toxic concentrations as well as oxygen deficiency.

Sanitation division personnel (who clean the tank) obtain two airline respirators from the safety division, one for use and one for stand-by. The safety division also provides a safety harness and line which is always worn by the person entering the tank. A member of the safety division is in attendance at all times in case of emergency.

The man cleaning the tank uses non-sparking tools (shovel, bucket). The light used in the tank is provided with explosion proof protection. The man usually comes out into the fresh air at least once every half hour, even though the tank atmosphere is non-toxic. The employee also wears rubber boots, goggles, gloves, etc., for protection while in the tank.

In all of our recommended procedures, careful consideration is given to the hazards peculiar to that particular operation. For instance, in our recommendations for carbon dioxide welding, the following factors had to be considered: 1. gamma or beta radiation, 2. ultraviolet light, 3. ozone, 4. carbon monoxide, 5. phosgene, and 6. oxides of nitrogen.

There are other items which come under the jurisdiction of the committee: 1. empty containers (dangerous), and 2. pressurized containers (not allowed).

This control program is being carried out effectively in our plant. It could not succeed without the confidence and backing of top management plus the dynamic attitude of the committee itself. The whole control idea came about because we assumed that our employees knew what they were doing with hazardous materials.

CONTENTS—Continued

ACCIDENT PREVENTION FUNDAMENTALS

PART I — KNOWING YOUR PROBLEM

GATHERING ACCIDENT FACTS

By RICHARD M. BRYANT
Superintendent, Engineering-Audit Dept., Glen Falls Insurance Co., Glen Falls, N. Y.

No accident in itself is of primary importance, even though the resultant cost and inconvenience may be of great consequence. Studying the results of accidents merely informs us of their number and severity, but leaves us wide open for more of the same. What is important is the reason why the accident happened, and whether or not the conditions still exist which might result in another. Gathering the facts of the accident must include a careful investigation of the *cause or causes* that were responsible.

All of us here have one thing in common: an interest in safety. Not all of us work at it from the same point of view, *and not all with the same size budget.* My particular interest as supervisor of the engineering department of the Glens Falls Insurance Co., is to help our insureds to eliminate accidents. I'll admit that we have the ulterior motive of trying to make a profit on the various types of business which we service, but our department is interested in preventing accidents rather than in compiling statistics.

In our efforts we try to work with the people responsible for safety in the plant, institution, hotel, or whatever the *risk* may be, in analyzing the accident for the contributing factors. A knowledge of these factors is a primary requirement. I'm sure that all of you are familiar with the American Standards Association's Code Z-16.2 "Compiling Industrial Injury Causes" but I would like to re-state and discuss these five factors. They are: 1) The agency and agency part, 2) The unsafe mechanical or physical condition, 3) The accident type, 4) The unsafe act, and, 5) The unsafe personal factor.

There is other information that must be included in an accident report in order to be complete. Such data as the workers' name, sex, age, and occupation; the date, hour and place of accident. These, however, have little direct bearing on our efforts to prevent further accidents of the same nature.

Getting back to the five major factors involved in an accident, let's consider them one at a time. First, the agency and agency part. There will normally be little difficulty in determining the machine, elevator, hand tool, or what-have-you, and the particular part of *the agency involved in the accident.* In Amarillo a scaffold turned over, causing an employee to break an arm and be badly bruised, resulting in an insured loss of $3,975. There was no question but what the agency involved was the scaffold. Any time there is personal injury or property damage, the injured person, foreman, or supervisor will be very willing to place the blame on the inanimate object. The agency might even be an animal, bird, or insect, but here again, there will be no reticence about placing the blame.

Factor #2: The unsafe mechanical or physical condition. Here again, with no great effort, it can be determined if the accident resulted from improperly guarded or defective equipment, hazardous arrangement or procedures, *improper illumination* or ventilation, or unsafe dress or apparel. In the previously mentioned scaffold case, the unsafe physical condition of the scaffolding was the cause. In LaFayette, Ga., a mechanic and helper were taking a track off a caterpillar dozer. A chip from the mushroomed head of the chisel took the sight of one eye of the helper who was holding it. The chisel was defective and the man should have been wearing safety goggles. Due to the fact that the management had refused to cooperate in eliminating such unsafe practices, our coverage

had been terminated before this accident occurred.

In establishing this factor, though, we begin to make someone uncomfortable. Perhaps the foreman or supervisor realized, but failed to correct, some of these unsafe or unsatisfactory conditions, or the workman did not heed them. They become a little more reluctant to be completely honest in reporting the fact.

Factor #3: The accident type. This factor also is fairly easy to determine. It includes such information as whether the person or property struck against or was struck by an object; was caught in, on, or between something; fell on same or to a different level; slipped or over-exerted; inhaled, absorbed or ingested harmful matter, or contacted electric current or temperature extremes. Perhaps the best example of the latter was the little boy who licked the North Pole at Santa's workshop on Whiteface mountain. His tongue and cheek were fused to the pole. This turned out to be a $1.040 lollipop for us.

The next two factors are the ones that are the most difficult to determine. They involve personal behavior and the motives behind such behavior. These are the underlying causes. Accidents involving these factors are too often described by unqualified or uninformed investigators as due to carelessness on the part of the person involved.

Factor #4: The unsafe act. This is the factor involved when the accident results from operating without authority, failing to secure or warn, working at unsafe speed, making safety devices inoperative, using hands instead of equipment or unsafe equipment, taking unsafe position or posture, working on moving or dangerous equipment, distracting or teasing (horseplay in general), failure to use safe attire or personal protective equipment or devices. As you all know, this factor is included in a great many accidents. You have all had experience with people who refuse to wear goggles or use shields. Less common was the case where a man working under a riveting team caught a runaway rivet in his loose-fitting boot. Before he got the boot off, the flesh was burned to the bone. Sometimes such causative factors are obvious. At other times, considerable investigation might be required to find the basic reason. In many cases, unsafe acts are committed so regularly and often that they are accepted as standard operating procedure by both workmen and supervisors. In such cases it is not so obvious that an unsafe act had been committed.

Factor #5: The unsafe personal factor. Here we run into such things as improper attitudes, lack of knowledge or skill, bodily defects.

Since this is a factor in so many accidents and is often more difficult than others to identify with the accident, perhaps we should break these three down further. Improper attitudes include such factors as willful disregard of instructions, or failure to understand instructions, violent temper, absent-mindedness, willful intent to injure, nervousness or excitability.

Lack of knowledge or skill include those who are unaware of the safe practice to follow or have had no opportunity to practice or become skilled. Bodily defects include the obvious—defective eyesight or hearing, crippled, intoxicated, and the less obvious—muscular weakness, existing hernia, fatigue and existing heart or other organic weakness.

An example of defective eyesight as an unsafe personal factor was the employee of a sheet metal and roofing concern in Savannah, Ga. A series of minor accidents brought to light the existence of poor vision. His employer had no other type of work for him to do, but due to his length of service, they would not discharge him. Admirable though it might appear, the fallacy of this reasoning was apparent when the man died as a result of injuries from a fall which was due at least in part to his defective vision.

Accepting the presumption that all accidents include one or more of these causative factors, we know what to look for in the facts pertaining to any one accident. These facts may be assembled by the safety engineer or safety committee in a sizeable operation, but, regardless of size, the person most often called upon to complete the first report is the foreman or supervisor.

If this Congress runs true to form, and I have no doubt it will, the foreman and supervisors are going to be charged with a tremendous amount of responsibility. I have the utmost confidence in this group as

a whole, and am certain that a great deal of credit is due to them for many of the advances which have been made in this great industrial nation of ours. Not only are they responsible for the production records which have been set, but have taken safety into consideration to the extent of an 80 per cent reduction in the last thirty years of the all-industry frequency rate for all disabling injuries. Due to his familiarity with the worker and the work area, his knowledge of machines and materials, and his close relationship with the work group, the foreman or supervisor is in the best position to conduct the accident investigation.

However, any safety engineer knows from sad experience that supervisors who maintain a keen interest in safety are not typical. Requiring them to complete accident reports therefore, has an educational value. They are made aware of the number and type of accidents happening in their department and whether they are the result of his failure to properly instruct or enforce safe procedures.

The first requisite in gathering the facts of an accident is to have an open mind. The very human tendency to reach an early conclusion and then use only that subsequent information that tends to confirm your original conclusion must be resisted. The inquiry should be handled in such a manner that the cooperation of those involved will be spontaneous, not hindered by the impression that an attempt is being made to fix the fault or blame someone.

The primary purpose of investigating the accident is to find the immediate and contributing causes and identify the corrective steps necessary to develop safe working conditions and to prevent the same type of accident from re-occurring.

The investigation should be conducted promptly before the conditions change. Only then can all the details be recalled, either by the person involved or by witnesses to the accident. Certainly if there is a personal injury, the first consideration would be to provide proper care for the injured. Another advantage of promptness is the impression it makes on the minds of persons in the vicinity, the feeling that management attaches a great deal of importance to their safety and well being.

The accident facts must be accurate. They should be verified and carefully recorded for referring to at any later date.

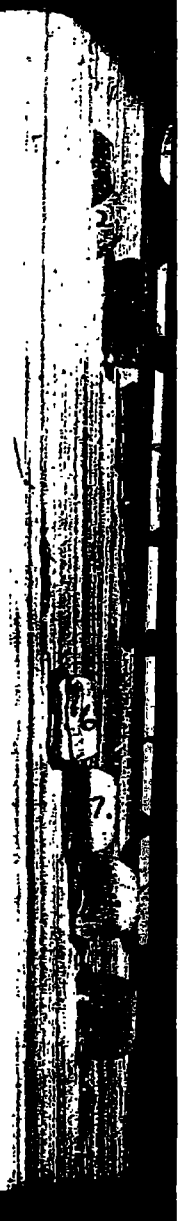
So far I have tried to confine myself to the term "accident" rather than "injury." Too often the terms are used interchangeably. Mr. Heinrich defines an accident as "an unplanned or controlled event in which the action or reaction of an object, substance, person, or radiation results in personal injury." Russel DeReamer calls it "an un-planned, non-controlled, and an undesirable event or sudden mishap which interrupts an activity or function." Dean Keefer's definition in Blakes' "Industrial Safety" is "any occurrence that interrupts or interferes with the orderly progress of the activity in question."

Regardless of what definition you prefer, I'm sure that we can all agree that many accidents occur which result in neither personal injury or property damage. Perhaps only by the Grace of God, such as the incident when a cable broke during the stressing of cables before pouring a pre-stressed concrete bridge section. The 18 in. square steel jacking-block flew through the air like a guided missile but only hit the gantry—no personal injury and no appreciable property damage. However, in an almost identical accident at another plant doing the same thing, the block struck and killed two workmen almost instantly.

Such instances as this prompt me to feel that all accidents should be investigated as thoroughly as possible, regardless of whether they result in serious injury, minor injury, or no injury.

Certainly it is impractical to investigate every minor first-aid case in a large plant, but, by keeping a record of them, any trends that develop can and should be looked into. Investigating minor injuries demonstrates to the employees the personal concern of the supervisor for his welfare. In so doing, it develops an atmosphere which tends to make it much easier to investigate a more serious accident.

Reliable statistics indicate that the cost of minor injuries computed in terms of time lost from work, first-aid and treatment expense, is two or three times the total compensation and medical expense paid as a result of disabling injuries. It therefore stands to reason that any effort spent along the lines of eliminating these accidents is well worthwhile.



Since the ratio is some 300 potential injury occurrences to 25 first-aid cases to one lost-time injury, it seems reasonable that an investigation of no-injury accidents, and correcting the conditions responsible for them, would be a good investment also.

In gathering our accident facts there is a great deal to be learned from a study of past accidents. One advantage is that when there are a large number of apparently unrelated accidents a study of the over-all accident experience will often indicate a remedy immediately — usually a sub-cause such as lack of proper employee instruction, or congested, inadequate or poorly illuminated work areas. Another advantage is that where there is a frequency of accidents an analysis of them as a whole will sometimes point to those with a possible severity which should be acted upon first.

One other topic I would like to mention is the responsibility of every one of us to do what we can to reduce the number of off-the-job accidents. I believe that this is one of the most fertile fields for "Safety In the Sixties." A man killed or injured off the job is just as much of a loss to production as one killed or injured by a machine or an elevator. It might not affect your plant safety record or our compensation loss ratio, but if for no other than the humanitarian aspect, something drastic needs to be done about the 27,000 deaths and 4,000,000 injuries in the home and 16,500 deaths and 2,050,000 injuries in public, not to mention the horrible motor vehicle statistics which were accumulated in 1958.

The economic loss to industry of off-the-job accidents is probably not fully realized. One company's record indicates its off-the-job frequency is 10 times their occupational rate. The 1959 edition of Accident Facts discloses fewer deaths from work injuries than from any of the four principal classes, with 13,300 deaths from work injuries from a total of 91,000 accidental deaths in 1958.

In this phase of safety work, as in all others, it is important that we gather our accident facts in order to plan our attack on the problem. Agreed that employers cannot tell their employees what to do off the job, but once we know the types of accidents involved, we can keep reminding them of the dangerous practices that are causing the accidents.

There are several ways of assembling data on off-the-job accidents. In those industries such as ours that require employees to report to the infirmary after a sick leave or unexplained absence, it is an easy matter to have the nurse or doctor complete a simple form, checking off the cause, and number of days lost. These completed forms can then be forwarded to the designated person. Such information is almost mandatory in those states having disability benefits laws. Another method is to have the supervisors report all off-the-job injuries on the time sheets or on a separate form. In either case, the forms should be kept simple and uncomplicated. No use in gathering a lot of information that won't be used.

Even if no other use is made of this information than making sure every employee is made aware of the problem, and maintaining such awareness by such means as plant publications, bulletin boards, or local newspapers, it would bring about a reduction in off-the-job accidents.

To summarize the points I have tried to get across, it seems to me that regardless of whether it is a serious injury, minor injury, or no-injury accident, the principal requisites in gathering our accident facts are: 1) To have a good working knowledge of the five industrial injury causes outlined in Code Z16.2; 2) To require a prompt and complete report of the accident from the person best qualified to obtain the data, usually the foreman or supervisor; 3) To keep an open mind until all of the direct and indirect causes have been established, and most important of all; 4) Once the facts are assembled, to take some positive action to correct the conditions responsible.

All the facts in the world are of no value until they are put to use in an effective safety program.

PICKING YOUR SAFETY TARGET

By J. E. BROWN
Superintendent, Engineering Dept., Hartford Accident & Indemnity Co., Chicago

Have target—We think of a target as something to shoot at, and so it is that the man responsible for the development and administration of a program of accident control to be successful must be objective in his efforts. To be objective he must establish a target or goal and base his overall effort on the attainment of that goal. All of us may well map out targets on some phase of our program as we come to it but we should have an overall target which we can keep in mind as the main thing to shoot at. We can then frequently evaluate our progress against this target and take better aim when we are straying away from an objective approach.

This overall target or objective should be based on principles which are effective in accident control. It has been my experience, and this is verified by the experience of many of my associates, that accidents are effectively controlled when management takes three steps:

1. Recognizes the economic losses resulting from the conditions responsible for accidents.
2. Delegates responsibility for controlling losses to line supervision and makes sure this responsibility is understood and accepted.
3. Establishes systematic methods to determine and eliminate the loss producing conditions, both actual and potential.

The degree of success of your program largely depends upon how effectively these three steps are carried out. I highly recommend that those of you who are responsible for the development and administration of a program of accident control establish an overall target and I recommend that these *three principles* become that target. Use this target objectively to measure the progress of your efforts. When you are not hitting the bull's eye, adjust your sights.

Mr. Bryant gave you many good ideas about gathering facts. I cannot stress too strongly the importance of his subject. If we are going to accomplish anything in accident control our efforts must be based on facts. Tomorrow you are going to hear about "Selling Your Problem" and the next day about "Servicing Your Problem." I like to think about this three day session as being built around a logical program: 1. have target, 2. get the facts, 3. develop proposals, 4. sell proposals, and 5. follow up.

Get the facts—At the risk of some repetition of Mr. Bryant's statements about gathering facts, I would like to inject a few thoughts. You have established a general overall target. Let us say you have established that management should take the three steps I have *mentioned*. This is your target or goal. The facts which you gather should help you evaluate how effectively these three steps are carried out. Take this first step—How well does management recognize the economic losses resulting from the conditions responsible for accidents. We know that executive management has a humanitarian interest in the welfare of their people to some degree but largely they are swayed to action on most proposals by the economic factor. If they recognize the economic losses resulting from conditions responsible for accidents they will see that it is good business to support and approve proposals which are related to the second and third steps of our target.

Most executive managements are hard headed, cost conscious business men who are not gullible over general statements such as a general ratio of indirect costs to direct costs of accidents. They are easily motivated to action when they have their own costs. The best way I know of to get this is by immediate and detailed investigation of the uninsured costs involved in selected accidents. I recall one case in a plant in Michigan which was investigated. There was no injury involved as the man was protected by goggles. The cost of damaged material, damaged equipment and employee delay amounted to $1080.00 to say nothing of a delivery delay which effected customer relations. From this one example this management realized that the same conditions which basically are responsible for injuries are also responsible for many other hindrances to their operation, such as scrap, rework, machine delays, turnover, poor cus-