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THE REPORT OF THE NATIONAL COMMISSION ON STATE WORKMEN'S COMPENSATION LAWS

By JOHN F. BURTON, JR.

Former Chairman, National Commission on State Workmen's Compensation
Laws, Associate Professor, Graduate School of Business, University of Chicago.

Congress, in the Occupational Safety and Health Act of 1970, established the National Commission on State Workmen's Compensation Laws and instructed the Commission to "undertake a comprehensive study and evaluation of state workmen's compensation laws in order to determine if such laws provide an adequate, prompt, and equitable system of compensation." The Act required that a final report be transmitted by the Commission to the President and to the Congress no later than July 31, 1972.

There were 18 members of the Commission, and a full-time staff of 30 employees assisted the Commission. We carefully considered the views presented at our hearings and by our staff and contractors. The issues were analyzed in our formal sessions, correspondence, and conversations. The result of this analysis and the interaction among us is that we reached general agreement about the potential role and actual record of workmen's compensation. There are, to be sure, three Commissioners who filed Supplementary Statements (which is our euphemism for dissents). But the disagreements in these statements is limited to a few areas, and the Report is essentially unanimous.

We concluded there are five objectives for a modern workmen's compensation program. These are: (1) broad coverage of employees and of work-related injuries and diseases; (2) substantial protection against interruption of income; (3) provision of sufficient medical care and rehabilitation services; (4) encouragement of safety; and (5) an effective system for delivery of benefits and services. These five objectives were used to evaluate the present workmen's compensation program and to develop our recommendations for improvements in the program.

1. Broad coverage of employees and work-related injuries and diseases. Concerning coverage of employees, the Commission found that although the percentage of employees covered by workmen's compensation is increasing, state and federal programs now reach only about 85 per cent of all employees. We concluded this coverage is inadequate. Coverage is also inequitable because of the wide variations among the states in the proportion of their workers protected by workmen's compensation. Thirteen states cover more than 85 per cent of their workers, but 15 cover less than 70 per cent. Inequity also results because the employees not covered usually are those most in need of protection: the low-wage workers, such as farm help, domestics, casual workers, and employees of small firms.

In order to remedy these deficiencies, our general recommendation is that workmen's compensation be extended to most employees now excluded and that coverage be mandatory. Our specific recommendations include the adoption of compulsory rather than elective laws, a provision still found in more than one-third of the states. We also recommend that employers not be exempted from workmen's compensation because of the number of their employees; almost half of the states still have such numerical exemptions to coverage. We have also recommended that certain occupations which often have been exempted from coverage now be brought within the protection of workmen's compensation. We have, for example, recommended full coverage of government employees and have also recommended that by 1975 all farm workers and most casual and domestic workers be covered.

In coverage of injuries and diseases, most

states are now doing an adequate job. The most serious problem appears to be the failure in a few states to provide full coverage of work-related diseases, and we have recommended such coverage.

2. Substantial protection against interruption of income. We concluded that, in general, workmen's compensation programs provide cash benefits which are inadequate. In most states, the most a beneficiary may receive, "the maximum weekly benefit," is less than the poverty level for a family of four (\$79.56 a week for a nonfarm family of four in 1971). Moreover, many states limit the duration or the total amount of cash payments.

Payments are inequitable as well as inadequate. Benefits differ widely from state to state. Within states, high-wage workers, if disabled, receive a smaller proportion of their lost earnings than do low-wage earners, because they are limited by the ceiling of the maximum weekly benefits.

We made a number of recommendations which, if adopted, would alleviate the present deficiencies in cash benefits.

Temporary total disability benefits. We recommended that, subject to the state's maximum weekly benefit, temporary total disability benefits be at least two-thirds of the worker's gross weekly wage. A majority of states now meet this traditional two-thirds standard.

The traditional standard for the maximum weekly benefit for temporary total disability benefits is that the maximum should be at least 66 2/3 per cent of the average weekly wage in the state. The failure of the states to meet this standard is one of the major failings of workmen's compensation, and the record over time provides one example where workmen's compensation has deteriorated. In 1940, 38 states had maximum weekly benefits which were at least two-thirds of the state's average weekly benefits. In 1972, only 10 states could meet the standard.

The standard which sets the maximum weekly benefit at two-thirds of the state's weekly wage is, in any case, too low. A maximum of two-thirds of the state's average wage, coupled with a provision that purports to provide disabled workers at least two-thirds of their individual wages, produces the

anomaly that almost half of all disabled workers—those who earn more than the state's average wage—receive less than two-thirds of their lost pay. We felt there was no adequate reason why workmen's compensation should penalize high income workers in the event they are disabled on the job. We therefore recommended that the maximum weekly benefit should be at least 66 2/3 per cent of the state's average weekly wage by 1973, at least 100 per cent of the state's average weekly wage by 1975, and that the maximum should continue to be increased until by 1981 the maximum is at least 200 per cent of the state's average weekly wage.

Permanent total disability benefits. Our recommendations for maximum weekly benefits and the proportion of wages to be replaced are identical with our recommendations for temporary total disability.

The main issue for permanent total disability benefits concern the total sum allowed and the duration of payments. Although there is wide agreement that payments for permanent total disability should be paid for life, we found that 19 states in 1972 failed to comply with that recommended standard. In 15 states, duration of payments was limited to 10 years or less, and in 11 states the gross sum payable was less than \$25,000, which is less than the average full-time worker in the United States earns in four years. We recommended that permanent total benefits be paid for the duration of the worker's disability without limitation as to dollar amount or time.

We also recommended that our permanent total disability benefits proposals be applicable only to those workers who actually experience a prolonged loss of wages because of a work-related impairment. A worker should not receive permanent total benefits merely because he is unable to return to his previous job.

Death benefits. Our recommendations for maximum weekly benefits and the proportion of wages to be replaced are identical with our recommendations for temporary total disability.

A major deficiency of present workmen's compensation programs is that death benefits are arbitrarily limited in duration or total

dollar amount in more than two-thirds of the states. We found this practice indefensible, and recommended that benefits in death cases be paid to a widow or widower for life or until remarriage.

Permanent partial disability benefits. The issues arising from benefits for permanent partial disability are critical to the future of workmen's compensation. Unfortunately, the critical need for corrective action is matched by the elusiveness of the proper remedy, and we concluded there was a serious danger that premature or insufficiently detailed recommendations might only worsen the present problems. These problems include the wide variation from state to state in the ratio of permanent partial benefits to total benefits, and the apparent tendency in some states for the payment of disproportionately large benefits for minor permanent partial disabilities. We felt these apparent inconsistencies and deficiencies could not be adequately examined in the time available to us, and we have urged the immediate commencement of a separate study and report on permanent partial benefits.

3. Provision of sufficient medical care and rehabilitation services. A proper medical care and rehabilitation program has three components. First, definitive medical care must be provided to restore the patient's abilities or functions. Second, vocational counseling and job retraining may become necessary if the worker suffers a loss of endurance or skills needed to perform his previous duties. The third component is the worker's actual return to productive employment.

The record of delivering such services varies. Performance of medical services is reasonably good but, with only a few exceptions, the performance of physical restoration is less successful. Vacation guidance and instructional services are spotty, and placement services for rehabilitated workers are generally inadequate.

The considerable variation in the performance of the states may be explained in part by the lack of appreciation that all three functions of medical care and rehabilitation are important and inter-related. A substantial effort is needed to recognize these three functions and provide a co-ordinated pro-

gram of aid to the worker as soon as a serious work-related impairment occurs. This will require each workmen's compensation agency to establish a medical rehabilitation division, with authority to effectively supervise medical care and rehabilitation services.

Our other recommendations for medical care and rehabilitation include the elimination of any statutory limits on the length of time or dollar amount for medical care or physical rehabilitation services. These limits have largely been eliminated, but 15 states still limit the dollar amount or duration of medical care for work-related diseases. We have also recommended that states establish a second injury fund with a broad coverage of pre-existing impairments. Only 20 states now have such funds.

4. Encouragement of safety. A stimulus to safety is built into the pricing mechanism for workmen's compensation insurance, since employers with adverse accident records are charged higher insurance premiums through the experience rating mechanism. However, the spur to safety from experience-rating is restricted, because 80 per cent of all employers are too small to be eligible under present regulations. We therefore recommended that the experience rating principle be extended to a larger proportion of all employers.

In addition to the built-in stimulus to safety provided by experience rating, workmen's compensation also promotes safety by expending substantial resources on accident prevention services. However, in some states there are so many carriers writing workmen's compensation insurance it is unlikely that all provide effective safety programs. Likewise, some state-operated insurance funds and some self-insuring employers devote insufficient resources to safety programs. We have recommended that insurance carriers by required to provide loss prevention services and that the workmen's compensation agency carefully audit these services. State operated workmen's compensation funds and self-insuring employers should also be audited as to the adequacy of their safety efforts. Remedial action, including revocation of the right to sell workmen's compensation insurance or to self-insure, may be necessary where a carrier or self-insurer is not providing an effective

safety program.

5. An effective system for delivery of benefits and services. The previously discussed objectives for workmen's compensation, such as coverage, income maintenance, and medical care, led to a number of commission recommendations which we felt were necessary components of a modern workmen's compensation program. But the real test of workmen's compensation is whether the program can deliver the benefits and services it purports to provide.

Originally, it was hoped that workmen's compensation would be self-administering; that employers would protect their interests without need for legal counsel or other assistance. It was assumed the no-fault concept and the statutory prescription of benefits would reduce the need for litigation.

The hope that workmen's compensation would be self-administering was overly optimistic. It has become clear that workmen's compensation claims and statutes are, in practice, much more complex than anticipated. Few employees are able without assistance to effectively negotiate with representatives of employers or insurers.

Who, then, is to protect the employee in his attempt to receive adequate benefits? In most states, the answer has been an active plaintiff's bar. Claimant's counsel have in fact contributed to the performance of the system to the degree they have protected employees' rights. But the participation of attorneys has not been without costs. An obvious cost in almost every state is claimant's attorney fees, which are deducted from the awards of the workers.

There are less obvious costs of litigation than attorney fees which may have an even more serious adverse impact on the performance of the delivery system. These costs include delays and uncertainties resulting from disputes pending over means of determining benefits, as well as the immeasurable cost of maintenance with or delay of rehabilitation of the disabled.

Workmen's compensation can be undermined by excessive litigation. I do not want to suggest that plaintiffs' attorneys are unnecessary in a well functioning workmen's compensation program, but surely the extent

of legal involvement found in many states is unwarranted. And, there is a better way to provide protection to injured workers, who simply cannot be left on their own to deal with employers and insurance carriers.

The alternative to excessive litigation is an active workmen's compensation agency which takes the initiative in protecting injured workers.

We have made 22 specific recommendations for the operation of a State Workmen's Compensation Agency. I will not attempt here to recite these recommendations, partially because it would detract from the main point about the delivery system, that I want to stress.

The fundamental point is that the state agency must become the dominant partner in the delivery system for workmen's compensation and must create an atmosphere of protection and mediation rather than adjudication. This atmosphere cannot be created by statutory provision. It depends on the attitude and competence of the administrator of the state agency.

Implementation of the Commission's Recommendations

There are, in total, 84 specific recommendations for a modern workmen's compensation program. The question of implementing these recommendations was carefully considered by the Commission for two reasons: We were specifically directed to consider the implementation topic by the Act which established the Commission; and it was evident that previous recommendations for improving workmen's compensation have had a limited record of success.

Our recommendations were, to be sure, more numerous than most earlier lists of recommendations and, to some extent, our recommendations contain some innovations. Nonetheless, many of our important recommendations are merely reaffirmations of earlier proposed standards for workmen's compensation from sources such as the IALABC, the AMA, and the AFL-CIO. The record of compliance with these earlier recommendations is discouraging.

The review of this record led the Commission to the "inescapable conclusion that state workmen's compensation laws in general are

meet only biennially. Most states will need time to review their statutes carefully on the basis of all our recommendations. Nonetheless, we believe these essential recommendations are so feasible and essential that every jurisdiction can be expected reasonably to adopt them within three years.

We believe that compliance of the states with these essential recommendations should be evaluated on July 1, 1975 and, if necessary, Congress with no further delay in the effective date should guarantee compliance.

We believe the most desirable method to insure that each state program contains our essential recommendations would be to include these recommendations as mandates in federal legislation, applicable to all employers specified by our essential recommendations.

The normal enforcement method would be the imposition of fines on non-complying employers. Most claims would be handled by existing state workmen's compensation agencies using their regular procedures, except that the scope of protection afforded by the state must include the essential recommendations.

This enforcement method represents an accommodation of two important principles held by the Commission members. The Commission was unanimous in concluding that congressional intervention may be necessary to bring about the reforms essential to the survival of the state workmen's compensation system. At the same time, if federal intervention is necessary, most members of the Commission reject federal pre-emption of the state workmen's compensation programs as the enforcement mechanism. Rather, the administration of workmen's compensation would be left with the states, with the only requirement being that the states must provide protection to injured workers which includes the substantive terms of the federal mandates. Our suggested enforcement mechanism for federal mandates would thus not involve massive federal intervention through pre-emption; it would involve federal enforcement by acupuncture.

Let me stress that most commissioners would prefer no federal intervention at all, if that is possible. Nothing would please us

inadequate and inequitable. While several states have good programs, and while medical care and some other aspects of workmen's compensation are commendable in most states, the strong points are too often matched by weak.

The reasons for this discouraging record were reviewed in the report. The explanations seem to involve several factors, including the general lack of interest or understanding of workmen's compensation by the public and state legislators; the veto power over reform held by interest groups, such as unions, trade associations, and lawyers; and the competition among states for employers, which has dissuaded some states from reform because of the fear the resulting increases in workmen's compensation costs will drive employers to less expensive states.

We felt the record of the states was so discouraging in improving workmen's compensation and the factors which serve to inhibit reform were so powerful that we could not merely submit our recommendations on the assumption they would be self-fulfilling.

We felt that reform of workmen's compensation largely can and should take place at the state level. Nonetheless, we concluded that creative federal assistance can enhance the virtues of a decentralized, state-administered workmen's compensation program and improve the prospects for reform. This federal assistance should take two forms. First, we urged the President to appoint immediately a federal workmen's compensation commission to provide encouragement and technical assistance to the states.

Second, we designated 19 of our recommendations as essential. These essential recommendations include compulsory coverage, coverage with no occupational or numerical exceptions, full coverage of work-related diseases, full medical care, reasonable choice of jurisdiction for the employee to file his claim, and certain of our recommendations for temporary total, permanent total, and death benefits.

We urge the states to incorporate these essential recommendations into their workmen's compensation programs as soon as feasible. We realize that time is required for this achievement. Some state legislatures

more than for the 1975 review of state progress to reveal that workmen's compensation is adequate and equitable. But, if the choice in 1975 becomes the continuation of the presently inadequate workmen's compensation program without federal intervention on one hand, or limited federal intervention to insure the adoption of our essential recommendations on the other, we have chosen the latter option. The only dissent to this viewpoint on the Commission was from three members who urged congressional action now, rather than in 1975.

I know that some of our substantive recommendations may appear surprising. And I know that our proposal for federal enforcement, if necessary, of our essential recommendations may be disturbing to some of you. Because of these possible misgivings you may have about our recommendations, I want to stress two aspects of the report.

First, the commissioners represented a wide variety of viewpoint, including employers, employees, and state administrators, and the report is, with minor exceptions, a unanimous report.

Second, the Commission members are supporters of workmen's compensation. The

concluding words of the report state: "We are without exception supporters of the basic principles of workmen's compensation."

"We have criticized the present workmen's compensation programs, but not because we believe the basic principles are inherently wrong—indeed they are right. We voice our criticism because present practice falls so far short of the basic principles and because there is no possible justification for this shortfall."

"Our report must then be understood as a repudiation of the old saw that 'even your best friends won't tell you.' We believe we are workmen's compensation's best friends, and as friends, we are telling those who control the fate of the program that it should and can and must improve. Our disagreements within the Commission as to the exact nature of the program's present impairment and as to precisely how the improvements must occur are far overshadowed by our agreement that the time has now come to reform workmen's compensation substantially in order to bring the reality of the program closer to its promise."

FRONT-END LOADERS—ACCIDENT CASE HISTORIES

By F. R. WERTHER
U.S. Bureau of Mines

A significant change has occurred in mining equipment during the past decade. The equipment of today is larger, more sophisticated and, needless to say, more expensive. Possibly, it is even more hazardous. A good example of these changes and improvements is the modern front-end loader, which is found at all types of mining operations throughout the world.

The first loaders appeared about 1930. These machines were small, crawler-type tractors having a cable-operated, two-position gravity-dump bucket attached to the side arms of the vehicle. During the early 1950's, the first of the wheeled loaders made their appearance on the market. These utilized a hydraulic system for actuation of the bucket and side arm. The next major improvement was the articulated loader. This design change removed the hazard of the bucket side arms adjacent to the operator. Front-end articulation improved vehicle maneuverability and front vision for the operator. From this modest beginning has emerged today's modern loader, whose size and diversity of use continues to increase.

The loader, unfortunately, is a piece of equipment which is a major contributor to mining accidents. In preparing this presentation, I have researched many accidents. I will use the case study approach in order to present some of the more common-type accidents that occur relative to this particular equipment.

The following cases all involved fatalities. These accidents could occur wherever front-end loaders are used.

1. *Unloading a Loader From a Lowboy Trailer.*
A lowboy trailer carrying a front-end loader was backed to a three-foot-high level stockpile. The operator drove the loader off the lowboy onto the stockpile. When backing and turning the loader, a rear wheel encountered soft material near the edge of the stock-

pile. The loader tipped. The operator, realizing the seriousness of the situation, attempted to leap clear but in doing so was crushed by the loader as it overturned.

The unloading of a loader from a trailer is a common occurrence and has been performed many times without mishap. Possibly, here was a situation where haste, operator error in judgment, or inattention was responsible for the accident. On the other hand, had there been another man to signal or guide the operator, the accident might have been avoided. Rollbar protection and seat belts or a cab might have reduced the severity of the accident.

2. *Loader Operated in an Area With Insufficient Clearance.*
A loader operator was assigned to clean up debris under an elevated hopper. The loader was not equipped with a cab or canopy. The clearance between the high point of the loader and bottom of the hopper, with no debris on the ground, was approximately two feet. The operator loaded the bucket and prepared to move backward. Inadvertently, the loader moved forward and the operator was caught between the lower structural members of the hopper and the loader seat.

Here again, clean-up operations with a loader is a common procedure. What caused the loader to move forward rather than backward? Was it lack of familiarity with the controls of the loader or was it simply human error? Perhaps the operator put the machine in forward rather than in reverse. Rollbar protection or a cab would not have prevented the accident, but in all probability would have protected the operator from injury.

3. *Loader Backed Over a Person.*
A loader operator was performing the routine function of moving product to a stockpile conveyor hopper. Three persons were standing in the immediate area watching the operation of the plant. The operator dropped a load into the

hopper and then backed up the loader. The three bystanders were apparently unaware of the loader's approach, nor was the loader operator aware of the bystanders' presence. Two of those standing watching the operation managed to jump clear. The third was run over by the loader.

Watching equipment at work is fascinating to most people. All too frequently the individual is not paying attention to vehicular activities in nearby areas, especially when a great deal of noise is involved. This particular case illustrates a situation which no doubt occurs many times but, fortunately, without serious consequence. An operator cannot see what is immediately behind the loader. Rear vision mirrors are an assist when backing a loader. Backup warning devices, both visual and audible, will help to alert persons of a vehicle's approach.

4. *Unattended Loader Rolled Forward.* A feed hopper was plugged. The operator parked the loader on a downward slope some 20 feet away to assist a fellow worker in clearing the hopper. The two men were in the hopper when the loader rolled forward, plunged into the hopper, and killed both men.

This particular case illustrates a situation where a number of basic safety rules, if applied, could have avoided an accident. Was the parking brake in good operating condition and set? Was the bucket lowered and tilted into the ground? Were the wheels turned so that if there was movement of the loader the angle of the wheels would divert or restrict movement? Could the operator have parked the loader at right angles to the road or blocked the wheels? Any of the above precautions might have averted the accident. Safety rules and procedures are developed to prevent accidents, and their application is a never-ending function.

5. *Loader Operated in a Hazardous Area.* A loader operator was cleaning debris around and under an operating cement kiln. The operator backed the loader and was caught against the kiln. The rotation of the kiln drew the loader and operator under and through to the other side of the kiln.

This situation is somewhat similar to Case 2. Both involve working in an area where insufficient clearance was a hazard. In this

case, if clean-up had been done when the kiln was stopped, in all likelihood the injury would not have happened. However, cement kilns rarely are shut down except for major repairs. Roll protection or a substantial cab might have contacted the kiln and perhaps stopped the loader.

6. *Undercutting a Vertical Face.* A loader operator was performing the routine operation of loading stockpiled material into trucks. The face of the stockpile was approximately vertical but slightly undercut. As the operator was about to load the bucket, the upper section of the face collapsed and crushed him.

When loading material, keeping the face of the pile sloped to the angle of repose is a basic safety rule. This the loader operator did not do, with the consequent tragic results. How could this accident have been avoided? Closer supervision, better training, and a more effective safety program could be the answers. There are many possibilities. The end result, however, does emphasize that safety rules are for the protection of the individual and, if followed, help to prevent accidents.

7. *Moving Railroad Cars With a Loader.* A loader operator was assisting a car dropper in moving several railroad cars. The loader operator positioned the bucket against the corner of a railroad car and proceeded to push. The car dropper was standing on the braking platform of the car adjacent to the loader bucket. The loader bucket suddenly slipped sideways and crushed the car dropper against the end of the railroad car.

As you all know, it is not uncommon to move railroad cars with a loader. There are better ways, but it is done throughout the industry. Why did the loader operator choose to push the car on which the car dropper was standing? Why did the car dropper choose to stand on the car being pushed? One does not know. The end result we do know. One thing is certain: If and when a loader is used to move railroad cars, there should be no one present in the immediate area of the loader, either on the ground or on the railroad cars.

8. *Loader Bucket Used as a Working Platform.* Two workmen in an elevated loader bucket were proceeding to make repairs to a loading bin. The engine was not running, and the

operator was holding the loader in position with the brake. As one of the workmen leaned forward to start a weld, the loader suddenly moved forward, crushing him between the loading bin and bucket.

A loader bucket is not considered a safe working platform until certain precautions are taken. The mandatory Metal and Non-metal Health and Safety Standard 57.14-30 states, "Men shall not work on or from a piece of mobile equipment in a raised position until it has been blocked in place securely." In this particular case, the equipment was not blocked, and the end result was a fatal accident. A proper working stage could also have averted this accident.

9. *Repairing an Improperly Supported Loader Bucket.* Repairs to a loader bucket were in progress. The bucket was elevated approximately three feet and was supported by several pieces of timber to facilitate welding. The welder was standing between the bucket and the loader when the supporting timbers failed. The bucket dropped and crushed the workman between the loader and bucket.

This case illustrates what can happen when making repairs to an elevated bucket without adequate support. There is no good substitute for a proper support, and such a policy should be a part of the indoctrination of every employee. Strict enforcement should be the responsibility of every supervisor.

10. *Making an Adjustment to a Loader Engine.* An operator had stopped the loader to make a minor adjustment to the engine. With the engine running, the operator climbed up, sat on top of the tire, and started to adjust the engine. The loader moved forward, and the operator attempted to leap clear. In doing so, he fell in front of the loader and was crushed beneath the tire.

The employee in this case must have inadvertently moved something on the engine which caused the loader to suddenly move forward. Here again is a case where, if the brakes had been set, the wheels had been blocked or turned into a bank, or the bucket lowered, the accident might have been averted. A better practice would have been to take the loader to the shop where the maintenance crew would have made the adjustment.

11. *Loader Overturned.* No specific case is cited for this type accident; however, it is the most frequent. In fact, it accounts for the major percentage of front-end loader accidents. A recent study indicates a high percentage of these accidents occur while traveling between work sites. Many of these accidents appear to involve the human factor rather than mechanical failure.

How does one cope with this type accident? It is not easy, for if it were, there would be fewer. Sometimes it is human error, sometimes it is mechanical, sometimes a combination of both factors. Better training and education is perhaps the answer.

The loader today is a far different vehicle from a few years ago. Its usage has increased, its size has increased, and its complexity of mechanical components and controls has increased.

There is a saying that all accidents can be avoided if one follows proper procedures. This is easy to say, but it is not always done. The greater the number of loaders, the greater will be the potential for accidents. Recognizing this fact, there are a number of things that can be done. These are:

1. Test prospective operators to determine their competence and coordination. Select competent persons to operate the loaders.
 2. Provide training and refresher training in safe operating procedures.
 3. Publish safety rules for the operation of the loader and make certain these rules are enforced.
 4. Make regular maintenance checks to be certain of proper mechanical operation.
 5. Establish a vehicle check system which the operator must follow prior to his operating a loader.
 6. Utilize all available safety or protective devices. These may be rollbars, canopies, cabs, backup lights, warning devices, horns, or any other equipment that might preclude an accident.
 7. Provide yearly medical examinations to determine if the loader operator is physically competent. This should include a thorough check for adequate vision.
- In addition to the above, industry and manufacturers should cooperate to improve the design of the loader for vehicle safety and

operator comfort.

The front-end loader itself is basically safe. It is only when man takes it upon himself to

operate the vehicle improperly that it becomes a hazard.

A SUPERVISORY DEVELOPMENT AND TRAINING PROGRAM FOR THE MINING INDUSTRY

By WILLIAM H. POE

Director, Supervisory Development and Training, American Smelting and Refining Co., El Paso, Texas

Prior to 1941, industry as a whole had little or no concern for the training or development of their supervisory personnel. There was a general philosophy that a man proved himself at one level of employment and therefore when the time came and an opening was available, he was promoted to a higher level. If he made it, management congratulated themselves for having selected a good man. If he didn't make it, he was simply replaced with another man. Seldom had the displaced man been given any training or assistance. He was expected to know his job before taking it.

At the beginning of World War II, management people recognized the need for qualified supervisory personnel in the defense plants across this nation. They became aware that "leadership" produced more of a better product than the "boss" techniques of a past era.

As a result of this need for qualified supervisors, the existing O.J.T. and J.I.T. programs were expanded to include supervisory training. Qualified personnel were selected to attend short training classes to learn how to supervise others.

These supervisory training classes proved so successful that when the emergency was over in 1945, many industrial organizations arranged to continue supervisory training as a part of their regular training programs.

This was not the case, however, in two major industries; namely, the construction industry and the mining industry. My personal experience in conducting supervisory development programs from 1958 through 1970 was that for the most part, both of these industries provided only a token interest in training their supervisors to meet the needs they would be confronted with in their new

environments. Those industries that did implement a training program for their supervisors have indicated that this program has contributed to their successful growth, profits, and safety records. By comparison, those industries who do little or no supervisory training have experienced difficulties in meeting the ever-changing conditions that prevail today.

The mining industry, like others, has undergone a number of technological changes in recent years. There are newer, better, and safer ways being experienced every year. Because of these technological changes, management has had to retrain some of its employees for these new procedures. They had to. The people, if they were to be retained, had to be taught the new procedures and methods. Not so with the supervisors.

It has often been said that time changes everything. Actually, time changes nothing. But as time goes by a lot of changes do take place. People change. Attitudes and conditions change, and companies change. An organization that was successful a few years ago may be ill-suited for the needs of today unless it changes to meet the conditions of today. This means that the people of the organization must change. The foreman or supervisor who was successful last year could very well be unacceptable today unless he changes to a different way of supervising. Even the methods of selecting supervisors in past years are not acceptable in whole today.

I offer you a quote by Grant Venn, a noted author and teacher in industrial education: "Today's accelerating and changing technology has placed man, his education, and his work in a new relationship in which education becomes the bridge between man and his work." This quotation was made not last

year, but in the 1920's. I personally find it quite applicable today, especially to people who are in a supervisory position at any level.

Today's supervisors must know considerably more than the supervisor of yesteryear. He has more things to do now than in the past. He has more responsibilities than ever and often more authority. Yet these things are something he must learn. Often, in the promotion of an employee, he may have only a slight knowledge of what is expected of him as a supervisor. Of course he can still learn by the time honored methods of trial and error, by observation of others, and by asking questions. These are costly and time consuming methods of learning and often prove to be ineffective. They are, however, better than nothing.

Today there is available to industry many supervisory training programs. Some of these programs are very effective. Some I would be hesitant to recommend. All are costly, and, certainly, they provide a good profit for those who present them. Colleges and universities throughout the nation as well as private institutions are providing all kinds of supervisory courses. Often, some of these courses carry college credits and are highly academic. Some require text books along with research projects. They may cover a wide range of material and several subjects.

My past experiences in conducting supervisory classes for all types of industry has revealed that there are six basic and separate things that most supervisors should be taught. Never assume that he will "catch on" as time goes by.

The first of these is "The Principles of Supervision." It would be most difficult to establish a hard and fast set of rules that a supervisor should go by in every situation with which he may be confronted. There are, however, certain principles that are applicable to almost all conditions and situations, provided a person understands how to apply them. For example, if a man fully understands all of his responsibilities and duties as well as his authority, he will obtain better cooperation from his fellow supervisors and his employees. It would be to his advantage to have a clear understanding of company policies and to know how to explain them to

his employees. He should assume the responsibility not only for the quantity and quality of the productive efforts of his employees, but also for the actions of his employees. The supervisor should be able to recognize excessive and unnecessary waste of time, materials, etc., and how to prevent these. Perhaps, too, if when a supervisor knows what management expects of him and what his employees expect of him, when he realizes that he represents both management and the employees, then he will be in a better position to fulfill the requirements of his job.

The second is "The Supervisor and Employee Motivation." Perhaps one of the most disturbing things in the transition of an employee to a supervisor is the failure to recognize and appreciate what this transition brings about. Until this promotion took place, the average employee spent most of his time applying the skillful use of tools and equipment towards a job, and only a small part of the time telling someone else what to do or how to do it. With this promotion he suddenly finds the situation reversed. He is no longer using tools to accomplish an objective. He is now using people. If he has had proper training, he will know how to give orders, handle gripes, reprimand, and counsel. He will also understand the many other things that are necessary to motivate employees.

If he has not had proper training in handling people, he may panic, get things mixed up, ignore employees, or he may turn into an autocratic "boss" who does not know how to accept responsibilities and authority. He should, if necessary, be given training in human motivation and in how to handle problem employees and employee problems. He may also need training to understand better how people's attitudes influence their productive efforts and safety awareness.

The third is "The Supervisor and Job Economics." Someone once said: "If you are doing something today the way you did it yesterday, it's probably out of date; and if it isn't, it will be tomorrow."

The modern supervisor of today is confronted with many problems, and a great many of them are not necessarily confined to personnel. For example, the methods of oper-

ations today are of a versatile and complex nature. Many of them require special training. Often, too, the methods used need to be revised or changed. All to often the supervisor of the past left these changes or revisions up to management or engineering personnel. It was not that he did not want the change. Rather it was due to the fact that he himself probably did not know how to accomplish it. He did not know how to analyze a job from the standpoints of economics, safety, expediency and its relation to an over-all objective.

Today, management expects the supervisor to look at his jobs objectively. If an improvement can be made that will cause a job to be more efficient, economical, expedient, or safer, the supervisor should be able to present to management a comprehensive proposal. Such a proposal should have all the facts (past, present, and future) that will substantiate the various points of his recommendation.

The fourth is "Organizational Communication." It seems to be universally true in any organization that whenever a problem arises as a result of poor communication, usually "someone up above" is blamed because he failed to communicate. Regardless of how high in an organization you go, it is the same. We seem to feel that most communication failures occur somewhere above our level.

Most of these problems arise, not because people do not want to communicate with one another, but often because they do not know how to communicate effectively. The spoken word and written word provide us with our most common means of communication. Most of us have acquired a reasonable degree of proficiency in their uses. Yet, we often overlook the interpretation that the person who receives these words might place on them. If there has been a misinterpretation on the part of the receiver, a problem arises when he attempts to put the words he hears into action. These misinterpretations, or "barriers" as we sometimes call them, are the result of numerous factors: prejudices, feelings, interests, stereotyped notions, and many others.

This first line supervisor is the man who is in closest contact with more people (employ-

ees, other supervisors, management) than possibly anyone else in an organization. He should be given proper training in how to recognize the problems of communications in his company and how to prevent them from reoccurring. He should understand his own role as a key man in the communications that take place in his company. As someone has pointed out, the first-line supervisor has more opportunities (on a percentage basis) to help or hinder communication than anyone else in his company.

The fifth is "Employee Training." It should never be assumed that a man's past experience or knowledge necessarily provides him with all the facts he needs in order to assume the responsibilities and duties of a higher-level position. The same may be said even though the new responsibilities represent only a change in job assignment at the same level. Certainly this is true if a new employee is brought into the company.

Today's supervisor is very much aware of the shortage of adequately-trained employees. Even if he were fortunate enough to obtain a person with a particular skill, that person would still have to be given certain training. He would need to learn how to apply his skill in the manner desired by his supervisor or company. Probably more often, though, the supervisor finds himself with an employee who has only a basic knowledge or skill, if any. This employee must be trained from the very beginning.

The supervisor's objective in providing whatever training that is necessary is production—quantity and quality. Safety should always be included in the training objective, but sometimes, unfortunately, it receives only secondary emphasis. Regardless of who does the actual training, the supervisor has the responsibility to make sure his subordinates are adequately trained. If a supervisor is the one who is responsible for the training of his employees, he himself should be given training in how to teach people their jobs and how to include safety in all phases of job training.

The sixth is "The Supervisor and Accident Prevention." I have not withheld mentioning this phase of supervisory training until last because it is least in importance, but because it is the one phase of training that should be

included in all other phases. In adequately training a supervisor to recognize and accept the responsibilities of his job, safety will always be included.

When a supervisor is using people as the tools to accomplish his objective, their safety is his responsibility.

If a supervisor is involved in any way with making changes in procedures, equipment, or methods, safety should be foremost in his mind as he analyzes that job.

A supervisor needs to be able to make himself understood. He himself should be able to understand his people if he is to develop a safety attitude among those with whom he associates. He must be able to communicate effectively in order to ensure safe procedures and conditions on the job.

A supervisor should conscientiously make every effort to include all the safety points in every phase of employee training. It is not enough for a man to know what to do; he must know how to do it safely.

Safety is, in fact, built into all phases of

supervisory training. It is not, by itself, a "separate and whole" part of supervisory development. Safety should be viewed as an element that permeates all aspects of supervisory training.

These six basic courses—Principles of Supervision, The Supervisor and Employee Motivation, Job Economics, Organizational Communications, Employee Training, and Accident Prevention—should not be considered as the total answer to all supervisory training. Neither should it be assumed that once a person has completed these six basic courses, his training should cease. Just as in safety training, a supervisor should be continuously updated in the latest techniques of supervising.

The ultimate goal is to develop a supervisor to the point where he will have a complete knowledge of his duties, responsibilities, and authority. One who will assume a cooperative attitude toward everyone with whom he may be associated.

IN-PLANT RAILROAD SAFETY

By DALE O. ANDERSON

General Inspector & Instructor, Chicago, Milwaukee, St. Paul & Pacific R.R.,
Chicago, Ill.

It is difficult to make a great distinction between "in-plant" railroad safety and regular railroad operations. The same cars are handled, the same air hoses coupled, the same switches are lined, and the same hand brakes are operated, to mention only a few of the repetitive jobs involved in car and train movements, whether in a plant facility or a railroad yard. In-plant railroad safety must encompass not only plant personnel and facilities, but also the involvement of railroad employees engaged in switching or moving cars within these facilities.

Let us proceed through an imaginary trip of a railroad crew delivering cars to an industry. We will begin at the track entrance of the industry and, in most procedures, the conductor receives permission or acknowledgment to enter and proceed with his switching duties. But before he gets into the plant he generally has to move through an opened chain link gate. More times than I care to recall, accidents have occurred right at the gate. A gate that is not equipped with proper securing, or the failure of the crew or plant employee to secure the gate, has caused men to be wiped off the side of cars, damaged the gate, and damaged equipment.

After determining that the gate has been secured, the next probability is the removal of a derail from the track. Derails, of course, protect against damage from unsecured movements, which may be toward a main track or possibly to the approach of a loading platform, building door, or where ever car movement could cause damage. A word of caution might be worthy at this point: derails should not be installed where track is laid in hard surface such as concrete or asphalt pavement, because movement of the car can con-

tinue under the support of the hard surface.

The location of the derail should be plainly marked by the use of a sign bearing the word "derail." This can prevent a lot of disturbing moments in the event a derail is overlooked. Some derails become weather-worn and blend well with the rail, and train crews are accustomed to responding to the signs because of their own work rules.

The next point in this movement will undoubtedly be a switch in the track, where we will direct the cars where we want them. Switches should be well maintained, properly adjusted, and lubricated. Whether an industry employee or a train crew member is required to operate the switch, the potential of strained muscles and back injury is always a threat. If night movements are required, switches should be provided with identifying markers which are either self-illuminated or reflectorized.

If night movements are required, adequate yard lighting should be provided to aid in observing ground conditions, allowing for better depth perception, identifying obstructions which may foul the track, and provide other employees opportunity to see car movements; also, so they may be seen in the event they should walk foul of a track with moving cars.

Further along we may have to pass some fixed obstructions along the track side which will not clear a man riding the side of a car. These obstructions must be identified with "no clearance" signs to forewarn a man that he cannot, and must not, ride a car beyond the point of the sign.

Our movement now heads for the track on which we want to couple onto standing cars. These particular cars are being worked on by industry employees, and they should be pro-

ected by a standard railroad blue flag or blue light. Railroad rules prohibit coupling to or moving cars with blue flag protection. The blue flag is an indication that men are working on or about the cars. The flags or lights should be hung on the ends of the cars or placed in the middle of the track where they are in full view when approaching the track. They should be placed at both ends of the track, if the track can be entered from either end. The purpose and effect of the blue flag is to protect the men working in or about the cars, and no one except these men should be permitted to remove the blue flag protection from the cars.

After all plant personnel working in these cars have been notified that a switching movement is going to take place, necessary steps must be taken to remove bridgeplates, conveyors, tank couplings, spouts, or any loading or unloading device and keep them clear of the track. After all men and equipment have been cleared, the blue flags may be removed from the ends of the cars.

Part loads should be secured and doors, covers, or hatches should be closed or secured to prevent commodity damage or equipment damage.

There are alternative methods that may be considered for these types of movements on industrial tracks; they are: use of somewhat sophisticated warning devices such as flashing lights, bells, gates, and sequential interlocks. For example, a derail which protects the entering of a loading dock track may be so connected that it cannot be removed until a mechanically operated ramp which extends across the track is raised and clear of the track, or a simple toggle switch operated by the dock foreman which will release the derail lock and at the same instant activate flashing lights or bells on the dock to alert plant personnel and warn them to stay clear of the cars.

Before car couplings are made, the crew must be certain that previous action has been taken to clear workmen from the car and that all apparatus for loading and unloading is clear. This can be done by personal inspection or by acknowledgement from the dock foreman.

The crew must also be certain that cars

being coupled to are secure and will not roll away if there is a failure of the couplers to lock on impact.

When train air brakes are to be used, air hoses must be coupled and angle cocks positioned properly to permit air passage through the train line. Hand brakes on cars must be released, and wheel chocks or blocks must be removed from the track.

Up to this point, this has been just a simple dissertation on requirements for a smooth, uneventful operation to a loading or unloading track using a railroad crew to handle the movements.

It is, of course, apparent that train or car movement in the in-plant operation is often handled by plant personnel. Research of in-plant operations indicates there are many options available for car movement, and this is a basic difference between common carrier railroad operation and industry operation.

Specific sets of circumstances will dictate the method of car movement within an industry. Following are some of the ways in which cars are moved; not all of these are considered safe:

1. First, of course, is where the servicing railroad provides the motive power and personnel. The use of standard motive power and experienced railroad crews would be the safest method of operation.

2. Some industries use their own motive power and employ their own crews. Industries using their own power and crews should parallel the operating rules, safety rules, methods and technique of common carrier railroads as closely as possible.

3. Use of a self-propelled rider-operated car mover equipped with coupler and retractable rubber tires and steel wheels designed for on-rail operation. The self-propelled rider-operated unit is a safe, acceptable method but should be assigned to an individual who is keenly aware of safety precautions. With this type of mobility, the rails need not be followed to get where the cars are located and any number of safety devices can be circumvented.

4. Power-operated winches or capstans using cable or heavy rope with hook attachment. Winches and capstans have possibility of unhooking or tow line breakage, and

there is not absolute control of car movement—the car can be started, but can it be stopped?

5. Lever-type, manual car movers which are used as a pry against the wheel of the car. Manual car movers are back breakers, finger smashers, and gut strainers.

6. Rubber tired tractor equipment using chain or cable attachment to pull cars. Rubber-tired tractor equipment using chain or cable is similar to a winch operation with a noted exception—the chains or cables are sometimes attached to ladders or stirrups, pulling them loose and creating a serious hazard for personnel required to board or ride these cars.

7. Tracks built on a grade which permit gravity movement of the cars. Gravity movement is accomplished by releasing the hand brake and permitting the car to roll free down grade. It is stopped by contact with

wheel stops, skates, hand brake, or other cars which had been moved previously. This type of movement has a high potential of risk.

After cars are switched and reset, they must be secured to prevent unwanted movement. Air brakes must not be depended upon for securing of standing cars. Methods which can be used under various circumstances are hardwood wheel wedges, rail clamps, track skates, chaining truck side to rail, and the most dependable—hand brakes.

Of all the activity involved in in-plant railroad safety, the use and operation of hand brakes for either controlling car movement or securing cars have been shown to be a major agency of accident.

(A slide presentation identified various types of brakes and proper method and technique in the use and operation of hand brakes.—Ed.)

IMPLEMENTATION OF A HEARING CONSERVATION PROGRAM

By GARRY G. GORDON, M.S.

Industrial Audiologist, Environmental Acoustical Research, Boulder, Colo.

Since the passing of the Occupational Health and Safety Act of 1970 (OSHA) industry has undoubtedly felt outside pressures to clean up their environments. In fact, the whole idea behind this piece of legislation was not to harass or embarrass industry; it was to provide a working environment which could be considered free from the contaminating factors which might jeopardize a man's health and safety. OSHA is considered by top authorities to be one of the most comprehensive pieces of legislation ever enacted. It does not involve such matters as welfare or war, it involves industrial safety. It covers everything from hard hats to safety glasses, and the expense of compliance will surely be felt for some time to come. A new era has emerged whereby top management must recognize that any individual who plays a role in developing and administering safety programs, such as the industrial safety engineer, industrial hygienist, or industrial nurse is not to be considered a secondary or relatively unimportant role any longer. Such positions must be recognized as time consuming, key positions in the whole mechanical concept of any industrial operation dealing in interstate commerce. Unfortunately, some industries simply changed a few job descriptions for people who already had full time jobs. The role of safety only became an additional responsibility. Those industries who recognized the changes that were being implied by law hired qualified people to develop and administer complete safety either at the local or corporate level.

Included in the composite of regulations spelled out in the *Federal Register* is Section 1910.95, regarding industrial noise. In its simplest definition, this section of the law is designed to prevent or minimize hearing loss resulting from occupational noise exposure in

a large percentage of the national work force. Industry's goals regarding noise were to be approached through sound measurements, noise reduction and, where necessary, hearing protection as a final but hopefully temporary result. Periodic hearing tests are recommended to check the efficiency of the control measures adopted by industry. The basic guidelines for determining whether or not an industry had to deal with noise are described. Noise levels exceeding 90dba for an eight hour working day represented potential hazards to employees working in them. Where noise levels exceeded 90dba, it was expected the exposure time would be decreased accordingly. It has been estimated that 40 per cent of the noises noted in industry exceed the current 90dba base line. At 85 dba, which is being discussed as an alternative maximum level and which has already been accepted in Europe, about 60 per cent of the noises are unacceptable (Glorig). The differences between these two levels will continue to undergo a great deal of discussion.

It might be well to remember the criteria for maximum noise exposures was not by any means a display of magic. These figures were adopted by the U. S. Bureau of Labor Standards when they initially got the responsibility for health and safety aspects of the Walsh-Healey Act in 1964. Not only was occupational hearing loss expected to be minimized by these limited exposures, but so were other physiological changes which contributed to fatigue and probability of accidents. The regulation which was finally adopted contained the American Council of Governmental Industrial Hygienists threshold limit values as shown in Table 1 of Section 1910.95 of the *Federal Register*.

When formulating the regulations as we recognize them today, the Bureau of Labor

Standards observed from the beginning that there would be plants or whole industries where it would be next to impossible to control the environmental noise within current techniques and where it would be necessary to protect people by personal protective equipment or by administrative control of exposure periods. A paragraph was consequently included which stated: "(d) In all cases where sound levels exceed the values shown herein, a continuing effective hearing conservation program shall be administered."

Unfortunately, it was this part (d) of section 1910.95 that created a great deal of confusion for many industries having to deal with hearing conservation for the first time. Although audiometric tests were implied, they were not mentioned. To help clarify an industry's role with this phase of the law, Bulletin 334 "Guidelines to the Department of Labor's Occupational Noise Standards" was made available. In this bulletin, Department of Labor outlined specifically what it expected from industrial establishments having noise levels in excess of 90dba. Included in this composition was information describing the need for periodic testing of hearing in addition to periodic sound surveys which monitor the noise exposures.

The clarifications made regarding this section of the law benefited several industries until Jan. 14, 1972, when the deputy assistant secretary of labor for OSHA announced that his agency would not issue citations to employers who failed to maintain audiometric testing as a part of an effective hearing conservation program. The immediate response to that statement was confusion, concern, and protest. Several employees expressed anger, since they had been led to believe they were required to establish audiometric programs in order to comply with section 1910.95. Now they feel they may have spent thousands of dollars unnecessarily. Despite the fact that audiometric testing is not currently written into law, OSHA has cited many companies for not maintaining "a continuous, effective hearing conservation program." In order to comply, these industries were instructed to "follow the guidelines in Bulletin 334, including specific audiometric testing

recommendations for these industries that have started their programs or considered starting their program." Legal authorities agree that it is impractical to discontinue this requirement now, especially if there is any significant chance that the new standard currently drafted by the National Institute of Occupational Safety and Health (NIOSH) will require audiometric testing. Until any new standards are adopted, Floyd Van Atta from the U. S. Department of Labor has maintained that OSHA can be expected to testify that audiometry is a component part of such a program as there is no other known way to determine accurately if the adopted control measures are actually preventing occupational hearing loss.

Steps of Program Construction

1. *Sound Survey.* The first step of course, should be that of determining what noise problems exist that might create a hearing difficulty for an employee. It would be considered better by some authorities to recognize 85dba noise levels which deviate eight hours or more as potentially hazardous. These surveys should be conducted by competent persons according to accepted practices. In many cases, the analysis of complex noises typical of industrial operations is deceptively easy. The assumption that anyone equipped with a sound level meter can take accurate measurements is erroneous. There are several factors other than overall noise levels and selection of proper equipment. Of primary importance should be determining the amount of exposure time employees may be receiving throughout a typical working day.

2. *Noise Reduction.* The most desirable course of action for implementation of a hearing conservation program consists of engineering the noise levels to safe limits. Application of known principles of noise control usually can reduce the noise to any desired degree; however, economic considerations and/or operational necessities may make this impractical. Where practical methods of reducing noise to safe limits have been developed, they should be adopted. Such practices may include: quieter machines and better operating methods (i.e., chain drive vs. belt drive); maintenance and repair of equip-

ment for quieter operation; noise dampening (i.e., mufflers, pads, acoustical tile, carpet, etc.); sound barriers which isolate the noise from employees; increased distance between worker and noise source; and rescheduling work for shorter exposure or for quieter working hours. Reduction of exposure time is seldom a practical method of reducing noise hazards in industry.

3. *Audiometric Examinations & Hearing Protection.* Reduction of industrial noise to safe limits at the source is often impractical because of costs, time needed for alteration, and slowdown of production during the change over period. In some cases, the lagging progress in noise control makes it necessary, for the moment, to deal with many noise problems by providing employees with personal protective equipment in the form of ear plugs and ear muffs. These devices, if correctly worn, reduce the intensity of the noise striking the inner ear by as much as 25-35 db. This amount of reduction is sufficient to bring the loudest noises encountered in most industries to within safe limits.

Industries resorting to hearing protection are recommended to monitor its use on a periodical basis. Such programs are also recommended to use devices that have been tested in accordance with the American National Standards Institute Standard Z24.22-1957 "Method of Real Ear Attenuation of Ear Protection of Threshold." So that potential users of hearing protection may make reliable comparisons of practical rather than theoretical performance of various insert and over-the-ear protectors, the American Standards Association has devised a method of evaluation that consists of free-field measurements of puretone threshold levels in both ears with and without protectors in place. It might be remembered that the majority of attenuation results reported by most manufacturers represent well fitted plugs under maximum conditions. Do not expect similar results when plugs or muffs are worn or fitted incorrectly. Currently several organizations, including the Armed Forces, are attempting to develop a new method of measuring hearing protection performance by use of an artificial head. Presumably such a method would eliminate variation due to

live listeners.

4. *Types of Protection.* The safety market is being bombarded with new product advertisements that promise to solve every conceivable problem of noise control and hearing conservation. It has been estimated that the market for noise abatement materials, devices, and programs averaged \$2 billion in 1969 and that figure will climb to \$3 billion by 1980 (Frost & Sullivan). Information overload makes it difficult to sort out useful and useless devices and to keep track of how many genuinely different types of protection are available. There is a tendency to lump protective devices into two categories—muffs and plugs. Actually, there are many variations of each type. For example, the material used may be plastic, non-allergenic neoprene rubber or surgical silicone rubber.

5. *Ear Muffs.* The muff type protector, sometimes called circumaural ear protection, consists of two cup or dome shaped devices that fit over the whole ear and seal against the side of the head. The cups are usually held in place by a spring loaded suspension assembly or a headband and are lined with an acoustically absorbent material such as sponge foam. Models are available with suspension assemblies that can be worn over or behind the head or even under the chin. Ear muffs offer several advantages. The cost of muff-type protection has decreased significantly over the past several years. Many units sell for less than \$5 per set if reasonable quantities are purchased.

Ear muffs are readily available in a choice of models. Because ear muffs do not require individual fitting, expenditures of time and money is reduced. Ear muffs usually provide more protection (attenuation) than conventional insert devices, average attenuation for muffs is 30-34 db. Because ear muffs are very visible, it is easy to be sure that employees wear them. On the other hand, muffs are cumbersome and extremely uncomfortable to wear with other safety devices, such as hard hats or protective eye glasses. Also, muffs are very hot and sweaty if worn for long periods of time. Ear muffs may cause headaches and interfere with work in small enclosed areas, and women complain that muffs ruin hair styles.

6. *Ear Plugs.* There are several varieties of ear plugs, ranging from dry cotton to custom-fitted devices. Some ear plugs have very sophisticated features. For example, it is claimed that one type has a tuned acoustical cavity that allows speech frequencies to pass through with little alteration, while other noise is blocked out. Another manufacturer advertises a mechanical valve that seals an opening in the plug whenever the sound pressures exceed hazardous levels. It is suspected by many professionals that dirt and grime defeat the concept built into these types of products. Before any company chooses an insert device, professional approval should be obtained.

A step up from ineffective cotton ear plugs are wax-impregnated battings of cotton, wool, or fiberglas. Used properly, these can provide adequate protection. However, there are drawbacks. Since it is recommended that this type of protection be used only once, the cost is high if workers need protection everyday. Also, fibers from cotton-like plugs often collect in the ear; because ear wax sticks to the material, this accumulation may breed new problems.

Another type of ear plug is the bullet or cone shaped device made of a soft rubbery material. Shape and size varies. Some are flanged; others are smooth along the entire length of the plug. Fitting such a device can be complicated, because it is not uncommon to find people who require a different size for each ear.

Custom-molded plugs are among the most recent development in the field of personal protection. They are made by taking an impression of the ear with a quick setting, soft material. Sometimes, these impressions are taken to a laboratory where they are used to cast a female mold from which the finished product is made. Sometimes, the original impression hardens in the ear and becomes the finished product. In either case, it is believed that custom-molded plugs which are properly fitted provide more comfort and more reliable protection because the molding method allows for the basic anatomy of the outer ear canal. Also, it is not necessary to guess what size will be correct for each ear. Caution should be maintained when selecting the in-

stant variety of custom-fitted hearing protections, as some are made from materials which shrink and become hard with use. You should also be cautioned about some of the newer instant silicones on the commercial market, as professional observation has revealed some are made with fillers and petroleum jelly similar to those found in dental materials. These are liable to contaminate the ear and deteriorate quickly.

Common complaints about insert devices are that they hurt, they are too much bother, they are easy to lose, and they may cause infection, headaches, and dizziness. Also, because ear plugs are small and hard to see, it is difficult for supervisors to tell whether or not they are being worn. It should be noted that these problems often are associated with improper fitting and inadequate follow-up and employee education.

7. *Fitting & Indoctrination.* Hearing protection is a relatively new concept and is often difficult to promote in industrial settings. Selling employees on the idea of wearing ear plugs or ear muffs is much tougher than convincing them of the need for other personal protective equipment (such as hard hats, special eye glasses, and safety shoes). Noise-induced hearing loss creeps up on employees. Many refuse to worry about damage that will not be noticeable for 10-15 years. Any program utilizing plugs or muffs will require persistent and continuous selling that may tax the patience of supervisors, safety engineers, and physicians and nurses.

Before any employee is fitted with an insert type protection, his ears should be examined by someone qualified to identify any existing problems. Hearing should be evaluated to determine whether or not there is any existing loss at the time the protection is fitted. Records from this testing are invaluable in gauging the success of the program when employees are re-evaluated at a later date (preferably after 9-12 months).

A number of successful hearing conservation programs have benefited from the following guidelines:

If an employee's audiograms are explained to him and he is made to understand what types of noise he is exposed to, he will be more willing to protect his hearing and make the

program a success.

Before any device is placed in an ear, the ear should be examined by a qualified person to determine whether or not any condition exists that makes insertion inadvisable, for example, a draining ear, occlusion due to ear wax, or a perforated ear drum.

When employees are fitted with hearing protection, they should be specifically informed of how, when, and why this protection must be worn.

Employees should have a choice of at least 3-6 different types of protectors. There is enough difference in peoples' ears and individual attitudes to warrant this approach.

Usually ear muffs are adequate for short exposure to intermittent noise. If workers are expected to wear protection for most of the working day, plugs may provide better results.

It should be explained that hearing protection may be uncomfortable for a while. It may be necessary to arrange some type of wearing schedule for each employee until he becomes accustomed to using the recommended protection. If pain ensues or discomfort continues, the worker should be re-examined and fitted with a different protector.

Mandatory programs are generally far more successful than those that leave the responsibility to each employee.

There should be no exceptions when it comes to wearing adequate hearing protection. Foreman and managerial personnel must abide by the same rules they enforce among other employees.

8. Audiometric Test. It should be remembered that hearing protection alone does not constitute a complete hearing conservation program. For example, when hearing protection has been adopted as one of the temporary solutions to a noise problem, industry is recommended by current legislation to add an audiometric program which monitors the hearing acuity of an employee exposed to hazardous noise. Without this means of testing there is no reliable method to demonstrate that the existing controls are successful.

It is also recommended that the determination of an employee's hearing be made by puretone air conduction audiometry on a recurrent basis, preferably once every 9-12

months. Such testing should be administered by a "trained or skilled" person utilizing a testing facility that meets the criteria of the American National Standards Institute or S 3.1-1960 "Standard for Background Noise in Audiometric Rooms." In order to meet these requirements, many industries have found it necessary to purchase or construct some type of sound booth, while others utilize such facilities as walk-in vaults, fall-out shelters, or vacant structures free from excessive background noise. The point being made is simply that it is not mandatory to make all audiometric examinations within a sound booth.

If a significant hearing loss for any reason is noted, it should be properly referred. Of particular importance should be the concept of keeping adequate records which describe the results and circumstances by which they were achieved. Such records should be reviewed and supervised by someone who is professionally qualified to determine their accuracy. It is believed companies who pay more than four to six dollars for audiometric evaluation by outside agencies are paying far too much. Small companies utilizing their own man-power and purchasing their own equipment should not have to pay more than \$1,600-\$1,800 for a complete testing facility.

9. The Handwagon. For some companies it will take time and effort to meet the required standards, but industry has been assured that parties responsible for creating and enforcing the laws are not unreasonable. As long as industry is willing to demonstrate good intentions in meeting the required standards, the prevailing problems between industry and the law will be kept at a minimum.

Many specialists, some legitimate and some self-styled, are racing to jump on the bandwagon for noise pollution control. Their training may range from 2-3 days of seminar study to several years of formal university education. It is up to industry to carefully scrutinize the noise control products and services that are available. Many disciplines will have to cooperate to iron out all the problems related to industrial noise. Don't be led astray by being unfamiliar with the basic requirements of an adequate program.

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