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construction industry and public employee

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59th NATIONAL SAFETY CONGRESS

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Construction Industry Sessions

REPORT OF YEAR'S ACTIVITIES

By DONALD W. DODSON
Mgr., Engineering Dept., Aetna Life & Casualty Co., Chicago, Ill.

The objectives of the Construction Section are to research, study, and define the accident prevention problems of the construction industry and to disseminate information concerning the problems and bring them into the program of the NSC.

Those broad objectives are re-defined at the beginning of each year. Objectives are established in a number of specific categories, all of which are areas of concern in the construction industry. I am pleased to report our objectives for the past year have been substantially accomplished. These include the publication of new data sheets and revision of data sheets, technical releases, and safety releases. These accomplishments were achieved in spite of the fact that our Executive Committee has been heavily preoccupied with the development, promulgation, and continuing study of the standards under the Construction Safety Act of 1969 and the Occupational Safety and Health Act of 1970. This accomplishment would not have been possible without the dedication and hard work of the officers, division chairmen, the standing committee chairmen, newsletter editors and every member of the Construction Section Executive Committee. To each I say, Thank-you.

LEGAL ASPECTS OF OSHA

By G. S. OSTROWSKI
Dir. of Services, National Constructors Association, Washington, D. C.

You cannot separate the function of a safety manager from that of the labor relations man within your company. Neither can you exclude the work of an attorney in connection with the Occupational Safety and Health Act. These three men must of necessity work together and work together closely.

With respect to the labor relation aspect, safety is a mandatory subject of collective bargaining. By law, you are compelled to bargain on safety when the union demands that you do so. The Department of Labor has made its position known—collective bargaining will generally determine the rights of the employees. In many areas, such as compensation (for work performed in connection with OSHA), subject of course to the provisions in the Fair Labor Standards Act and the anti-discrimination provisions of Section 11-C1 of the Act, we are certain that the courts must decide these matters. You are searching for answers which are not available, and will not be available until five or 10 years hence. When OSHA and regulations promulgated under it run the gambit of the courts, through the appellate process and into the Supreme Court, many questions of rights and constitutionality and other aspects of OSHA must be and will be determined. Therefore, I think sometimes that the criticism of the Labor Dept. is unduly hard. I believe that generally the Department of Labor, and particularly the Occupational Safety and Health Administration is doing a good

job in proceeding with the Act and the regulations they're under.

Some of the questions that will arise in the matter of collective bargaining will be: Will the employee be compensated for the amount of time he spends accompanying the compliance officer when your job is visited? Should he be compensated for any work that the individual spends on a safety committee or others connected with OSHA? These may seem like trivial sums, but it should be remembered that when you decide to pay or not pay an employee for certain work performed in connection with OSHA you are setting a precedent, and as this area expands you may wish you had not set the precedent, and you may find it difficult to reverse.

The second matter under labor relations is the matter of discipline. Under OSHA Section 5, the employer has certain duties and responsibilities, and equally under 5B the employees have a duty to conduct themselves in a proper manner. The problem arises in that the employees are not subject to any penalties. The only means that the employer has of enforcing employee responsibility is through discipline, even it it means dismissing the employee from the job. This is important, not only as a matter of meeting your responsibility under OSHA but as a matter of self-preservation. If you have knowledge, direct or indirect, that an employee appears at the work site in an intoxicated condition, perhaps under the influence of drugs, and you allow this employee to continue and he creates a situation which results in serious injury, you may be held responsible on the grounds that you did not perform your responsibility in seeing that that employee conducted himself in a safe manner.

Finally, we must discuss employees' refusal to work under unsafe working conditions or at an unsafe place of employment. These are questions which will involve a determination of jurisdiction between the National Labor Relations Board and the Department of Labor. These problems must be settled in court, because it's actually a problem of this sort that partakes of both. It has a certain facet which comes under the National Labor Relations Act, and another part comes under the Occupational Safety and Health Act. For example, when employees go on strike, are they entitled to lost wages—or is it a strike when they leave an unsafe place of employment? Here again, this question will be decided by the courts.

The second topic I would like to touch upon is the matter of employers' rights. In discussing OSHA with many people, usually the employer, I sense that some of the rights the employer has are not fully exercised. For example: in the matter of consultation, which is offered by the regional and area offices of OSHA, employers should seek guidance as an excellent preventive measure. At the same time, we hope that when an employer in good faith contacts the area or regional office, this will not be used by the Department of Labor as means of levying citations and penalties.

A second matter under employers' rights is the matter of the criminal nature of OSHA. OSHA is both a civil and a criminal statute. Some people overlook this fact—they do not realize that because it is a criminal statute you are entitled to the various protections of the general body of criminal law—the rules of evidence, etc. This is particularly important with respect to Form 101, which is the supplementary record of injuries and illnesses which you must file under the record-keeping provisions of OSHA. Items 13, 14, and 15 under the form can be very incriminating if your employees who are in charge of filling out these forms begin to insert conclusions and opinions—they are placing the employer in jeopardy. Just as long as they stick to the facts, that risk is minimized.

I am not advocating fraud, perjury, or evasion of OSHA. What I am suggesting is that every employer ought to have a review procedure to be sure that in the process of completing Form 101 the employees have not put the nails in the coffin as far as the citation and penalties are concerned.

The last item under employers' rights that I would like to touch upon is the matter of your subcontract. If you are a prime contractor, the contract that you enter into with the subcontractor should contain a provision clearly delineating the responsibilities under OSHA between you and that subcontractor. As all of you know, by the subcontract you

cannot shed your responsibilities under OSHA. However, you can, by the use of a hold-harmless clause be sure that the subcontract will indemnify you in the event of a penalty.

Now, that is not a 100 per cent solution, because a penalty is only one aspect of a citation. When any employer accumulates a series of citations, this might be construed as evidence of bad faith on his part.

Finally, I would like to touch upon the federal and state relationship; this is and will continue to be a problem area. This is a very important problem that is confronting all of us. Employers who are strictly intrastate employers have a lesser problem, because they do not cross state lines. They need only to familarize themselves with the standards and the safety code of one particular state and the federal regulations under OSHA.

The National Construction Association is made up of national and international contractors. Our problem is somewhat broader. Our people must be familiar with all the laws and all the safety codes of all the states in which they operate—which may be 10 to 15 states at a time.

The association (particularly the Accident Prevention Committee, which is one of our very active functions) has undertaken recently to establish a system of liaison people with the various regional and area offices, as a means of keeping informed of the current developments and progress in connection with these federal and state plans. These plans are on file at the regional offices of OSHA and are available for public inspection. They contain the state standards, the enforcement policy, and other matters which are germaine to and necessary in connection with compliance of OSHA.

Finally, we sense that there is some problem with respect to the funding of the Federal/State Program. At the present time $3 million has been appropriated until July 1972, and it is possible that the Department of Labor is experiencing some difficulties in funding these state plans.

The states are entitled to receive up to 90 per cent in federal grants in the development of programs, and 50 per cent in day-to-day operation of these programs.

LABOR EYES SAFETY LEGISLATION

By DALE MARR
Vice-President, Operating Engineers Local No. 3, San Francisco, Calif.

President George Meany of the AFL-CIO has gone on record as saying that while there are many things that we are not pleased with, generally speaking he feels that the Labor Department has taken their obligations under law very seriously and are working on them to the best of their abilities in most instances.

I think labor is in a position to never really be satisfied. We have to keep pushing because this is how we got these laws, by pushing, and we'll continue to push and they will be continually strengthened as time goes by. I can't help but think that with all the great expectations we in America hold for OSHA, like most laws, the Attorneys wrote it, and like most laws they wrote themsleves in for the major part of the action on one side or the other. I can't help but hope that when we get through paying both sides for the litigation that's going to come about we have a little money left over to do a few construction projects. It's going to be years before some of these questions are answered or decided by the courts.

In the meantime, labor has a job to do. We are considerably unhappy over the makeup of the Advisory Commission to the Occupational Safety and Health Administration. We feel that it does not reflect what the law

says it should reflect—a representation of labor, management, and governmental agencies. We feel that there are two representatives of labor on the commission and the so-called public members do not represent the public; they represent management. We don't like it, we don't think it was the intent of the law, and we want you to know that we think we got shuffled on the thing. I don't wish to condemn anyone personally, but when a person has worked for big business all of their working life, when it comes to an issue it's only human nature to reflect the feeling of the industry they've been in all of their working life. This is why we say we don't think we have a true representation.

The AFL-CIO has gone before the House of Representatives and protested the amount of money they're talking about giving the Labor Department in order to get this job off the ground. We think what the Labor Department has asked for is not nearly adequate, and even that has been cut down. We are going to continue to push for money that we think is adequate to do a job. We are going to need all the help we can get.

We are extremely concerned, I might even say considerably burned up, over the hiring policies that are being followed in filling these key jobs around the country, particularly in the construction industry. Management should be considerably concerned over the caliber of people going into some jobs around the country—people who have no construction background whatsoever are going to be making decisions affecting millions and millions of dollars in their area. We say to you loud and clear, we don't like these hiring policies. We say they are hiring basically on college degrees and on civil service examination—they simply have no respect for years of construction experience. The AFL-CIO is disturbed over the hiring in construction because we think we are entitled to have some people who have a background in the construction industry. If labor and management don't get together more and more you're going to see people coming out on those jobs with no background, nothing to base their decisions on and there will be nothing but problems.

We are also unhappy about the position Health, Education and Welfare has taken. We think they have been slow in getting started, and we're not too happy about the direction they are taking.

Above all, the things we're really disturbed about is the state programs part of this Act. Many states in America have done nothing in the field of industrial safety, and suddenly they want to get into the act. They are not qualified any way, shape or form.

This law was passed on the hue and cry that we would have one law we'd be working under. I might add for you multistate employers, maybe even you were allowed to sleep a little bit—you thought maybe you were going to have one law you could work under throughout America. Under these state plans that's not going to happen. It's not even about to happen.

We don't like some of the things under the Section of labor discretion that they are probably going to relax in these state laws. It's their discretion to give at least a maximum 24 hours notice. I signed a danger complaint just three weeks ago—the first complaint I ever signed in writing in 12 years. I signed one in writing over a very critical situation. A big operation was given notice that they were going to come out and look at four big blast furnaces in one tremendous room. When they got there, three of them were shut down. They were told to get the three cranked up or they'd red tag the whole works, so they got going again. But this is what happens when you start warning them that there's a situation. I had been out there and talked to this operation a dozen times, and finally gave up and signed this danger complaint, which I didn't want to do. But this is the sort of thing labor is concerned about.

Lest I sound totally disillusioned with this whole thing, it isn't so at all. I think there are many good things happening. The very fact that there are so many people interested, totally concerned, for whatever the reason, is good. I think that labor probably is going to do more, perhaps more than we ever dreamed of doing, in the field of education for our people. The AFL-CIO is setting up a four-day seminar in universities and colleges around America on a regular basis now. We are going to promote one-day seminars all over America for people who can't afford the four-day—a one-day seminar to tell the workers what their rights are, to tell them what our responsibilities are. I think in America we in the Operating Engineers tell our people.

Thank God, we have the right to demand a safe place of employment but along with that right goes the responsibility to help maintain it. We are telling our people that, and I think (as I say more and more) you're going to find labor throughout America is going to spend a lot of time, a lot of money in educating our people as to our rights and our responsibilities. Again, I say it is too early to criticize this Act because it hasn't had a chance to really show what it'll do, but I can't help think that down the road we're going to be better off for it.

CONSTRUCTION SAFETY AND OSHA

By EUGENE L. NEWMAN
Dir., Office of Compliance, Occupational Safety & Health Administration, Washington, D. C.

Part 1903, in the *Federal Register*, is concerned with inspections, citations, and proposed penalties under the Occupational Safety and Health Act. However, it does apply to the Construction Safety Act, because Congress at the time of the OSHA decided that there should be one system utilized. It was the intent that there would be uniformity of enforcement, including assessment of penalties where appropriate. If you have one establishment and you are doing one job that is financed with federal money and another part is non-federal, why apply two different types of penalties?

As a result, we've come out with Regulation 1903. First, there is a requirement for posting a notice that informs your employees they are subject to the provisions of the Act, that they have certain rights to a safe and healthful work place. The poster must be posted where most of the employees can see it. I am going to briefly cover a couple points in it, because on a construction site you may be spread over many blocks (or many miles, if it's a highway). "Establishment" means a single physical location where business is conducted or where services or industrial operations are performed. Where distinctly separate activities are performed at a single physical location, each activity shall be treated as a separate physical establishment, and separate notice or notices shall be posted in each such establishment to the extent such notices have been furnished by the Occupational Health Administration. Where employees are engaged with activities which are physically dispersed, such as construction, the notice or notices shall be posted at the location out of which the employee operates. This could be a construction shack, a time shack, or the site office.

Compliance officers are authorized to enter without delay at a reasonable time any construction site or other area work place or environment where work is performed by an employee to inspect and investigate during working hours and other reasonable time any such place of employment. We may want to check on a second shift or so, but in general we are going to work doing your regular work days. If there is an objection to inspection, there are procedures whereby we can obtain a court order, because we do have the right of entry. We do allow advance notices of inspection in certain instances. This is usually limited to cases of apparent danger, to enable the employer to abate the danger as quickly as possible, in circumstances where the in-

spection can be effectively conducted after regular business hours or where special preparations are necessary. This is necessary to assure the presence of the employer and the employees or the appropriate personnel needed to aide in the inspection. In no circumstances will this advance notice exceed 24 hours. We have on each of our inspection reports a question regarding this: Was advance notice given? If so, why? And justify it.

When we conduct inspections a representative or the employer will be asked to go along; a representative of the employees will also be asked to go along. You are not authorized as employers to select that representative; your employees must select him. If by chance they haven't, and we can't determine who the representative will be, we will waive that part of the inspection and conduct specific interviews of a reasonable number of employees at the work site.

Where, on a construction job, you have several crafts or trades involved, many times it will be impossible to decide who should accompany the compliance officer on the inspection from the employees stand point. It could be a representative employee of each sub-contractor for that particular phase of inspection. We don't want to get in the situation where we have eight or ten people trailing along with the compliance officer, because this in itself creates a hazard, but if there's any doubt we will interview employees, rather than get in a hassle over this.

After an inspection, we will issue an appropriate citation concerning any hazard or hazards which may have been founded at the work site. This citation or citations must be posted at the work site until the hazardous condition has been abated. If all the conditions that were cited have already been abated on receipt of the notice of citation, the citation still must be posted for a minimum of three days. If a penalty is proposed, this will be sent out currently or shortly after the issuing of a citation or citations. The penalty does not have to be posted, because this is between the Department of Labor and you as the employer. You have a right within 15 working days to contest the citation and or proposed penalty if you so desire to the Occupational Safety and Health Commission. An employer or employee representative has a right to contest the citation, but only for the purpose of questioning the abatement period if he considers it too long.

If you contest a part of the citation and/or the penalties, the date for abatement ceases to run until the review commission has ruled. However, if an employee contests the abatement period, the abatement period continues to run. So, if you have 30 days, don't think, if an employee contests the abatement period, that this will be put off until the review commission rules on it; it will not be. This is covered under the rules of procedure of the review commission.

An employee or employer has the right to request an informal conference with the regional administration prior to the end of this 15 day period to contest and resolve any issues. The intent here is that if it can be resolved without having to go through the contest or appeals route, this would be better for all parties concerned.

But if you request this as the employer, the employees have a right to appear before the regional administrator. If the employee asked for this informal conference, the employer has the right to appear also. This protects everyone's rights.

I will touch briefly on complaints. What is a valid complaint? A complaint, to be valid, must be in writing and can be on a form prescribed by the Department or it can be in a letter form or so forth. It must identify the employer and the work site and describe what the hazard is. It must be signed by an employee or employee representative. A copy of this complaint will be furnished to you as the employer at the start of any inspection that results from this complaint, if it is valid. If the employee desires to remain anonymous we will delete the name, but you as the employer will get an exact copy of the remainder of the complaint. We will, when we have a complaint, inspect the remainder of the premises while we are there. The inspection will not be restricted to the area of the complaint. This is because we may have to come back in a couple weeks and make a full investigation anyway. If we receive a complaint three months after we've investigated once, we may restrict the investigation to only the issues set forth in the complaint, because we may not have any reason to suspect that there are hazardous conditions that have not been corrected due to prior inspection.

The citation shall be posted unedited in a prominent place where it will be readily observable by all affected employees. If you decide to contest it through the review commission, you as the employer have the right to also post notice to the employees that it is being contested, because the citation has to remain up during the period of your appeal.

The Review Commission is composed of three members, appointed by the president. They have some problems—they are hurting for money. They have to rely on hearing examiners borrowed from other government agencies, and they do have a problem in getting these hearing examiners to report in the findings so the commission can review if appropriate. You do not have to have attorneys to appear before the commission. Safety people, presidents of companies, or so forth have the right to appear. Hearings will be held in the general area of where the violations or alleged violations occur.

Provisions have been made for states to have 18-H agreements. An 18-H agreement only allows a state to continue what it has been doing under its own laws, regulations, standards, and codes for a period of time up to December 1972. At that time, if the state has not submitted a plan under the 18-H section of the Act to take over issues or a total program that would be as effective as a federal program under OSHA, the state's laws are superseded by the federal requirement. Many states are creating an interest in planning in this area. How many of them will decide by 1972 (and they must submit a plan before that) to get into the act, we do not know.

There are many problems involved in state administration. Home rule is a factor, money is a factor (although we will fund up to 50 per cent of the states operating plan); it could be that in many states, the state will only take a portion of the total program and you will still have a federal presence in that state.

I think we are going to have many different types of state plans in effect; in many states, we will not have a state plan in effect. (This has already been indicated that they are not interested in one). We will know more in another year in regards to states' intents and interest.

Funding from Congress is vital, also. Even if we turn over to states certain of these activities under the Secretary's authority, if it's not properly funded (the federal level provides 50 per cent) we don't know what will occur. As has been said, many parts of this law we will still be determining in the next 10 years. Many parts will end up in courts. These are some of the things facing us. We've got a big job to do. We are going to try to be fair and reasonable about it, but the situation is somewhat fluid at the moment.

* * *

(The speakers then responded to the following questions which had been directed to them.—Ed.)

Q: You made reference to hold-harmless agreements. Isn't it so that such an agreement may define responsibility between the sub and prime contractors, but have little to do with the rights of the third party? Therefore if a sub has inadequate insurance coverage, the prime must pay despite the hold-harmless clause?

Ostrowski: There are volumes of law written upon the obligations, the duties, and the rights with the respect to the third party contract. To answer your question briefly and in general: your sub-contract is no better than the sub; this has always been the case preceding OSHA and it's the case today. If you have a sub who enters into a contract and he is in fact judgment proof or collection proof, that contract isn't worth much. With respect to the third party provision, a third party contract may be enforced. About 105 cases are pending before the Review Commission, but I know of no pending court actions.

Q: How many have been resolved and how many denied?

Ostrowski: None have been resolved. There are two up for a 30 day review where one of the commissioners may decide to look at it or let the findings of the hearing examiner stand.

Q: In the matter of consultation, if the regional office is called for advice, why is the

calling contact subject to complete inspection?

Ostrowski: As I mentioned earlier, I would hope that the OSHA regional and area offices take a more constructive view of this; it seems that seeking consultation is evidence of the employer's good faith.

Q: If the subcontractor commits an infraction of OSHA, is it possible to have a contractor agreement between the sub and general contractor that the sub will pay the general or reimburse the general if any fines are imposed by the OSHA compliance officer?

Ostrowski: Yes. A great many of the primes today are entering into the sub-contract with that kind of a provision. This type of subcontract with a hold-harmless clause does not relieve you, as the prime, of your responsibility under OSHA; however, it does remove the financial penalty.

Q: Under the sub-contract agreement, can a hold-harmless clause be included in the sub-contract under the new Illinois law which has eliminated the hold-harmless agreement?

Ostrowski: I understand that this is the case, but I must confess that I am not familiar with the provisions of that law. It would have to be looked at closely. I would have to determine what position such aggreements now occupy; that is, whether such a contract now becomes illegal or merely unenforceable. This would raise a whole series of issues and legal problems.

Q: Will reports and recommendations made by OSHA officers and company safety directors be confidential or available in all court cases?

Ostrowski: In an OSHA proceeding (that is, where the government issues a citation and/or a penalty) all reports are available and may be used. The Act specifically states that all the various records you are required to maintain must be kept and made available to the compliance officer at the time he visits the job site. The OSHA administration published a set of regulations governing the extent to which records and compliance officers will be available in private litigation. The general tone of those regulations is that a good many of these things will not be available, and understandably, because the Department of Labor does not want to have the compliance officers and its record-keeping people continually appearing in court proceedings.

Q: Were you suggesting that the company not pay union representatives while they accompany the compliance officer?

Ostrowski: When you look at how often your job site will be visited, how many hours the employee or employee representative spends accompanying the inspector, this is a trivial amount. What I meant to draw your attention to was the precedent setting implication of anything that you might do with respect to payment of employees who do any work with OSHA. We know that some unions will attempt to use this as a featherbedding vehicle. That isn't a general charge, and I don't mean it to be that, but we know human nature, and we expect that these situations will develop. When you open this door you had better open it carefully, or you may get more than you bargained for.

Marr: We feel we pay our agents quite adequately. I may feel underpaid, but the agents are pretty well paid. We don't need any help from the boss to pay our agents; we are pretty well capable financially of paying them. I think what Gerald is really saying is in a number of industrial plants where there are safety committees it could be a real problem. I agree, it could be a real can of worms one of these days if it isn't walked into lightly. We have no intention of plugging very hard for our people to be paid while they're going around like this. If we make a complaint, it will be with us who have something to do with the union o there. It won't be the workers themselves. In a big industrial plant where you have big safety committees and such (incidently we have 1,400-plus safety committee men on construction jobs) they're not going to get anything, and they are not even going around on construction jobs if we have anything to say about it.

Q: Should the occasion arise where the contractor is taken to court, would he be tried in a state or federal court (assuming the agreement between the Department of Labor and states is consummated).

Ostrowski: OSHA and the regulations under it do not pre-empt safety, the citations,

the penalty provision, exclusively to the federal government. Quite the contrary; the Department of Labor is operating on the premise that the states will undertake and assume the obligation of enforcing OSHA and the regulations.

Whether or not the matter would be in a state or federal court would depend at least in part upon the state plan that is in effect, if there is one. You must understand that the state plans are a contract between the federal government and the state and, like any contract, you must look at the particular provision of that state plan. My understanding is that there is no stereotyped state plan that will apply to all states under all circumstances. This will be handled generally on a state by state basis.

Newman: As Jerry said, it will depend on the agreement between the federal government and the state on jurisdiction. We'll just have to wait and see what comes up when we enter into state plans under 18-B.

Q: What is an employer's position when a group of employees, members of the local union, refuse as a group to use personal protective devices required under OSHA? An employee equipped with safety hat, ear muffs etc., is instructed that it is necessary to use this equipment in his work. He fails to do so and an OSHA inspector sees the individual not wearing safety equipment and management is cited. Why isn't the employee cited, since he was given the safety equipment to perform his job and was instructed in its use? Why shouldn't he be fired?

Marr: We have a very simple situation in Local 3, Operating Engineers. We told our employers that if they have any specific safety instructions, to make them known to our members when they go to work or periodically when something comes up. Give them a hand-written sheet so they know, and if they don't want to do it, send them down the road. And if they don't follow your instructions and you don't send them down the road, you better quit being boss. The Act requires that the employee comply with safety and health requirements.

Q: Will other federal agencies be enforcing health and safety requirements?

Newman: We are working with other federal agencies to determine the limitation of their authorities and where ours begin. We hope to have some answers in about 60 days to answer many of these questions. At the moment they have laws in effect, we have laws in effect, and we are negotiating with them to get clarification to determine who will enforce what.

Q: If there's a complaint where a contractor is working for a federal agency, who would look at it if he's a private contractor?

Newman: We are going to look after it. We are not going to refer it back to the federal agency. However, if it is a federal employee on that job site who is complaining about the situation, we will refer it back to his federal agency to resolve.

Q: How do you determine if an employee is under the influence of alcohol or drugs?

Ostrowski: Generally by observation, by how he performs his work. For example, it is known that in a person under the influence of drugs, the pupils dilate. There will be other general appearances. The law does not require you to take a blood sample once an hour of every man on that job. You must, where you see a hazardous situation, take steps to correct it.

Q: If every aspect of OSHA is fulfilled by the employer and an employee is injured by working in an unsafe manner at the direction of his foreman, will the foreman assume any responsibility?

Ostrowski: As you know, under OSHA somebody might go to jail. No guidelines have been given, and at this point it's not clearly defined and I don't think it can be. It will depend on the circumstances of each case, but somebody in the employer's executive structure might go to jail, and in some situations it might be the foreman.

Q: How does the employer treat the fellow he suspects is under the influence, whatever degree it is?

Marr: For years the problem was alcohol, but now we must recognize that drugs are becoming more and more of a problem. Certainly, we as a union are concerned over this, and the problem is that until the employer takes his position we are pretty well hamstrung. In the last negotiation we got a provision in our contract that if the employers

discharge a man three times for not being competent to run a particular kind of equipment and will say so on his discharge, he can never register for that piece of equipment again until he goes to our training school (we have a 3,600 acre ranch that is a training school) and passes qualification tests at that school.

If someone is implying that the unions are trying to protect the drunk and the guy on dope, they are wasting their time. We are proud of our craft in running this heavy equipment. Most of our operators are proud of their craft, and they are running some expensive equipment, and the most highly qualified man isn't too good for it. So we are concerned. There are some real problems for the employer to get rid of the guy and make it known to us what the story really was. There are some legal problems—the day you put on the discharge papers he was intoxicated, you better be able to back it up. So this is now a legal question. But we as the union are joined with employers in being really concerned about this problem. It's something that labor and management have got to sit down and find out where we are going together on this.

Q: How many compliance officers do we have in the field at the moment?

Newman: We have approximately 350; about 60 in construction activities.

Q: If the contractor feels that the man is not competent can he request an inspection by another compliance officer who is?

Newman: You can go back to the area director. We have a lot of new people out there who are not familiar with enforcement. Since we had a back log of complaints, we may not have designated a construction-trained man. We will stop this through further training. We don't expect 350 compliance officers will become trained construction inspectors, and we can't expect a construction inspector to go into general industrial establishment and conduct an effective inspection. But live with us for a little while. We do have some growing pains.

Q: What is your position on states enforcing the act who have and have had construction standards. They have many qualified people, should they be made federal compliance officers?

Newman: Personally, I am delighted that several of the states have done an excellent job in the past in the field of construction safety, and I am delighted to see them continue in it. I would voice a personal concern on states who have never shown any interest to suddenly get in the Act. I do not want to see one competing against the other, trying to see who can do the toughest job. I don't think we or the employers want it. I have seen some signs of this happening. I say more power to the states who have done a good job in the past. I hope they continue to do a good job.

Q: I understand some of the states are using their inspectors as OSHA compliance officers; is this correct? Which states are doing so?

Newman: We entered into a so-called 7C-1. Under the act we have a contract with eight states to perform the target industry inspections for us because we don't have enough people. About 60 state inspectors were interviewed, came to Washington, and went through training. They are out in eight of the states conducting OSHA inspections for us in the target industries only. These eight states are Washington, Oregon, California, Illinois, Pennsylvania, New York, Florida, and North Carolina.

Q: Do they have the same authority as the OSHA compliance officer?

Newman: They inspect and report to our area director, who then issues a citation, if considered appropriate, and/or proposed penalty. They just do the inspection.

Q: Why doesn't the compliance officer sign the citation? Why must he go to an area director?

Newman: This is an artificially contrived mechanism that we feel is necessary. We do not want to have one of our inspectors who may have gotten up on the wrong side of the bed get into an argument with a contractor and decide to throw the book at him. It must be checked out by the area director, who is a disinterested party. We feel this will be fair to everyone.

Q: Will additional states be added to the target industries?

Newman: There is no intent to at the moment. This is a pilot program, and calls for full reimbursement of these salaried individuals.

Q: Are the operating engineers prepared to send operators to the job with a current hearing test?

Marr: The day I tell all our people they have to have a hearing test is the day I am coming out with my sound ear and tell you what your machine really tests. This is an engineering problem. The job that requires a hearing test is the crane operator, the hoist operator, and they're working on signals. They take them regularly, and at our direction. I spoke at the National AGC meeting several years ago urging labor and management to get together on a total medical program, and I haven't had any takers. We're still ready, able, and willing to talk to you about a total physical program.

ENVIRONMENTAL ASPECTS OF HIGHWAY CONSTRUCTION

By BARRY L. PETERSON

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A key word in today's construction industry vocabulary is "environment." What are the parameters of our environmental concerns? How do we better understand them? And perhaps most significant to you, How do we do our job and still conserve this "environment"? Note that I didn't say preserve—rather, I use conserve. I like to think of myself as a conservationist within the terms used by President Theodore Roosevelt, who said, "Conservation means development as well as preservation." Conservation implies wise use of resources—therefore, I suspect that most of us would be willing to acknowledge that we're conservationists.

There are many who would believe that the highway official—and the construction official who performs a service for the highway department—is a "Johnny-come-lately" with respect to environmental concerns. This is just not the case. There is certainly a substantially increased awareness of environmental impacts in the highway construction area, but the immense impact of highways on our lives and our communities has long been a concern of highway people.

In the early stages of road improvement, the major concern was to enable people to move out of the mud. Now that our technology has assured rapid movement from place to place, it is proper to place greater emphasis upon the social-economic and environmental aspects of construction programs. Criteria other than efficiency have risen in importance in judging the value of a highway. They include safety, esthetics, pollution control, and ecology. Legislation during the past four years has greatly expanded the interest and concern of our citizenry in doing the job better. This may mean that we will build fewer miles of road—but we will build better miles of road.

Perhaps because Pennsylvania has been studying the wildlife—auto collision phenomenon the longest, the problem seems greater there. Reports of animal kills in northwest Pennsylvania have been reported in highway construction magazines since at least 1945, and figures date back to 1941 when a total of 14,088 wild and domestic animals was tallied in six counties. On a state-wide basis, the reported deer kill alone has varied from 7,107 in 1960 to 22,610 in 1967 since these figures have been tallied.

But this deer-motor vehicle collision problem seems to extend into many other states. As you would expect, there are significant deer kills in Wisconsin, Virginia, and New York. But it is also interesting to note that a prairie state such as Nebraska also is experiencing increased deer kills.

All of the reasons for the reputed increases in kills are not yet known. Factors related to this safety problem must include increased traffic speeds, size of the deer herds, types of hunting seasons (that being about the most effective method of control), roadside vegetation (on and off the right of way), sight distance, and highway design and construction. Several studies in Pennsylvania indicate that the types of vegetation on new segments of Interstate 80 may have some bearing on deer crossing onto the right of way—especially in Spring and Fall. Another finding was that deer tended to cross the road where cut and fill sections met.

In one study section where 17 deer were killed in 14 months, the researcher considered that certain topographic and vegetation characteristics contributed significantly to the kill. The roadways did not have guardrails (which deer tend to walk around), the right of way was generally vegetated by grass with steep slopes having crownvetch cover, while off the right of way there were small open fields bordered by woods.

From an ecologist's viewpoint, these studies indicate that it may well be possible to build highways which will minimize collision incidence if we better understand the effects of the highway environment on animal behavior. Perhaps it would then be possible to design and build highways with appropriate slopes, vegetation, and fences in areas of known moderate to high deer populations. Establishment of hunting management areas near the roadway (recognizing that most deer are shot within a quarter mile of some type of road anyway, and recognizing possible increased safety hazards could result unless the hunting were also controlled by use of shotgun and/or bow and arrow).

Location of a highway can also be a modifying influence upon future deer-motor vehicle collisions. A case in point relates to the proposed location of an Interstate highway. Three feasible alternate locations were identified. Two of the routes went through a large marsh used as wintering land for deer. The deer moved in and out of this marsh continuously to favored brushlands and corn fields to feed. Most of the deer remain in the general area all year. If the highway were to use either of these alignments, dangerous deer-vehicle hazards could be expected. The third proposed alignment passed several miles south of the deer concentration area and became the favored route for this highway location.

It is not always possible to avoid these situations, however. In the western states, the deer are much more migratory in their habits than the eastern whitetail deer. In one state, an existing two-lane U.S. highway has been programmed for upgrading to four-lane freeway standards because of significantly increased traffic. This highway is in an area of predominantly grazing country with pinion-juniper, sage and bitterbrush and native grasses being the common plants. In one 12.6 mile stretch, an especially high deer kill has been reported from 1966-1969. One hundred nine deer were killed during that time—76 of them in one six-mile section featuring steep cut banks and pinion trees lining the roadway. In order to minimize the adverse effects upon the wintering mule deer crossing the highway, the state highway department proposes to move the deer across the freeway through two 10x14 concrete box culverts which will also serve cattle. The state highway department is also continuing a study to develop control of access fencing which will protect the deer herds, domestic cattle, and motorists. In addition, vegetation near the freeway will seek utilization of grasses which are unpalatable to both livestock and deer (Streambank Wheat Grass) in hopes such actions will discourage grazing along the highway. Water impoundments may be made near the crossings to encourage full utilization by deer.

Use of box culverts for deer—especially migrating deer—is still in experimental stages. The oldest study I am aware of is on Interstate 70 near Vail, Colorado. This project is being studied through the cooperative effort—a key to these ecological investigations along roads—of the Colorado Division of Highways and Colorado Division of Game, Fish, and Parks in cooperation with the U.S. Bureau of Land Management and the Federal Highway Administration.

A 10x10x100 foot underpass was designed to allow deer to travel safely from one side of the highway to the other along a natural migration route along Mud Springs Gulch. In addition, about two and one half miles of eight feet high fence on either side of the highway directs the deer to the underpass.

Evaluation began with the Spring migration of 1970. An electric-eye device was installed to count the deer, and a skylight and lighting were installed in the underpass and at the entrances. Before each migration, dirt is spread over two-thirds of the floor. This raised, dirt-covered portion was to be used as a track bed. The remaining concrete portion was left clear for drainage. Eight one-way deer gates have been installed along the fences at probable deer concentration areas to allow deer who may get on the right of way to escape.

Game biologists reviewing the deer use have found an apparent reluctance on the part of the deer to enter the culvert. This could be dependent upon the design. Another underpass is being designed for an Interstate which may be 10x24 feet. This may tend to relax some of the wariness of the deer to enter the underpass.

Most of the deer traffic took place in darkness. An observed increase in traffic volume and human interference, plus the natural decrease of deer activity during daylight, may account for a lower number of passages at that time. Preliminary indications are that the success of fences in funneling deer to the underpass, and of one-way gates allowing trapped deer to escape, had led to a safer passage for the animals and safer highspeed travel for motorists.

Deer are not the only creatures who use the highway right of way. Smaller mammals and birds also use the right of way for feeding, resting, hunting, and nesting. According to a South Dakota wildlife official, the best potential increases in wildlife habitat in the foreseeable future are to be expected along roadsides where, interestingly, the highest per-acre pheasant use of any type of habitat exists in some states. South Dakota has established a program whereby the Highway Department works with the Game, Fish, and Parks Department in the selection and establishment of certain types of roadside vegetation attractive to both ducks and pheasants. In addition, they have a roadside management agreement whereby Interstate and some primary highways get only minimal mowing.

Millions of acres are available which may contribute to this productive use of right of way. Current land-use trends, especially in the Midwest, adversely affect nesting cover for many prairie birds. The result is that roadsides are becoming ever more significant non-agricultural lands which provide vitally necessary cover.

Illinois biologists have been studying such aspects of the pheasant use of right of way as manipulation of vegetation, mowing practices, and potential traffic hazards which might exist along low volume roads. A North Dakota biologist reports that "With only 15 feet of inslopes mowed, anticipated problems associated with mowing cessation, such as increased wildlife-vehicle collisions and increased snow on the highway did not materialize" over a 23 mile segment of I-94. This is one of the few examples known of the accident relationship of small animals to a major traffic facility.

Since 1967, the Traffic Section of the Illinois Division of Highways has been keeping track of the number of accidents caused by pheasants throughout the state. To date, they have recorded a grand total of two accidents caused by pheasants. Since property damage of less than $100 need not be reported there, Illinois researchers also check two insurance companies and found 49 of 2,705 claims attributable to pheasants. But there is so little which we have to suggest that delayed mowing of roadsides or plantings of vegetation attractive to wildlife affects the frequency of, say, pheasant-auto collisions.

It would appear most desirable that some added information be gathered on the bird-auto collisions considering some increase in use must be expected on most roadsides—especially on Interstates with wide right of

way.

Secretary Volpe recently urged the nation's highway builders to be alert to opportunities of turning roadbuilding projects into instruments of creation and recreation. Certainly a significant creative force is available to us if we take advantage of it to enhance or even create native wildlife habitat on right of way.

Erosion during and after construction has long been a problem in highway work. Besides making slopes unsightly and necessitating costly repairs, the materials removed can be harmful if they reach lakes, ponds, or streams. Erosion control methods are continuing to become more sophisticated and it appears that substantial progress is being made to curtail the amount of erosion on highway projects. I'm sure innovative construction practices are playing a part in this reduction. For example, many techniques for soil preparation and grading of slopes have been developed by contractors. Slopes have frequently been smooth graded, whereas if tracked construction machinery were used, small pockets form which tend to trap moisture and speed up the vegetation of the slopes. I cannot overemphasize the need for rapid dressing up of cut and fill sections. Other relatively simple and inexpensive means are available to prevent or control soil erosion and to encourage rapid revegetation. Burlap cylinders filled with sand (nearly 25-foot long sand bags) are being used at the tops of fill slopes to expedite revegetation and prevent washouts. These burlap embankment protectors are more economical than curbs, easier to remove once soil stabilization has been accomplished, easier to install, more flexible and versatile than other types of curb, and safer.

If paved ditches are required, it is highly desirable to get them constructed as early in the project as feasible so that drainage channels don't erode. The soils are compacted during the grading. If left for a lengthy period, it is easy for runoff to begin eroding away these soils. Later, material may be brought in, not adequately compacted and, when the paved ditch is finally installed, erosion may still be a problem along the ditch lines.

Settling ponds or stilling basins are becoming more commonplace in various types of construction projects to collect those sediments that do occur during construction. Design techniques are available to allow these erosion control devices to be carefully designed into most highway projects where there will be significant amounts of bare land.

One area formerly overlooked but now receiving closer attention by contractors are waste and disposal areas and borrow pits. There are a number of uses which can and are being made of these areas. Generally, if properly treated at the end of their use, they will provide new opportunities as natural areas, parks, or recreation areas. There are many examples of enhancements because of a little extra care taken by designers, project engineers, and contractors. These include a wildlife refuge and conservation area in Iowa, the famous Nebraska Chain-of-Lakes on I-80, waterfowl breeding ponds in Arkansas and Minnesota, fishing ponds and swimming beaches in Wisconsin, Indiana, and rest areas in many states. In some instances, these areas are also converted to industrial, residential, commercial, or agricultural uses by proper grading or application of top soil.

The ecological aspects of highway construction are important in many phases of a highway program—from location studies, design, construction, and into maintenance and operation. It is critical that construction contractors maintain an awareness of the environment they are working with, for there will be many opportunities to modify that environment for good or bad. In rural, suburban, and even in some urban areas, animals are using roadsides more frequently. We need to further our efforts in identifying and relating these uses to the safety of the highway facility and then put the engineers and ecologists to work to determine how to alleviate safety problems if and when they are identified.

HOW THE CONTRACTOR MANAGES RISK

By JOHN L. PICKENS
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Risk management involves risk analysis, risk evaluation, risk abatement or control, risk transfer, and risk accounting. The application of these five steps becomes more and more important in today's high risk construction industry.

Stating the objective of risk management is quite simple: To recognize and control risk. Understanding it is quite something else, involving a process of sorting out and learning new definitions for what certain words really mean and getting what may be an entirely new viewpoint on costs.

From the framework of insurance—which has itself attained the status of a legitimate management concern at a corporate level only in the past 25 to 30 years—comes the new and broader concept of risk management. Like insurance management, it has tended to develop in the marketplace, with its practices leaving far behind the educational system which should be developing its future practitioners. It is an art in a state of development, still largely tied to insurance in actual practice, but with a growing band of disciples seeking ways to cut the cord and achieve recognition as a new and essential part of corporate management.

I will try to illustrate in a non-technical way what we mean by "risk," why the contractor should take a greater interest than at present, and why the loss control specialist should know more about this new management tool.

In a publication of the Associated General Contractors I found a good sub-title for this presentation: "The General Contractor—What Kind of Fool is He?" Another statement from the same source: "He who is fond of building will soon ruin himself without the help of his enemies." This statement is from a Greek scholar named Plutarch, and is over 2,000 years old. Many builders have had cause to ponder these two statements.

Exactly what kind of a fool is the general contractor? Why does he risk his time, his talent, and his assets in an industry that has such a poor record in rewarding its members?

Certainly the record shows that the path of the general contractor is a rocky one. The chances of going broke in the construction industry exceed the norm for business as a whole, and if the contractor does not go broke, his profits are frequently an extremely small fraction of his total volume of business.

In January 1858 The Mercantile Agency issued its first report of business failures throughout the nation. This report excluded California ("Arrangements for that state not yet being as perfect as elsewhere."). "There has been lost by 337 swindling and absconding debtors $5,222,500 and by 512 which will pay nothing, their losses and confidential debts absorbing everything, a total of $20,-300,000."

In the 113 years since that time, Dun & Bradstreet, successor to The Mercantile Agency has served as a central clearing house for statistical data on commercial business failures and has provided absorbing, if somewhat morbid, reading for business men generally.

Through the first seven months of 1971 a total of 955 contractors failed—340 general contractors, 539 building sub-contractors, and 76 miscellaneous. In the year ended June 30, 1971 there were 1,641 contractor failures in this country, which was even a slight improvement over 1970. In an analysis of these figures, the writers maintain that the one cause of firms closing their doors is still the same: "Managerial inexperience or ineptitude."

Our company's experience as a major surety bond underwriter bears this out—undertaking a job much larger or in a different

field than previously handled successfully are common examples. The successful school builder finds that a sewage treatment plant poses problems he did not anticipate and with which he cannot cope. The experienced dirt man cannot necessarily handle a sewer job or build a dam. And there's a lot of difference between a one million and a three million dollar job that can ruin a contractor. "Managerial experience" means ability to control costs, to manage finances. A lifetime on construction projects does not necessarily produce a manager any more than it develops aptitude in all the widely differing types of construction jobs.

What kind of man is the general contractor? He obviously is many different types of persons wrapped up in one. He wears many hats. He is a businessman, administrator, financier, public relations specialist, labor relations expert, and an authority on construction. He has to be a diplomat, a lawyer, a buyer, a student of the industry. First and foremost, however, he is a businessman; for construction is a business, America's largest single business. The estimated $135 billion in new construction, repair, and maintenance this year will exceed the combined output of the automobile and steel industries. I will address my remarks here to the contractor as a businessman, introduce the concepts of "risk" a d "risk management," and discuss the role of loss control in the risk management process.

The basic objectives of any business are first, to make an adequate profit and, second, to be a good corporate citizen. In some quarters today it is considered that perhaps we should put these in reverse order and say, first of all, that the objective of business today should be to be a good corporate citizen in the broadest sense, while at the same time—and perhaps thereby—attempting to make adequate profit.

A business exists to provide goods or services at a profit. Someone has to run the business—which is management—and by definition, the objective of management is to maximize the productive efficiency of the enterprise. It does so by setting desirable goals and then achieving these goals in the face of obstacles, of problems, and of risk.

The taking of risk—meaning the possibility, the uncertainty regarding loss—is part of the nature of a business enterprise. Only by committing or risking assets in the business venture can there be any possibility of profit. In one sense, therefore, it is the job of a manager to create risk. We mean here the speculative or business risk which can result in gain if all goes well or loss if things do not go well—when the sales, the market, the general economic environment do not turn out as favorably as planned. This is the chance-taking that is inherent in all business, in the hope and expectation that gain or profit will result.

However, there is a different kind of risk, called "pure" risk or "static" risk. This involves no chance of gain, only a chance of loss or, at best, no loss. This includes losses from natural causes such as earthquake, flood, wind, lightning; from the activities of man such as fire, explosion, collision, collapse, theft, and embezzlement. The risk is almost endless as man interacts with his environment, his products, and with other men. These losses can directly destroy company assets, people, property, or money; or can arise out of the liability for damage to the property or personnel of others; and both of these kinds of losses can interrupt the business operations and affect credit. Remember that we are talking here about the possibility of loss, not necessarily the probability.

Man learned very early that in order to survive he had to learn to deal with risk by fleeing from wild animals, by fighting them off with whatever weapon he could contrive, by making protective clothing for himself, or perhaps by barricading himself in a cave or climbing a tree. He survived only if he recognized the peril soon enough, made the proper decision on how serious it was, and then took the proper protective action quickly enough. By thinking ahead, planning the action to take, and being ready to act promptly, he thus became the world's first risk manager. Then there probably came along a man who had lost some fingers and most of a leg in an encounter with a wild animal, who kept saying things like, "Don't go near that big cave because there's a family of hungry bears inside," or, "Be careful down in that grove of trees, because there's a saber-toothed tiger there. Be sure to give yourself at least 200 steps headstart, and remember he can climb trees." That was the world's first safety man.

The risk manager today functions as a part of management, helping to protect and preserve the corporate assets of property, plant, equipment, personnel, cash, credit, and good will. His job is not just to prevent direct loss of these assets but to assure their availability for furthering the corporation's objective of making profit, by preserving the capacity to produce goods or services. Thus he helps maximize the productive efficiency of the enterprise, and that's what makes him a key member of the management team.

The job of the risk manager is accomplished in five basic steps very similar to those which I described in terms of prehistoric man.

The first is *risk analysis.* What are the assets—equipment, material or people—susceptible to loss? What are the hazards or exposures which may possibly cause a loss of these assets?

The second step is *risk evaluation.* What is the probability of a loss? How serious a loss is likely to result from these hazards or exposures?

The third step is *risk abatement or loss control.* How can we eliminate or reduce the hazard? How can we thus eliminate or reduce the probable loss?

The fourth step is *risk transfer.* Can we substitute some known expense for the unknown? Should we accomplish this through insurance? Can we do it through contract?

The fifth step is *risk accounting.* What procedures do we need, to accumulate data to keep track of costs?

Let's look first at some of the risks that confront the contractor. Here are several situations illustrating risk. In each of these there exists a possibility of loss with which loss control men are familiar.

A helicopter is lifting a 7,500 lb. storage tank onto the roof of a building. It is an economical solution to a difficult problem and presents an innovative approach by adapting specialized equipment.

Consider the risk and how to control it: the value of the helicopter and tank; proper cradle; lifting capacity of the helicopter; weather conditions; training of the crew; possible damage to the building or injury to the man if the load is dropped. Should he subcontract and secure hold harmless agreements?

Or, consider the erecting of a steel frame section at a smelter plant. From the engineer's design board to the steel fabricator's shop to the field, the ironworker is dependent upon each predecessor working with the prescribed tolerances if he is to erect the steel without incident. Misfits expose the men, the crane, the structure and slow down the job so it misses the completion date.

The erection of electrical transmission towers and lines is made more difficult by remote and often almost inaccessible terrain. Temporary roads must be hacked out of the wilderness to truck in the tower sections; special techiques are developed to assemble the steel where cranes cannot get in; the wire must be strung, sagged to proper tension, and connected to the insulators. All represent values at risk and their replacement is costly.

Men and equipment are isolated and in many instances the only contact to civilization is by radio. The men face the hazards of working aloft and, in many areas, have to cope with poisonous snakes on the ground; the equipment sustains unusual punishment and many times outright loss from operating in the rough terrain; the towers are subject to collapse if conductors are not tensioned properly.

What is involved with a scaffold? Almost all construction activities require some type of scaffolding. In most instances, it is used for men to perform their tasks. As such, it solves the physical height limitation of a man, but at the same time he is exposed to falls from poor platforms or unsecured sections. It is costly, erection is costly, and for wooden scaffolds fire is a hazard.

Another use is also made of medium and heavy scaffolding, particularly in smaller concrete bridge construction. There's much to consider: the economics of rental vs. purchase; strength required; ability of the crews to assemble the components for the required rigidity during concrete curing; the disassembly procedures necessary to minimize damage to the scaffolding.

Specialized considerations must be developed for unusual conditions. A bridge is located in earthquake country near San Francisco. The center pier is being formed to span a BART tunnel and the scaffolding provides temporary earthquake bracing for maintaining structural integrity during construction. The span forming is designed to keep the supporting members light as it crosses a major highway so that the necessity of using massive falsework can be lessened. Job expenses are kept in line, and traffic moves.

Using the right piece of equipment to do the job, such as a scraper, requires job planning. The investment in the rig must be justified on the basis of its ability to perform, with a trained operator, and operated in such a manner that it won't sustain loss from collision or upset while moving the maximum material hourly. Again, rental vs. purchase.

Massive trench excavations bring into play many factors of evaluation: the type of excavating equipment to be used; the side slope cuts required to prevent sidewall collapse; the placement of the equipment and the men. Having equipment slide into trenches, or men injured or killed from cave-ins, can wipe out any profit margins the job has, as well as tarnishing a public image.

This is no less true of the smaller operation than the jumbo. Under the requirements of OSHA, much more consideration to trench sheating may be required, particularly with machinery and trucks operating near an open cut. Costly to install, but no longer an option on most jobs.

That quarry location and its operation in supplying the job may determine how much profit there will be. Drilling and shooting the benches for optimum breakage; minimum secondary blasting; carefully synchronized firing schedule to time with shift changes and a minimum of unnecessary equipment movement, all must be planned. Hauling must be kept as short as possible.

The handling of explosives, loading, and firing expose the men and equipment to injury and damage. Overzealous shooting can damage the job or cause adjoining property owners to become irate, even file damage claims.

A batch plant represents a heavy financial investment. What consideration is given to site selection where landslide may be a problem? Or, to fire protection? Material supply is certainly a primary consideration for the batch plant placement on or near a job. But other factors must be weighed carefully, in the final evaluation. Alternate supply sources are not always easily located after a loss.

Warehousing and maintenance facilities on the project are primary support facilities. Are they adequately built, accessible but not too close, buildings spread so that a fire in one does not involve others, provisions made to remove major equipment in case of fire, located so they won't sustain a flood or landslide? All are important.

All materials and equipment cannot be warehoused. Is the yard arranged for maximum storage, readily accessible to reduce secondary moving? What about flash flooding, fire, theft, vandalism, or weather damage?

Massive wooden forms are used universally for concrete construction and in many cases can be reused. Cold climates require heating, always a problem if unattended, because of fire. Some sections of the country have high wind exposure, requiring extra precaution in panel erection and stabilization. Some projects are exposed to the annual flood problem in river valleys where the washout of a cofferdam could destroy the project and possibly bankrupt the contractor. Forethought must be given to these exposures with as much reasonable practical precaution taken as possible.

A building being erected in an urban area has many facets requiring attention; prime among these, of course, is the foundation. If piling is used, there is the question of minimizing vibration to adjacent structures; if dewatering is required, provisions against settlement to adjacent structures is likewise essential. Deep excavations must provide side support to protect the integrity of adjacent structures and the building being erected, as well as providing a safe working place for the men.

When the foundation of the building is well established, the superstructure can be built—and a different set of evaluations is introduced.

In recent years, the hi-rise building is seen everywhere. And with it, a new set of problems: material handling with elevators, derricks, or tower cranes; limited storage yards; hoisting material and equipment operating directly over city streets; increasing vandalism and theft to equipment and material in unsecured storage yards; fighting fires at levels above the reach of regular apparatus, if provision has not been made for standpipes; wind lifting unsecured material off the deck and blowing it so it damages adjacent property or personnel.

And don't forget that all important Public Image.

Oil drilling barges operating off our coasts have an ever-present concern for pollution. Breaking off a drill stem 800 to 1,300 feet below the surface in a pressure hole while fighting an ocean storm can be an ecological disaster. The engineers have worked on this with a series of seals grouted into the sea floor to reduce leakage in case of a problem.

But, think of the other problems involved on this floating island: 40 to 80 men on two shifts daily; never escaping the sea; never escaping the motion of the vessel; never escaping the operational noise 24 hours per day, seven days per week. The men have to be well selected to adjust to this type of life.

We used to orient ourselves to the single type of hazard. For instance, workmen's compensation and the specific exposures related thereto. Three men were sitting on a bench just two minutes before an unsecured piece of metal coping slipped and fell from the roof. Obviously, at least one man would have died in this accident.

Look at the mighty Dworsak Dam under construction. It encompasses almost every type of risk. Men must be able to work safely. The environment must be protected: pollution control for sediments; fish weirs; controlled tree cutting; erosion control; even the quarry location was dictated by aesthetic considerations. Equipment has to operate in all types of weather and field conditions, requiring the best of maintenance in the shop and service roads to minimize breakdown or damage.

Fighting fire in the many support facilities must be provided for and answered by the contractor's own fire department.

The course of construction must not be interrupted by flood, so upstream diversion and downstream cofferdam protection has been incorporated in the project to divert the seasonal high water.

Capability to perform both physically and financially—certainly affected by any casualty or property loss experience—finally ties in with the all-important ability to bond. Without the strength of outside institutions to provide surety bonds, this monument to man's ability could not be built.

One of the world's greatest orthotropic bridges is the graceful Coronada spanning San Diego harbor. Its construction experienced the range of hazards from marine to high superstructure.

In each of these instances, I might ask a question. "Is management really interested in the hazards we have outlined, or is management interested in the risk, the possibility of loss which each of these represents? Which emphasis is most likely to produce the desired response and corrective action on the part of management?

First of all, we must identify and chart the types of risks to which the contractor is subject. Remembering that risk is not hazard but uncertainty regarding loss of assets, on the left side of the chart we include not only his own properties—warehouses, yards, materials, equipment, plans, and engineering drawings—but the owner's properties under construction. They include his liability to others for possible damage, and his obligation to complete the job on time and according to plans and specifications. He must consider all these as part of risk.

On the right side of the chart we must have risk management policy. This is the position which management takes, and perhaps might be defined as the "degree of reluctance of management to subject the firm to the possibility of loss." Risk aversion—the amount of loss to which the contractor feels he can subject the firm at any given point. There are many things which influence management's policy regarding risk, one of the key factors being the financial capacity of the corporation to absorb a loss of a given size and thereby reduce its liquid assets. Also, the

length of time that a particular management has been in charge. We might compare this to the corporation where the top management is threatened with replacement by the Board of Directors if the profit picture is not as it should be. Another factor is the tough-mindedness of management, the conviction that they are always correct, the unwillingness to budge very much from a course of action that has been taken and which is stubbornly believed to be right. This factor might have a great deal of bearing upon the position taken by contractors.

From the combination of the types of risks and the risk management policy, a number of practices begin to evolve and become the risk management practices of a particular firm. It should be made clear that in the long run the contractor is going to pay for all of his losses in one way or another. The practice of risk management is concerned with how he plans to pay for his losses, with providing some assurance that he will be able to pay and still stay in business and, of course, keeping these losses to a minimum.

There is a great deal of difference in approach between companies and perhaps confusion as to what we really mean by risk management practices. In general, however, we can say that these practices represent guidelines for decisions on which of five different ways a risk is to be managed, and in each case there is usually some combination of these five ways.

Starting at the left we find that the first course of action available is to avoid or reject the risk completely. In other words, when the nature of the risk is identified and the seriousness of it is evaluated, the decision is made that perhaps this particular risk is too great to take. The contractor may decide that he simply does not care to bid on this particular project, or this part of a project. Here is where a good surety bond underwriter can help him avoid commitment to a job that he should not take. Competitive pressure and a desire to keep his organization busy has led many a contractor into a disastrous bid. A good bonding company is a friend; their advice should be heeded.

The second course of action is to assume the risk. This means that having identified the risk and the problems that might occur, a decision is made that this particular risk is best assumed as a business expense. The contractor may also set aside a reserve fund rather than to take the cost of any possible loss out of operating cash. This particular decision about assuming risk is quite frequently not a conscious one but is made by default. Nevertheless, it is a very specific decision that management makes, consciously or not—how much of a given risk, how much of a given type of loss that occurs, he intended to absorb as an operating cost.

The third course of action is to reduce the risk. The uncertainty of risk can be reduced by self-insurance, where we assume the risk but plan and provide for the losses more accurately. Other steps that reduce uncertainty about the amount of loss include selecting the size of deductibles, perhaps the employment of a retrospective rating form of insurance.

The next device is to transfer the risk, and the most common way in which this is done is by the mechanism of insurance. The uncertainties regarding loss are transferred to an insurance company for a premium. The uncertainty on the part of the contractor is eliminated, he knows how many dollars he is going to pay, and the insurance company assumes the risk in his place. Rental of equipment rather than purchase transfers risk, and I know of one large contractor who went broke because he tied up too much operating cash in equipment.

Certain types of risks can be transferred by means of a contract. We have already mentioned the fact that frequently risks are assumed through ignorance. The contractor must be alert that he does not, through ignorance, assume a risk by the type of contract which he negotiates. This is a very easy way to acquire a contractual liability, simply by the way in which a particular contract is drawn. The shores of the Sea of Bankruptcy are littered with the hulls of shipwrecked contractors who ran into this unseen hazard. The review and legal research regarding contracts is extremely important if the contractor is to avoid assuming a risk without knowing it, or if he is through contract, hold-harmless agreements, etc., planning to transfer a certain amount of risk to the other party. This might be to the owner, or it might be to the sub-contractor, so that the sub-contractor is liable for the risk rather than the general.

The last item on the right side for managing risk is Loss Control. The significance of this should be obvious. It involves a study of the loss possibilities, establishment of means by which they can be eliminated, reduced or controlled, and then implementing a program so that it becomes effective.

There are three basic rules, or principles, which apply to the process of risk management. They should always be kept in mind when deciding which alternative is to be employed. The first is, Don't risk more than you can afford to lose; the second, Don't risk a lot for a little; and third, consider the odds. Just as a gambler considers the odds, the contractor also must make a wise decision. It should be based on the odds, the possibilities, and the probabilities, and he must make sure that he does not risk losing a great deal by saving a few dollars in insurance premium or by cutting the cost of adequate protective measures. On the other hand, he should not spend more for his insurance or loss control programs than it would cost to pay the possible losses. Management's aversion to risk, reluctance to assume the chance of a large amount of loss, determines at just what point and at what limits management decides to buy insurance—transfer the risk as opposed to retaining it—and how much he wants to devote to controlling or preventing loss through a really effective program of loss control.

This represents a little different view of costs than we are accustomed to taking. We are talking about the *cost of risk*. This can be displayed in general terms by a pie-chart. We usually tend to think just of the loss itself, which usually represents less than half of the total cost of risk. The second largest chunk is usually the cost of getting ready for and settling the loss. Another sizeable chunk is the cost of recovering from the loss. Still smaller is the cost of forecasting next year's losses. If we knew exactly what these losses were going to be, our program of controlling risk and the cost of risk would be easy, for we would know exactly what to do, could pay for the small losses as they occurred, and avoid or fully insure the large. We would know exactly where to direct our loss control effort, which is also one of the smallest items going into cost of risk. To me, the significance of this chart is that greater attention to forecasting risk and to controlling risk offers tremendous possibilities of cost savings in the three major items: the loss itself, the cost of settling the loss, and the cost of recovering from the loss. All four costs except the loss itself represent service, service traditionally purchased from an insurance carrier for a price. This may well be the most economical way to secure these services, but certainly management should look carefully at what they are getting for their money and whether this is the method best suited to their own philosophy of managing risk. This may sound strange coming from an insurance company representative, but I am convinced that intelligent analysis of the cost of risk is in the best interest of both business management and the insurance carrier. More and more, progressive insurance companies are recognizing this and providing wise counsel to their accounts.

Looking at the five steps involved in risk management, it should be obvious that the loss control man has a very significant role in the effective practice of risk management. Step three, which we identified as loss control—eliminating or reducing the hazard—is precisely the task of the loss control specialist. This entire area is his job. Insofar as steps one and two are concerned, who is in a better position than the loss control man to help identify the possibility of loss, to identify the risk that is involved in a particular job or a particular phase of a job? Who is better qualified to evaluate the probable seriousness of a loss, as outlined in step two? It seems to me that loss control is more than just one aspect of risk management; it is an extremely important and indispensable tool for the risk manager. The risk manager needs the assistance and the wise counsel of the loss control specialist at almost every step of his job as he goes through this decision-making process of determining the potentials, or possibilities of loss, not just from natural perils but from thousands of new materials, new technological developments, new methods that are to be used. How serious are these? How can they

best be eliminated or controlled within known limits? What is needed to establish control programs and to implement the recommendations for control?

All of this should emphasize the critical importance of careful planning if risk is to be managed and the cost of risk held to a minimum. This planning must precede and be made an integral part of the bidding process, on each job.

It is extremely important to recognize that from here on safety and safety precautions must be built into the bidding on each job. The new OSHA standards are going to require it. This means that in preparing his bid the contractor must be extremely careful to identify the cost of all of the things which he will be required to do—and conceivably did not consider in the past—and that he gets the cost into his bid. He cannot afford, after the compliance officer visits his job, to go back and spend a lot of money which will come out of his profit at the end. He should also keep in mind that he cannot afford to pay the fines that can conceivably be charged against him for violations, because this, too, is going to come out of his profit. The loss control man must be very sure that in the preparation of the bid all of these requirements are called to the attention of the contractor, so that they can be properly bid.

In this connection I can only express the hope that these new OSHA regulations will not represent a step backward, a backward move to a very narrow or piece-meal approach to attacking hazards. I would hope that in the process of looking at specific standards we do not abandon a look at the entire operation, the entire system. I would hope that in the bidding and in the planning we look not just at specific physical conditions anticipated but look also at the training of our supervisory staff, the training of our employees, give proper consideration to the protection of adjacent properties against damage, and include these items in the bid just the same as we include an item for shoring or payroll.

Another thing that must be remembered in the preparation of a bid is protection of the environment. Some jobs are already including this in the specifications, but whether they are in the specs or not, the contractor would be wise to consider and take precautions against anything on his job causing pollution of the water, the air, or of the surrounding environment through the manner in which he disposes of waste. Quite frequently he will be restricted and not be permitted to burn as he might have in the past. He may be very carefully monitored as to the amount of pollutants he puts into the water. This is not necessarily toxic material, but could be the solids going into a stream from his batch plant, for example. He may be required to establish settling basins or filtering before any waste water is discharged into the stream. He may be held liable for runoff after heavy rains which carry loose material from his work site downstream. OSHA and EPA are going to make believers out of those who did not place adequate stress on pre-bid and pre-job planning.

In this relatively brief discussion on risk management, I can only outline some of the principles and relate them to the contractor. I hope that I have sufficiently interested some of you to do further reading and study, and thereby perhaps interest your boss in the importance of this subject a little more than he might have been in the past.

I emphasize that nothing in life, nothing in this world, is free. Everything has its price. Every business enterprise involves a certain amount of risk, both the normal business risk and the static or pure risk which we have emphasized today. Management always pays the cost of risk but, unfortunately, management is frequently unaware of the price which it is likely to pay when risks are not getting proper consideration, and they are quite likely to be unaware of the various alternatives available to determine how risk can be managed. Remember, risks are managed, one way or another; risks are assumed, consciously or unconsciously; and the ultimate profit picture—whether a contractor fails or succeeds—may well hinge on how well he manages the risks inherent in his job.

Why is this important to the loss control man? It is important because it emphasizes that the control of risks is a function of management; it emphasizes that the management of risk requires the services of a

competent loss control man at almost every step; and thereby loss control becomes of greater importance to the overall management of the operation. It is my firm belief that as the art of risk management grows, as it becomes more fully appreciated, as the ability and availability of risk managers becomes more widespread, the loss control man will enter more and more heavily into the management process.

"The General Contractor—What Kind of Fool is He?" From back-yard shed to launch pad at Cape Kennedy, from canals to superhighways, from dams to skyscrapers, he has built America. Of all businesses, his is the most risky, but perhaps most satisfying as raw aggregate becomes concrete testimony to his building skill, as lengths of steel become a beautiful church or a modern high-rise structure. Building is in his blood and he is still the entrepreneur in a world where the breed is vanishing. He is a fool only if he fails to recognize and take advantage of all the business and management techniques available to him. He is a fool only if he fails to have and to utilize an experienced and competent loss control staff, and learns to consciously manage the risks that he faces. He is a fool only if he lacks perception of risk, if he ignores the three principles of risk management: (1) Don't risk more than you can afford to lose; (2) Don't risk a lot for a little, and (3) consider the odds. And, finally, if he fails to recognize that he always pays the cost of risk and that he cannot afford not to seek expert advice on the best way to minimize that cost and thereby maximize his profit.

Public Employee Sessions

WHEN YOU TALK, DO THEY LISTEN?

By GEORGE J. WOLNEZ
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How to Win at Wordsmanship

After years of hacking through etymological thickets at the U. S. Public Health Service, a 63 year-old official named Philip Broughton hit upon a sure-fire method for converting frustration into fulfillment (jargonwise). Euphemistically called the Systematic Buzz Phrase Protector, Broughton's system employs a lexicon of 30 carefully chosen "buzzwords":

Column 1	*Column 2*	*Column 3*
0. integrated	0. management	0. options
1. total	1. organizational	1. flexibility
2. systematized	2. monitored	2. capability
3. parallel	3. reciprocal	3. mobility
4. functional	4. digital	4. programming
5. responsive	5. logistical	5. concept
6. optional	6. transitional	6. time-phase
7. synchronized	7. incremental	7. projection
8. compatible	8. third-generation	8. hardware
9. balanced	9. policy	9. contingency

The procedure is simple. Think of any three-digit number, then select the corresponding buzzword from each column. For instance, number 257 produces "systematized logistical projection," a phrase that can be dropped into virtually any report with that ring of decisive knowledgeable authority. "No one will have the remotest idea of what you're talking about," says Broughton, "but the important thing is that they're not about to admit it."

Better Ways to Communicate

One of the biggest obstacles to communication is our tendency to evaluate, to pass judgment on, to agree or disagree with statements before we find out what is meant. Another important obstacle is our feeling that we have to defend our ego by defending what we have said.

When listening, look for what the speaker intends, not just at what he says. When talking, think in terms of the total impression you create, not just of the words used. Consider every indication of the listener's response, not just whether he understands the instructions or directions.

Ask more questions, to see whether your listeners have understood what is intended. Have your instructions repeated, "To see if I've said what I meant." Check for understanding at the time of talking. Misunderstandings are inevitable, and therefore the kind of atmosphere needs to be created that will encourage people to ask questions when they don't fully understand.

Where difficulties have arisen, try to keep the talking centered on the problem rather than on personalities.

Remember, as the other person sees the situation, he probably right. Where individuals disagree, get each to state the other's position, each to the satisfaction of the other. We ourselves can try this too.

Recognize that, in discussions, disagreement is normal and inevitable. Expect it, prepare for it, use it to obtain greater awareness of the various aspects of the problem at hand.

Don't abruptly disprove someone's statement, and don't directly contradict. Disprove indirectly, preserving the other fellow's ego in the process. Control your own natural, ego-building desire to get the upper hand, to show up weaknesses in the other fellow's point of view. Do reveal the weaknesses when they are important, but do it in a way that leaves the other fellow's ego intact.

Take every honest opportunity to make the other person feel better or more important.

An important function of communication within an organization is to make known or bring to light misunderstandings and misapprehensions before they develop into serious problems.

It is usually a good idea, after a man has poured out a gripe, to ask him to describe the situation again, "So you can be sure to get it straight." Telling it a second time often makes it seem less important.

Very rarely will anyone change his mind by being asked to, told to, or argued with. He must come to see the situation differently, and he is not likely to do so as long as he sees a threat in the situation or feels the need of defending himself.

When talking, pause more often to think through what you are about to say. We create strong impressions by the way we phrase our ideas, such as whether we make rambling or concise statements. Tone of voice is more important than we think. Consider what impressions you are conveying with your voice. Body movements give cues to feelings and meanings. Random, involuntary movements often suggest that the speaker is ill at ease or impatient. Consider what is being communicated by your actions.

Be direct, as if your listener were very important.

It is not enough that we know such principles. We probably have known them all along. Their practice must become a habit.

Safety Meetings

Top Management Level

Plan agenda and distribute copies to participants before the meeting. Keep meetings as short as possible (maximum 30 minutes).

Docume it each item of new business by number and date and follow to completion.

Always discuss major disabling injuries. Discuss general accident trends. Briefly discuss problems dealing with procedures, safety organization, and management controls.

Plan date of next meeting and notify participants by note and phone call.

Shop or Worker's Level

Conduct meetings at least monthly and limit to 20 minutes.

Review current accident reports and discuss prevention. Review safety rules.

Involve workers in actual demonstrations of work procedures. Ask workers to report known safety problems.

Present a training topic during each meeting. Do not show films unless there is time for follow-up discussions and communication.

Invite employee partication. Establish a regular time and place for meetings.

Document important meeting decisions and report to employees who contribute safety suggestions.

Communication Follow-up

Speaking

Do you choose words that fit the listeners' background? Do you watch for signs of misunderstanding? Do you speak clearly and avoid distractions? Do you put the listener at ease?

Do you filter the facts from the opinion? Do you encourage questions? Do you act like you know what the listener has on his mind?

Do you break down directions into small packages? Do you "turn off" your listener by constant contradiction?

Listening

Do you show a negative attitude while

listening? Do your prejudices influence your listening? Are you listening only for what you want to hear?

Are you waiting for the speaker to "shut up" so that you can talk? Do you just pretend to listen? Do you quit listening when the subject matter gets difficult?

Do you bale out of the conversation because you fear to "rock the boat"? Are you alert for misunderstandings because the words don't mean the same to you as they do to the speaker? Do you put yourself in the speaker's place to try to understand his side of the story?

Are you so defensive that you close your mind to the speaker?

Sure Fire Techniques For Destroying a Meeting:

1. Call the meeting without notice.
2. Answer all of your own questions.
3. Don't prepare an agenda.
4. Let two people debate a single point for the entire meeting.
5. Defend yourself—anyone who disagrees with your viewpoint probably has it in for you.
6. Take lots of notes—don't miss a single detail.
7. Arrange for plenty of phone calls during the meeting.
8. Participation is important—be sure your opinion is heard on every topic.
9. Don't listen to others—it will only confuse you.
10. Save time by thinking up your answer while the others are talking.
11. Let the chairman do all the work—he called the meeting!
12. Side with the majority, regardless of your opinion.
13. Scrap the decisions made at the meeting, but don't let the others know (it may hurt their feelings).

ON THE LOGIC OF HAZARD CONTROL

By R. J. FIRENZE
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Reducing accidents, injuries, and associated losses cannot be accomplished by a single person or select group but instead through the combined efforts of the entire organization in controlling hazards.

This paper has been written to demonstrate the logic behind an effective hazard control program for fire service organizations.

The term "hazard control" as used throughout this paper is a replacement for the word "safety" and has been purposely chosen by the author to:

1. More thoroughly familiarize management with the full dimension of losses from the standpoint of failures in its techniques, equipment, systems, and operations, each of these factors being responsible for dollar and manpower losses, repair or replacement of tools, equipment, apparatus, litigation expenses, etc. In addition these failures are deterrents to effective and efficient mission accomplishment.

2. Indicate how the conservation of human and physical resources contributes to the mandatory function of control, a vital element in the management process.

Introduction to Loss Control Programming

Should a fire department manager consider hazard control programming as part of his management scheme? The answer is a qualified "No". That is, if he is confident and can substantiate that costs arising from human and equipment failures are minimal, that men are performing their duties according to proper and acceptable work techniques, that effective protective equipment is procured and utilized, that tools and apparatus are of the most effective design, that vehicle accidents and damage therefrom are minimal, that the firemen's morale is high and, finally, that his department is efficiently and effectively accomplishing its mission. This being the case, a hazard control program would be of little value and probably couldn't be justified on a cost-effectiveness basis.

Few fire departments can boast of these accomplishments. Conversely, many have not accomplished as much as they would like to reduce the number of accidents and injuries in their departments. The penalty for this omission is high injury rates, reduced effectiveness, high costs, and reduced mission capability.

In most cases, fire department managers have given the proverbial nod to the theory of hazard control, but in practice have paid little attention to it. The reasons for their lack of enthusiasm are many; however, failure to understand the benefits of hazard control programming is paramount. These people have not been shown that hazard control is a necessary ingredient to the successful operation of their organization.

Another problem emanates from the fact that fire chiefs are confused over the meaning of the nebulous term "safety." They interpret the word as an important subject to be considered when time and conditions permit but not as something which should interrupt their normal operating procedures. These administrators try to equate what they think safety means against the hazards of their profession and come to the conclusion that the two are incompatible. They rationalize that safe work practices diminish the manliness of their men, thus reducing their effectiveness as firemen, or they draw the invalid conclusion that anyone interested in his own well-being is far too frightened to give the job his maximum effort.

To add to the problem, many of the traditional methods used in the field of safety are "don't" oriented. Management issues a whole host of things we shouldn't do, often without giving the reason behind the order. Sooner or later the worker becomes confused over the "don'ts," loses interest, and becomes alienated over the whole idea of "safety." We will learn in the pages to follow that hazard control consists of more than a list of "don'ts." Instead, sound, credible reasons for hazard control will be given with emphasis of the "why" being the rule.

Finally, safe work habits carry a "sissy" overtone with them, and are looked upon as deterrents to a man's ability in accomplishing his job.

Because "safety" is considered by so many to be an ineffective title for the conservation of an organization's human and physical resources, it was replaced by "accident prevention," a term which connotes the elimination of accidents in all of its ramifications. The difficulty with this title evolves from the fact that the word "accident" confuses many people. As a matter of fact, in any group of people, no two would define it precisely the same way, and the distortion would be extremely wide. Most people would interpret an accident as an "injury producing event." Unfortunately, this reasoning is inaccurate and is the basis for confusion in the field of hazard control management, since no mention is made about the no-injury accident, the property damage, or the problems and costs that they cause.

In order to keep our thoughts on precisely the same wavelength, let us pause for a moment and discuss the differences between an "accident" and an "injury."

An acceptable definition of an *accident* is: "Any event which interrupts the normal course of events (the mission) which is caused by one or more unsafe acts (human failures) and/or unsafe conditions (physical or environmental failures) which may or may not cause personal injury and/or property damage." Simplified, it is: "An event which interrupts the accomplishment of the mission caused by human failure, a failure in the

physical environment, or both, which may or may not result in personal injury and/or property damage."

There are two key thoughts in this definition which deserve our consideration. To begin with, accidents just don't happen by chance; they are caused. Cause is usually attributed to a human failure, system failure, or a failure in the physical environment. In each case, something must trigger the event. It is important to understand that the best hazard control program will not eliminate all accidents. However, with proper organizational controls, accidents can be kept within acceptable limits. A second important point is that an accident does not have to result in a personal injury. Blood should not have to flow in order for us to recognize that we have a problem.

The definition of an *injury*, on the other hand, is: "The bodily hurt sustained as the result of an accident such as a laceration, abrasion, fracture, sprain, etc." Unfortunately, too many people, in their meager attempt to categorize injuries to fire fighters, do not understand the difference between an accident and an injury. Inaccurate and misleading statistics are the result of their confusion.

A recent statement in a leading fire service journal concerning lost-time injuries to firemen indicated that 45 per cent of these injuries were attributed to "lacerations, burns, smoke, inhalation, and falls." Close examination of this statement reveals an obvious error since a laceration, a burn and smoke are injury classifications as defined by the American National Standards Institute. However, falls would not be included with the injury group since they have been specially designated as accident types as per the ANSI Standard. By mixing injury types with accident types, the usefulness of the statistical data is lost.

The Unsafe Act or Human Failure

Unsafe acts are human failures which often lead to accidents. Examples of unsafe acts committed by firemen are: jumping off moving apparatus; improper use of tools and equipment; raising ladders without proper help; failure to use personal protective equipment; and improper lifting methods.

The following reasons explain why unsafe acts are committed. To begin with, men often do not believe that a condition or practice is unsafe or incorrect; second, it may be attributed to a lack of knowledge or unfamiliarity with the accepted or proper method; third, the equipment which the man must use may be poorly designed. Its awkwardness, difficulty of operation, complexity, etc., may lead the man into making the very mistake which often results in an injury; fourth, physical unsuitability, i.e., poor eyesight or hearing, fatigue, etc., may, under the right circumstances, cause human error; fifth, the unsafe act can be attributed to the fact that the man may become excited, inattentive, or erratic in the course of his work activity; sixth, the man may be aggressive to the point where he is foolhardy, fearless and reckless; and seventh, the man may willfully disobey the rule.

Correcting human failures of the type previously mentioned will depend on: (1) methods of engineering improvement, e.g., re-design, guarding equipment, etc.; (2) training, education, and motivation to ensure that proper work practices are followed; (3) personnel management, e.g., applying accepted and common sense steps when dealing with employees who cannot or will not conform to the demands of the organization; and (4) enforcement, including counseling, warning, and penalizing when necessary.

Unsafe Physical Conditions

Unsafe physical conditions may be defined as factors emanating from defects, errors in design, faulty planning, or environmental hazards such as super heated conditions, slippery working surfaces, flying glass and debris, etc. Other examples of unsafe physical conditions are backdraft hazards caused by the ignition and rapid combustion of unburnt super heated gases during the process of combustion where oxygen is insufficient, and structural weakening of roofs or supporting members of buildings.

The Accident Process

As we previously learned, accidents are mainly the result of unsafe acts and/or unsafe conditions, with a miniscule amount attributed to fortuitous circumstances.

Understanding the causes behind the unsafe act and unsafe condition must preempt our attempt to establish controls. The question of how these variables become causative factors in the accident process, and how we attempt to establish controls is the subject of our next discussion.

Each worker, whether he be a machinist, bus driver, or fire fighter, performs his job as part of a network called a man-machine system, a system composed of the physical equipment, the man or men who perform functions with the equipment, and the environment in which the process takes place. This integrated group of components is designed to bring about from given inputs a desired product or mission within the limits of its environment and within an acceptable period of time.

Providing that our system functions as planned, the expected end result is usually obtained. However, a failure, whether it be of the man, equipment, or environment, will invariably detract from the efficient accomplishment of the mission or task. In some instances it wipes the mission out, resulting in a total failure or catastrophe situation. The match of human and equipment functions in a given environment are critical to the system's effectiveness and its capacity to perform as it was designed. As was stated by Alphonse Chapanis in his book, *Research Techniques in Human Engineering*, "One important engineering lesson to come out of World War II is that 'machines do not fight alone.' The war needed and produced many novel and complex machines, but often these contrivances did not do what was expected of them because they exceeded or did not match the capabilities of their human operators." The mismatch of man and machine has been responsible for a vast number of failures leading to accidents, injuries, and deaths. This is a profound statement and one which should stimulate our further thinking when we speak of matching the fire fighter to his machines.

There exists a void between our man-machine system and its mission. We will shortly learn that the process which takes place in this dimension holds one of the keys to understanding the man-failure-accident problem.

In order for the system to move towards its objective, a series of sequential processes must take place. First, the human element in the system must make decisions. Based on these decisions, he will take certain risks in an effort to reach his objective. A question often asked is, "What must a man know in order for him to make rationally sound decisions?" The answer to this question can be stated as follows: To take risks based on rationally sound decisions, the risk taker must be aware of five things: (1) he must be familiar with the task requirements; (2) aware of his own capabilities and limitations which are relative to the task; (3) what will be gained if he attempts the task and succeeds; (4) cognizant of the unfavorable consequences that will be suffered if the attempted task fails; and (5) what will be lost if the task is not attempted at all. In each case, the man needs information upon which to base his decisions. The better his information, the better his decision and, subsequently, the more calculated risk he takes. The poorer his information, the greater the chance for bad decisions, bad risks, and failures which may be responsible for an accident.

Second, the apparatus and/or equipment in our system must function effectively without failure. Poorly designed apparatus and tools or those which are not maintained properly may in themselves be the trigger mechanism causing an accident.

Third, the environment plays a significant function on our system. A failure in the environment may affect either or both the man and his machine, thus setting up an accident situation.

Before decisions are made, the human seeks information which serves to remove some or all of the uncertainty involving his task. The uncertainty centers around two major areas: (1) the requirements of the task; and (2) the nature of the harmful consequences. If his information bank is adequate, the ultimate risk resulting from his decisions will be within calculable limits of risk taking and the chance of his failing will be lessened. For this reason, one of our primary efforts must be devoted to equipping our men with as much information as is possible so that their decision-making ability is facilitated,

physical environment, or both, which may or may not result in personal injury and/or property damage."

There are two key thoughts in this definition which deserve our consideration. To begin with, accidents just don't happen by chance; they are caused. Cause is usually attributed to a human failure, system failure, or a failure in the physical environment. In each case, something must trigger the event. It is important to understand that the best hazard control program will not eliminate all accidents. However, with proper organizational controls, accidents can be kept within acceptable limits. A second important point is that an accident does not have to result in a personal injury. Blood should not have to flow in order for us to recognize that we have a problem.

The definition of an *injury*, on the other hand, is: "The bodily hurt sustained as the result of an accident such as a laceration, abrasion, fracture, sprain, etc." Unfortunately, too many people, in their meager attempt to categorize injuries to fire fighters, do not understand the difference between an accident and an injury. Inaccurate and misleading statistics are the result of their confusion.

A recent statement in a leading fire service journal concerning lost-time injuries to firemen indicated that 45 per cent of these injuries were attributed to "lacerations, burns, smoke, inhalation, and falls." Close examination of this statement reveals an obvious error since a laceration, a burn and smoke are injury classifications as defined by the American National Standards Institute. However, falls would not be included with the injury group since they have been specially designated as accident types as per the ANSI Standard. By mixing injury types with accident types, the usefulness of the statistical data is lost.

The Unsafe Act or Human Failure

Unsafe acts are human failures which often lead to accidents. Examples of unsafe acts committed by firemen are: jumping off moving apparatus; improper use of tools and equipment; raising ladders without proper help; failure to use personal protective equipment; and improper lifting methods.

The following reasons explain why unsafe acts are committed. To begin with, men often do not believe that a condition or practice is unsafe or incorrect; second, it may be attributed to a lack of knowledge or unfamiliarity with the accepted or proper method; third, the equipment which the man must use may be poorly designed. Its awkwardness, difficulty of operation, complexity, etc., may lead the man into making the very mistake which often results in an injury; fourth, physical unsuitability, i.e., poor eyesight or hearing, fatigue, etc., may, under the right circumstances, cause human error; fifth, the unsafe act can be attributed to the fact that the man may become excited, inattentive, or erratic in the course of his work activity; sixth, the man may be aggressive to the point where he is foolhardy, fearless and reckless; and seventh, the man may willfully disobey the rule.

Correcting human failures of the type previously mentioned will depend on: (1) methods of engineering improvement, e.g., re-design, guarding equipment, etc.; (2) training, education, and motivation to ensure that proper work practices are followed; (3) personnel management, e.g., applying accepted and common sense steps when dealing with employees who cannot or will not conform to the demands of the organization; and (4) enforcement, including counseling, warning, and penalizing when necessary.

Unsafe Physical Conditions

Unsafe physical conditions may be defined as factors emanating from defects, errors in design, faulty planning, or environmental hazards such as super heated conditions, slippery working surfaces, flying glass and debris, etc. Other examples of unsafe physical conditions are backdraft hazards caused by the ignition and rapid combustion of unburnt super heated gases during the process of combustion where oxygen is insufficient, and structural weakening of roofs or supporting members of buildings.

The Accident Process

As we previously learned, accidents are mainly the result of unsafe acts and/or unsafe conditions, with a miniscule amount attributed to fortuitous circumstances.

Understanding the causes behind the unsafe act and unsafe condition must preempt our attempt to establish controls. The question of how these variables become causative factors in the accident process, and how we attempt to establish controls is the subject of our next discussion.

Each worker, whether he be a machinist, bus driver, or fire fighter, performs his job as part of a network called a man-machine system, a system composed of the physical equipment, the man or men who perform functions with the equipment, and the environment in which the process takes place. This integrated group of components is designed to bring about from given inputs a desired product or mission within the limits of its environment and within an acceptable period of time.

Providing that our system functions as planned, the expected end result is usually obtained. However, a failure, whether it be of the man, equipment, or environment, will invariably detract from the efficient accomplishment of the mission or task. In some instances it wipes the mission out, resulting in a total failure or catastrophe situation. The match of human and equipment functions in a given environment are critical to the system's effectiveness and its capacity to perform as it was designed. As was stated by Alphonse Chapanis in his book, *Research Techniques in Human Engineering*, "One important engineering lesson to come out of World War II is that 'machines do not fight alone.' The war needed and produced many novel and complex machines, but often these contrivances did not do what was expected of them because they exceeded or did not match the capabilities of their human operators." The mismatch of man and machine has been responsible for a vast number of failures leading to accidents, injuries, and deaths. This is a profound statement and one which should stimulate our further thinking when we speak of matching the fire fighter to his machines.

There exists a void between our man-machine system and its mission. We will shortly learn that the process which takes place in this dimension holds one of the keys to understanding the man-failure-accident problem.

In order for the system to move towards its objective, a series of sequential processes must take place. First, the human element in the system must make decisions. Based on these decisions, he will take certain risks in an effort to reach his objective. A question often asked is, "What must a man know in order for him to make rationally sound decisions?" The answer to this question can be stated as follows: To take risks based on rationally sound decisions, the risk taker must be aware of five things: (1) he must be familiar with the task requirements; (2) aware of his own capabilities and limitations which are relative to the task; (3) what will be gained if he attempts the task and succeeds; (4) cognizant of the unfavorable consequences that will be suffered if the attempted task fails; and (5) what will be lost if the task is not attempted at all. In each case, the man needs information upon which to base his decisions. The better his information, the better his decision and, subsequently, the more calculated risk he takes. The poorer his information, the greater the chance for bad decisions, bad risks, and failures which may be responsible for an accident.

Second, the apparatus and/or equipment in our system must function effectively without failure. Poorly designed apparatus and tools or those which are not maintained properly may in themselves be the trigger mechanism causing an accident.

Third, the environment plays a significant function on our system. A failure in the environment may affect either or both the man and his machine, thus setting up an accident situation.

Before decisions are made, the human seeks information which serves to remove some or all of the uncertainty involving his task. The uncertainty centers around two major areas: (1) the requirements of the task; and (2) the nature of the harmful consequences. If his information bank is adequate, the ultimate risk resulting from his decisions will be within calculable limits of risk taking and the chance of his failing will be lessened. For this reason, one of our primary efforts must be devoted to equipping our men with as much information as is possible so that their decision-making ability is facilitated,

their actions are effective, and their accidents are minimized.

There is, however, an exception to the rule that a man with a sound information bank will always make wise calculated decisions. Variables known as "stressors" or blocks to a man's decision-making capability often appear in the decision process and cloud his ability to make sound, rational decisions. These stressors can be of physiological, psychological, or physical origin. They act to distort and sometimes prevent the decision process from taking place, often contributing to the very failure which may culminate in a catastrophe. Narcotics and alcohol are examples of physiological stressors which have an effect on the organism. Anxiety, aggressiveness, and fatigue are examples of the psychological types. Glare, temperature extremes, and low levels of illumination are of the physical type. Each of these has the capacity to temporarily block the human's decision process. It is often during this period, when the man is detracted from rational decision making, that he makes an error. The error oftentimes is responsible for a failure.

In the past, many accidents were attributed to human error, and were written off as uncontrollable and fortuitous circumstances. Close investigation revealed that many of these so-called human error accidents were in fact caused by variables over which the man had little control.

When we speak of accident causation we must consider all of the variables which affect the system. We must consider the design of tools and equipment. We must also consider the elements in the environment which may detract from the successful completion of our task. Last, but so important, we must consider the fact that the human variable in the system is a non-perfect entity subject to many forces in his environment. With this in mind, we must understand that no matter how intelligent the man is, how much experience he has, how much information he has in his information bank, he will still, under certain circumstances, make errors. Some of these errors will lead him into an accident situation. This is not to imply that we give up trying to improve the man's knowledge of his tasks. Chances are that if we sufficiently develop his decision-making ability, his comprehension of the hazards connected with his job, his ability to anticipate and counter accident situations, he stands a better chance of surviving without injuries than if he had no comprehension of the problem at all.

To conclude, we must consider the following: (1) accidents are not "accidental." They are the result of failures, either human, equipment or environment; (2) matching men with machine components is a difficult task but one which requires our most diligent efforts. The probability of eliminating all failures where men interact with machines is practically impossible; (3) the environment, which often sets up stressors accountable for failures, is uncontrollable, especially the one which embraces the fire fighter. In this respect we must do the best we can to work safely in an otherwise unsafe work environment; (4) man is a non-perfect entity subject to many forces capable of causing him to make errors.

To be naive enough to think we can eliminate all failures which may occur in a system where man is a controlling factor is foolhardy. Our efforts must instead be devoted to eliminating as many of the failures which is humanly possible. It is important that we stress (1) the discovery of as many potential accident causes in our operations and activities as is possible, and (2) the methods essential to correcting immediate hazardous situations which will eliminate or at least reduce these causes.

The Emergence of Hazard Control

Because "safety" is unsuccessful as a descriptive title for the work of conserving human and material resources, we will be better off disassociating ourselves from it. Throughout this series, the word "safety" will be dropped as a functional label. In its place "hazard control" will be used, a title which covers a wider spectrum. Our efforts will be devoted to applying knowledge, experience, and ingenuity to discovering and eliminating or at least reducing causative factors leading to accidents, injuries, and property damage. Our immediate concern will be to create in the minds of our people that mistakes, leading to failures, are responsible for reduced organizational effectiveness and efficiency. We will also concentrate our efforts on changing the "sissy" notion often associated with the word "safety" to a mature feeling of obligation which a man owes himself, his organization, and his community.

Benefits of Hazard Control Programming

In order to be effective in meeting the demands of its municipality, a fire department must provide control measures which will ensure operations with a minimum of loss. The head of each department is responsible for seeing to it that his organization maximizes its capability to the community and provides the dependable service it was created for. In addition to meeting its obligation, the department must accomplish its task within predetermined budgetary allowances. Costs arising from human and equipment failures contribute significantly to decreasing the efficiency* and effectiveness† of a fire department's operation and thus increases its cost of operation.

The major benefit derived from hazard control programming is the fostering of overall organizational control. This is accomplished through the reduction of accidents, injuries, repair to tools and equipment, damage to apparatus, manpower loss, and all the costs associated with each of these. The following points will indicate more precisely how hazard control programming can contribute to the overall effectiveness of the organization: Efficiency - optimum utilization of resources to reach a desired output. Effectiveness - ability of a system to carry out its desired objective.

1. By reducing costs of accidents and injuries and repair to tools, equipment, and apparatus.
2. By preventing manpower loss as a result of injuries.
3. By preventing delays in responses to alarms.
4. By determining hazards connected with unique fire fighting operations.
5. By providing technical guidance in the design, construction, and purchase of new fire fighting systems.
6. By assuring the purchase of the most effective equipment and apparatus.
7. By providing training and educational programs which will enable firemen to operate more effectively with tools, equipment, and apparatus.
8. By reducing litigation resulting from accidents.

In each of the preceding examples the benefits can be categorized into two groups: *direct benefits*, calculated in terms of dollars and cents; and *indirect benefits*, which are more intangible and cannot be as easily calculated on a cost-effectiveness basis. The direct benefits are, however, more readily understood by management and are the motivators which form the basis for justifying hazard control.

The hazard control administrator must emphasize his program's contribution to the overall organizational effort and justify these contributions on a cost-effectiveness basis. Another benefit, which is not ordinarily attributed to effective hazard control programming, deals with the justification of a fire department's demands for salary. Hazard control records serve as valuable negotiation tools. Information gathered on a fire department's accidents, injuries, deaths, and equipment damage have proven useful when the department enters wage negotiations with other municipal agencies. Adequate hazard controls will enable a fire department to more adequately cope with the ever increasing problems emanating from current shifts in our social structure. Adequate control measures will provide the facility which is mandatory to cope with potential hazards resulting from harassment and civil disturbances. Finally, adequate hazard controls will enable the department to cope with advancements derived from new technology.

The Problem—Significance, Reasons, Control

The annual toll of occupational injuries and deaths to fire fighters, coupled with apparatus and equipment damage is admittedly high throughout the nation. However, in many departments accurate records are not available to substantiate these losses. The reason for this problem is due mainly to the fact that many fire departments have not developed systems by which accident-injury data are reported and recorded.

In one particular department, time-lost in-

juries for the past eight years exceeded 16,000, accounting for over 600,000 days lost. Apparatus accidents alone totaled 1,278. The total direct costs resulting from these accidents approximate $8,000,000, a figure of vast proportion.

This waste of human and material resources constitutes a serious problem which detracts from the efficiency and effectiveness of the municipality, to say nothing of the fire department itself. In addition to the outlay of money, qualified manpower is lost which, in some cases, cannot be easily replaced.

Although this one department's accident-injury experience seems unduly high and may not seem representative of the entire nation's fire departments, it nevertheless indicates that a firefighting organization can sustain sufficiently high losses of both material and human resources as a result of its work activities.

Equally significant and in many cases even greater in magnitude is the productive loss of the injured firemen, whether it be on a temporary or permanent basis.

Mission Process

Every accident, whether it terminates with an injury or property damage, interferes with the mission and increases the time allotted for the process. This point is significant and, as previously mentioned, would be classified as an indirect cost or loss. This statement will be more clearly understood when the "mission process" is discussed.

In the mission process we find men and equipment interacting within an environment to accomplish the mission. Another vital input to this process is *time*, an ingredient without which the process could not take place, for time is the element which enables the men to use the equipment, materials, and skill to effect a successful mission. Each accident occurrence, whether or not it terminates in an injury or property damage, interrupts the process. Each interruption increases the time to complete the process, often reducing the efficiency and effectiveness of the overall mission.

While time loss is of particular concern to the production manager of an industrial establishment, since he more readily equates down-time as inefficiency leading to reduced profits, it is also pertinent to a fire chief who is concerned with time as a critical factor to his mission. Loss of time could easily result in the loss of lives and undue property damage. In any event, an accident interrupting the mission process leads to: (1) an interrupted task; (2) an operation which didn't go as planned; (3) possible damage to tools and equipment; (4) possible injury or death to personnel; and (5) increased operational cost.

This model should help us visualize that unless we keep all the elements of our systems within certain allowable limits of control, we will be ineffective in accomplishing our missions.

Mission Accomplishment and the Control Factor

The mission process indicates that *control* is the necessary ingredient by which operational efficiency and effectiveness is maintained. By definition, control is "that function of the system which provides direction in conformance to the plan." Simplified, it is the process of keeping the outcome of our mission within the allowable limits of our planned objectives. The process of control may be more readily understood by the following example:

A fire company receives an alarm. Assuming that all its members respond to the apparatus without injuring themselves in the process, the apparatus is driven to the emergency area without being interrupted by an accident. Upon arrival at the emergency, the firemen conduct the operation according to accepted work methods and are not injured or killed in the process, the end result being the preservation of the citizens' life and property, accomplished as planned beforehand. For all practical purposes, this operation was under control; that is, it came off according to plan with a minimum of interruption and loss.

On the other hand, suppose firemen are injured in the process of directing traffic while the apparatus is being driven from its quarters, or, in the course of travel, the apparatus were to be involved in an accident; would the company reach the scene of the emergency to perform its function? In some

instances it wouldn't. Suppose firemen are injured or killed in the performance of their duties; what happens? Again, the operation is interrupted and possibly terminated, often resulting in the unnecessary loss of life and property we originally set out to save. If we were to compare this second situation with our definition of control, it would be clear that the later operation is out of control; that is, the mission was not accomplished according to the planned objectives.

The mission process also helps us to understand the concepts of "success" and "failure" as they relate to mission accomplishment. The results of our mission can be categorized as being totally successful (100 per cent control), or a total failure (completely out-of-control).

If you are the man in charge of a fire operation and are able to complete your mission without a failure of any kind, you could deem your mission as being totally successful. On the other hand, let us suppose something happens which interrupts the operation. It is not serious enough to "wipe it out." You are still able to carry out the mission even though you know things didn't go as you thought they should. In any event, you can be assured of being around to command operations in the future. We can call this situation "maximum tolerable catastrophe." You have been successful, although to a much lesser degree than you originally anticipated. Suppose now that during this same operation numerous mistakes were made, many of which resulted in prolonged interruptions, such as hose lines bursting; having men trapped on the fire floor; pumps ceasing to operate, cutting off the water supply to the fire; men trapped under a collapse; etc. In these latter cases the mission is again moving away from the realm of success and is approaching total failure. Failure in a situation such as this could result not only in injury and death to your firemen, but in a community catastrophe. This time you have lost. You are wiped out. Things couldn't have gone worse.

Fortunately, our missions are not usually total failures, although we rarely embrace total success. Usually there is a compromise. We operate at a point somewhere between total success and total failure. This point can be referred to as the "minimum acceptable success." That is, the tradeoff point where, although not totally successful, our missions are accomplished with a tolerable number of losses and interruptions, keeping the effectiveness of our operation within acceptable limits. The concept "minimum acceptable success" should guide our thinking in hazard control programming, since our efforts will be oriented around keeping our department's operations within the realm of minimum acceptable success.

The very process of keeping operations within acceptable limits of success gives substance and credibility to the concept of hazard control. In essence, our efforts will play a crucial part in maintaining our department's mission capability.

* *Efficiency—optimum utilization of resources to reach a desired output.*

† *Effectiveness—ability of a system to carry out its desired objective.*

NEW LAWS PERTAINING TO WORKMEN'S COMPENSATION AND WHAT THEY MEAN TO THE PUBLIC EMPLOYEE

By DONALD L. REAM
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In all the years that we have had a workmen's compensation system, there has never been a time when the spotlight has been focused more clearly on the program and on its concern for the wellbeing of the American workforce.

Despite the many controversies that divide students of workmen's compensation, one point on which there is nearly complete agreement is that coverage under the acts should be virtually, if not completely, universal. With few exceptions, employers and workers alike agree on the desirability of this basic protection. For the employer it represents a relatively inexpensive way to protect himself against the possibility of law suits for injuries to his employees. For the worker it represents an important segment of his protection against income loss.

The principle of virtually universal coverage of all gainfully employed workers is basic to the whole system. Yet even today none of the state laws fully meets this goal, although a few come close. It is generally believed that progress has been made and the public has been educated on the justification for including all employments in the workmen's compensation system, yet over the past 20 years, the proportion of civilian wage and salary workers included under workmen's compensation has hovered at about four-fifths of the potential coverage. Recently it has edged up to about 84 per cent, largely as a result of a shift of workers to cover employments. In 1969, according to the Social Security Administration, average weekly coverage under state and federal workmen's compensation totalled 58.8-59.0 million, out of the 69.7 million civilian wage and salary workers in the country. In 15 states the workmen's compensation laws covered less than 70 per cent of their workers who potentially could have been covered. In 22 states, the ratio of actual to potential coverage was 70-84.9 per cent, while in the remaining 13 states, District of Columbia, and the Federal system of civilian employees, 85 per cent or more of the potential labor force was covered.

Public Employee Coverage

Coverage of public employees made little headway during the early period—only six of the 23 laws passed prior to 1914 provided coverage of public employment. Today public employment, especially in local governments, is frequently subject only to elective or voluntary coverage. It is difficult even to estimate how many of the local governments with optional coverage provide their workers with workmen's compensation protection. Yet we know, from occasional letters to the President or other officials, that some workers in this category get injured and are left uncompensated. With the great growth in state and local employment in recent years, this represents a serious gap in coverage.

As with private employments, coverage of public employees differs markedly from state to state. Some states have no exclusions or exempt only elected or appointed officials. Others, on the other hand, limit coverage only to employees of certain specified departments or political subdivision, or to employees in "hazardous" occupations. Still others leave coverage strictly up to the discretion of the state agencies or the political subdivisions.

Policemen and firemen are sometimes exempted if they are covered by a municipal

disability pension plan. The laws are compulsory in 44 states and Puerto Rico for state employees who are covered; three states provide elective coverage, two voluntary, while Alabama appears to have no coverage of state employees. Employees of local governments are in a slightly less favorable position as to type of coverage; the laws are compulsory in 36 states, the District of Columbia and Puerto Rico, elective in seven, and voluntary in seven. Public school teachers, one of the largest groups in the public sector, are covered either specifically or by interpretation in 32 states, the District of Columbia, and Puerto Rico. Arkansas this year passed legislation calling for the protection of public school teachers. In 12 other states, the laws permit but do not require the coverage of school teachers. Many elective and appointive officials still do not have the same protection as other government employees. By contract, coverage under the Federal Employees' Compensation Act was extended in 1949 to civilian officers in all branches of the Federal government, including judges and legislators.

Benefits under State Law

Under the workmen's compensation laws, various types of benefits are provided the injured worker or, in case of his death, for his family. These include medical services, indemnity benefit payments to the worker during period of disablement and for permanent disabilities, death benefits to the worker's family and, under most laws, burial expenses. In many states they also include special benefits; for instance, rehabilitation services for the injured workers, or extra benefits for minors injured while illegally employed.

Medical Provisions

Benefit payments under the workmen's compensation system in the United States amounted to approximately $2,612 million in 1969, according to a report published by the U. S. Department of Health, Education, and Welfare. Medical and hospital benefits probably accounted for as much as $920 million of this total.

When workmen's compensation laws were first adopted in this country in 1911, provisions for medical care were very restricted. One of the reasons for the limitation may be that members of the medical profession were very rarely consulted in the drafting of the first compensation laws in this country.

A more important reason for the limitation on medical care, however, was the influence of workmen's compensation laws of Europe. The law of Germany wielded the greatest influence on United States laws as far as medical care provisions were concerned. Under the German system, the expenses for the first few weeks for medical care were paid for from illness funds to which the employees and the employers contributed. After the first few weeks, payment for medical care was made from the accident funds which were wholly supported by the employers.

This principle from the German law was adopted by the early drafters of state workmen's compensation legislation. The theory followed by many of these early drafters was that the cost of the industrial injury to be passed on to the general public as part of the price of the finished product should include medical care.

The early students of workmen's compensation predicted that those states that limited their medical obligations would soon change their workmen's compensation laws to make medical care unlimited. The students today still agree that the workmen's compensation system should provide full medical benefits for workers who suffer an accidental injury or an occupational disease.

But what is this situation today? The workmen's compensation laws of 41 states, the District of Columbia, and Puerto Rico, as well as the two Federal laws, provide for unlimited medical benefits for accidental injuries.

The states are making tremendous strides in improving their systems with respect to this aspect of the program. In 1946 the record shows that 26 states, D.C., and Puerto Rico provided full medical care for accidental injuries. Since 1946, 15 additional states have provided through legislation for full medical care for accidental injuries.

Indemnity Benefits for Disability

There are various types of disabilities for

which benefits are paid. The great majority of compensation cases involve temporary total disability—that is, the employee is unable to work at all while he is recovering from the injury, but he is expected to recover fully and go back to work.

The monetary benefits in all but one state are based on a percentage of the worker's average wages, usually 60, 65, or 66 2/3 per cent. Injured workers do not necessarily receive the amount of their wage loss that would be indicated by the percentages because of other provisions in the laws, such as the waiting period and the maximum dollar limitations on weekly and total aggregate payments. A significant trend during the past several years is the policy of the states to base the maximum compensation on the average wage in the state. The compensation rate is increased as the state's average wage is increased. This type of legislation negates the necessity for legislating benefit increases every session of the legislature.

Permanent Total Disability

Over half of the laws now provide benefits for life in permanent total disability cases. But in the remaining laws, the payments are limited as to time, amount, or both.

Here, too, we have strong evidence of the state's interest in improving the program. In 1946 only 16 state laws called for compensation for permanent total disability for life or period of disability. Today, 31 states, D.C., and Puerto Rico provide such benefits.

Death benefits provide income for dependents of the decease l workman. The amount of compensation and the length of time it is paid vary considerably under the different laws. In 14 states, D.C., and Puerto Rico, benefits are paid to the widow during the period of widowhood. In 1946 only seven states paid benefits during the period of widowhood.

The states have made significant improvements in the benefit structure.

Rehabilitation

Increased emphasis upon the rehabilitation of injured workers has been called the most significant development in the field of workmen's compensation in recent years. By rehabilitation is meant the greatest possible restoration of a handicapped person in every phase of his life—physical, mental, social, vocational, and economic usefulness. A complete rehabilitation program thus includes both medical and vocational restoration. The medical phases aim at maximum recovery of health and the fullest possible restoration of lost function; the vocational phase is directed toward the best possible economic adjustment through vocational training, counseling, and selective placement.

Workmen's compensation agencies have a special responsibility in promoting the rehabilitation of workers injured in the course of their employment. These agencies are the first to learn about a work injury and thus are in a position to direct the worker toward rehabilitation shortly after his injury. Authorities agree that early referral to a rehabilitation program is essential to the achievement of maximum results. Unless rehabilitation is begun as soon as possible following the injury, maximum physical restoration may be prevented.

The states have truly accepted responsibility in this area. In 1946, only seven states and the District of Columbia paid maintenance benefits during the period of disability, while today there are 27 states and District of Columbia with such provisions that encourage the worker to accept rehabilitation.

New Legislation in 1971

The legislatures of 49 states and Puerto Rico met this year. There are many new state laws of interest to the public employee. For example:

1. Benefits for disability were increased in 20 states.
2. Supplementary payments to increase the benefits payable to longterm beneficiaries were provided in Delaware, Idaho, Maine, Minnesota, and West Virginia.
3. The waiting period was reduced in four states.
4. Maximum medical benefits were increased in six states.
5. Maintenance benefits were increased in three states.
6. Full coverage of occupational diseases was provided in Alabama, Georgia, Montana, North Carolina, South Dakota, and Texas.
7. Nebraska and South Dakota now have compulsory laws, and farm workers' coverage was extended in six states.

It is a good record!

Law Enforcement Benefits . . . FECA

Public Law 90-291 is of prime importance to public employees. The Federal Employees' Compensation Act has been extended to provide compensation coverage for non-Federal law enforcement officers who are injured, sustain disease, or are killed under circumstances involving a crime against the United States. This law was enacted by Congress in recognition of the assistance given the Federal government by local and state law enforcement officers. Some of the more common violations of Federal statutes that would activate this law are: flight or attempted flight of a fugitive wanted by the Federal government; unlawful flight or attempted flight across state lines to avoid prosecution; bank (savings and loan associations included) robbery if the institution is insured by the Federal Deposit Insurance Corporation; Dyer Act—transportation of a stolen vehicle across state lines; AWOL from military service; possession of certain types of weapons; and possession of guns by felons and others such as mental incompetents.

Benefits under the FECA are pretty good. The injured officer may receive medical, surgical, and hospital services, appliances and supplies and compensation may be paid in addition to that paid by local and/or state agencies. We have a good benefit schedule, as the maximum weekly benefit is now $454.66. If a law enforcement officer is injured, he should report the injury to the supervisor and submit a written notice of the injury to the Bureau of Employees' Compensation, U. S. Department of Labor.

The Bureau has received reports of fatal accidents in 48 cases and is now paying approximately half of the cases. The others are being processed.

The Congress has many bills under consideration that would affect workmen's compensation if the bills are enacted into law. Two of the bills that are of particular interest are those that would extend the same protection to firemen that the law enforcement officers now enjoy, and one that would improve the FECA.

The bill would change such things as equal rights to a widower; free choice of doctor; and additional death benefits and procedural changes which would help the administration of the law.

ENFORCEMENT ASPECTS OF THE NEW FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT

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The work force consisting of 13 million public employees at the city, state, and county level does not have the benefit of the Occupational Safety and Health Act as do others, such as their industrial counterpart. Specifically, Congress exempted the public employee and the Federal employee from the general provisions. However, under Section 19 of the Act the President of the United States, by Executive Order No. 11612, dated July 1971, set forth further guidance for Federal employee protection under the Act. This meant that all Federal agencies are required to provide a safe and healthful workplace for its working force. Thus, the Federal employee will receive the full benefits of the Act.

What about the state and municipal employee? State, city, and county employees are not covered under the Act unless a state decides to take over from the Federal authorities under Section 18 (b) (6). This can be done by an agreement which will provide protection for the workers of the state, and the state is required to provide safety programs for political subdivisions of the state, wherever the state constitution permits.

To enable the state to start making provisions for the take-over from the Federal government, a $5 million fund has been made available and has been suballocated to approximately 48 states for planning purposes. This provides 90 per cent of the funding necessary for a state to determine what it wishes to do and plan under the OSH Act. In addition, an agreement was reached with certain states under Section 18 (h). This has been misunderstood by many as being a take-over by the state from the Federal government. I wish to clearly indicate this thought is not true. It is not a state take-over at all; it merely keeps the state from being preempted by the Federal government in the continuing operations. It is recognized this agreement provides dual jurisdiction, one by state authorities and the other by the provisions of the OSHA Act in which the Federal government is responsible.

I have just been informed that the *Federal Register* will publish standards which will permit states to sign an agreement under 18 (b), providing states meet the criteria and develop an approved safety and health program which, hopefully, will permit a total take-over by states. Let's face facts as they are. Many states are simply not capable of taking over on their own. Many lack enforcement capability; they have limited area of coverage; some states are bound by "home rule" which constitutionally prohibits the state from interfering in the administration of political subdivisions, such as a city.

A specific example is the City of New York, which is autonomous. As you know, we can only make an agreement with a state. Therefore, if a state has made an agreement with the government, such as the State of New York, then the state in turn may make an agreement with the City of New York.

Another problem that must be recognized is that safety and health is approached in different ways by many states. Some have separate safety sections, some have a separate health section. Traditionally, safety has been under the Department of Labor in most states that I know of. States have an obligation to provide standards in many categories; for example, boilers and elevators require separate standards.

We are fully cognizant of the problems that will face the state which is planning for a take-over. First, they must provide for a coordinated safety and health program to include its political subdivisions. At the Federal level we hope to encourage the state to develop a cooperative attitude toward its cities and counties. The overriding factor is that we desire a safe and healthful workplace for the worker and that, of course, includes the public employee. You who are public employee representatives have an obligation to advise your leaders that it is good business to develop a safety and health program and that there is much you can do on your own. There are many examples of municipalities which have developed effective safety programs and have saved a considerable sum of money for the city. An overriding consideration for any state safety and health program is the assurance that it will provide for the protection of the public employee.

We are fully cognizant of the fact that states will have all kinds of problems. For example, when you contract work to be performed by a contractor, the contractor is bound by the provisions of the OSHA Act. Yet, you, as a public employee, are not covered by this Act. Therefore, the state cannot provide the same kind of protection for its workers that the contractor is compelled to provide. We fully recognize this as an inequity; however, it is the duty of the Secretary of Labor to make a recommendation to Congress within a three year period. This may be one of the recommended changes.

We consider the Occupational Safety and Health Act as a giant step forward. By its very definition we say that this Act pertains to all activities which affect commerce. This is a very broad conclusion. Only an individual who is self-sufficient, such as one who requires no electricity, requires no telephone, or has his own children work for him, is not affected by commerce within the scope of this definition. So you can see that for all practical purposes everyone is included within the provision of the OSHA.

It has tremendous implications for the future. At present there are more than four and a half million workplaces in the nation. We have 350 Federal compliance officers. In addition, there are 1,500 compliance officers at the state level. This means that approximately 400,000 workplaces may be covered in a year, roughly less than 10 per cent of existing establishments. Therefore, we count on voluntary compliance as a means of getting the work accomplished. This is a law and order society. We believe 95 per cent of the industrial establishments wish earnestly to comply with the law, because this is a tradition. An example is our income tax law which, I am informed, is 97 per cent effective and is a good example of voluntary compliance. Even under the income tax law few end up in jail and, by comparison, we expect very few to end up in jail under the OSHA.

However, the Act has done a great deal for the worker. It has drawn attention to the safety posture of the nation. From records available at the National Safety Council, industry has been able to reduce its frequency rate of accidents over a 25 year period and reach a low in 1958. From '58 to the present time the rate of incidence has been going up as indicated by the National Safety Council *Accident Facts*). In testimony before the Congress this has been made abundantly clear. The Congress felt that something had to be done.

The states have not responded adequately to the rising frequency rate among workers. Another example of Federal interest is the solid waste disposal problem, with its tremendously high cost. Another is unhealthful and unsafe work environment. It is necessary in many states to enact noise legislation. The National Safety Council reports 14,000 work connected deaths in the last year. Under the OSHA we hope initially for a 10 per cent reduction. Should we succeed it will mean a tremendous accomplishment in terms of loss of human resources and human suffering.

Under the Act, penalties are proposed. We at the U. S. Department of Labor, through our compliance officer, merely propose penalties. The Safety and Health Review Board confirms it and a further appeal can be made to the U. S. Court of Appeals. It is a great task that we have before us. At present we have over 100 cases being reviewed. The Review Board is the second busiest body in Washington! Since the passage of the Act, there have been 5,000 investigations. We are fully cognizant of employee rights. For example, if an employee at the state or city level makes a complaint and submits it to us, there is little that we can do except to refer this complaint to the state for their action, be-

cause we do not have jurisdiction over public employees. We hope that this will be corrected at some time in the future.

What can you do as a public employee? You can do a great deal. For example, you can recommend standards to be adopted by your state. You can institute a training program for your own people in safety and health techniques. You can do much to provide coverage for state and local people just as states have done for industry. The coverage for the public employee ultimately will come. At the moment it must be on a voluntary basis, and it is up to you to get this point across to your supervisor. It is quite true that the public employee at the moment is disenfranchised and they can rightfully say "Why are we not included." It is a good challenge to you to be persuasive and to point out what should have been done in the past.

WELCOME AND OPENING REMARKS

By Sgt. WALTER T. HAYES
Chicago Police Department

The Police Division received its beginning in a rather unusual way. It all began in May 1967, when I happened to be attending a one week safety course at the National Safety Council's Headquarters. During the course of the week, I was introduced to Ray Lascoe, Staff Representative of the Public Employee Section. Ray suggested the formation of a Police Division within the Public Employee Section of the National Safety Council.

In July 1967 I received permission from Superintendent Orlando Wilson to participate as a member of the Executive Committee of the Public Employee Section.

During the National Safety Congress in October 1967 I had the good fortune of meeting Gerald Hughes, Safety Officer of the Phildadelphia Police Department. Together, we laid plans for a future Police Division.

In November 1967 I was named Chairman of the newly formed Police Division, with Gerald Hughes as Co-chairman.

Plans were immediately set in motion for the first Police Division Congress Program, scheduled for October 1968. This program was firmed-up by December 31, 1967, and the Police Division was off to a good start.

It was resolved that the three main objectives of the Police Division would be to: (1) disclose, study, and define safety problems of police departments; (2) disseminate information about these problems and their solutions; and (3) bring them into the scope of activities of the National Safety Council for the mutual benefit of all policing agencies.

The first Police Division's meetings were held on October 29th and 30th, 1968 at the Chicago Police Department Auditorium. General Franklin Kreml, Vice President of Northwestern University, was the keynote speaker, and it was his inspiring words that helped get the Police Division off to a flying start.

All who attended the two sessions of the first Police Division meetings were asked to fill in questionnaires concerning police safety subjects which they considered appropriate for discussion at future meetings.

Information received in these questionnaires served as the basis for the 17 workshops conducted at the October 1969 meetings. Again, there was an overflow attendance at both afternoon sessions. Each workshop moderator prepared a paper on his subject, a copy of which was distributed to each person. In this way, a person could take back to his department 17 papers on important police safety subjects.

The workshop idea was so well received, that it was again repeated at the Police Division's 1970 afternoon sessions. Those in attendance again received copies of each police safety subject discussed.

Gerald Hughes assumed Chairmanship of the Police Division after the 1970 Congress, with myself reverting back to Co-chairman.

AN INJURY AND DAMAGE REDUCTION FUNCTION FOR MUNICIPAL POLICE

By THOMAS W. PLANEK, Ph.D.
Research Director, National Safety Council

A preview of material contained in a comprehensive report on the design of a "total package" safety program for municipal police departments.

As was promised one year ago, our project to design a safety program for municipal police has been completed. The ultimate success of this effort, of course, depends to the fullest extent on future utilization and evaluation of our recommendations. I should point out that, though some of the ideas presented in our report are innovative, many of the suggested programs are being successfully implemented by one or another individual department throughout the country. The contribution of this project rests for the most part in the integration of various programs into a "total package."

The purpose of this project was to define both vehicular and non-vehicular accident, injury, and damage problems among municipal police and to recommend programs and methods designed to reduce them. Cooperation of municipal police departments throughout the U. S. was enlisted, and available accident, injury, and damage data were collected. Site visits were made to ten departments and general survey questionnaires were completed by 118 departments to obtain data or injury and damage reduction programming. Supplemental data on injury and damage events were also collected, and literature covering police and industrial safety activity was reviewed.

The primary injury and damage areas found to be most costly to police departments were motor vehicle accidents and police action injuries. Review of police injury and damage reduction programming indicated definite weaknesses in record keeping, training, and operational procedures. Vehicle and equipment specifications and inspection systems were also found to be deficient in terms of injury and damage reduction considerations. Municipal police injury and damage reduction efforts have focused on motor vehicle accidents, while formal programming to reduce personnel injuries has not been given the degree of emphasis required, particularly at the supervisory level.

To attack these and other problems, recommendations for the establishment of an integrated injury and damage reduction function were made. Selected general and specific countermeasures for various police vehicular and non-vehicular injury and damage problems were given. Injury and damage event record forms were presented and described, as were complete programs for training and inspection.

With this general background in mind, let us move to the key portions of the report, namely, an injury and damage reduction function for municipal police.

To many of you, the words "injury and damage reduction function" may seem stilted. Why make another addition to the already long list of names that refer to those organized activities designed to improve the safety of police personnel? The reason is simple. Such terms as "safety program," "accident prevention program," "loss control," "loss prevention," and "damage control," do not describe the role of safety comprehensively relative to the police function. A closer look at the terms "injury and damage reduction function," or IDR, will make this observation clearer.

To use the word safety in conjunction with police work implies a degree of control of hazardous conditions and circumstances that in many situations is simply not attainable. The words "injury and damage reduction" recognize this predicament and simultaneously communicate the intention to prevent injury and damage events as well as to reduce their severity when they do occur. The word "reduction" rather than "control" stresses the fact that management is aiming at improvement of performance as its goal rather than maintenance or "control" of a certain performance level.

Finally the word "function" is used rather than "program." Actually, injury and damage reduction necessitates numerous programs. Use of the word function is intended to counteract a common tendency of police management to equate the "safety program" with a single activity, usually motor fleet safety. The term "function" communicates the broad scope of injury and damage reduction activities.

I hope from this discussion you agree that the designation "injury and damage reduction function" (IDR) did not arise because of a felt need to be different for difference' sake.

Clearly, the very words injury and damage reduction function set lofty goals for any municipal police department. The question remains, how are these goals to be reached? In answering this question I shall try to report, insofar as possible, some of the project findings as well as our recommendations for organizing and operating the IDR function.

Organization

With regard to organization the IDR function, or safety unit as it is called in most departments, is located in various branches of the police department. Its activity consists primarily of record keeping; it is concerned, most often, exclusively with motor fleet or vehicular problems, and it has little status in the chain of command.

In contrast to the current situation, the IDR function should be constituted on an organizational level equal to or above that of personnel, training, and community services as described by O. W. Wilson and others. In large departments it falls within the administrative services bureau, and in smaller departments it reports directly to the chief or his deputy. Whatever its position, however, the IDR function must have a strong connection with line management.

The IDR function should be integrated and operate out of a single office to provide the necessary focal point for the following crucial activities: (1) collection and analysis of accident, injury, cost, and manpower loss data; (2) assignment of personnel to plan, recommend, and coordinate IDR programs; and (3) controlled evaluation of the effectiveness of IDR programs.

To insure total department effort on the IDR function, all units should be required to participate in four primary activities: (1) task hazard analysis of field operations that involve hazards judged to be critical; (2) IDR training and observation of all personnel according to a predetermined plan and schedule; (3) inspection of facilities and equipment according to a predetermined plan and schedule; and (4) investigation and reporting of all injury and damage events.

I do not have space here to delineate the duties of each specific unit but these are contained in the full report. Suffice to say that without such participation the IDR function will fail. Total participation requires each level of management to undertake a role in the IDR effort. These roles must be clearly defined.

Top management must provide: a written statement of policy stating department attitude, establishing specific responsibilities for all command personnel and defining the responsibilities and authority of the IDR function director; a set of procedures by which an organized effort to reduce injury and damage is implemented; an actual time schedule for completion of these procedures; funding for approved IDR programs; concrete injury and damage reduction goals for the department as a whole and for its individual units; and follow-up to insure compliance of all department members.

The role of middle management, consisting of bureau and division commanders, is primarily one of example and review. Attendance at IDR committee meetings should be given high priority. Review of supervisor's IDR performance should be scheduled periodically. Also, commanders in conjunction with the IDR director and maintenance department should conduct complete inspections of their facilities at least on an annual basis.

Probably the most crucial IDR role apart from that of the chief is played by supervisors. It is at this level that program efforts will produce results. The two chief supervisor-related deficiencies that were present in the departments studied were lack of sufficient supervisor training in IDR activities and failure to maintain an adequate system of supervisor accountability as it relates to injury and damage reduction. Site visit interviewees indicated that promotion was based primarily on seniority and other factors related to "getting the job done." Efficiency was seen as a major determiner quite apart from safety factors that were often seen as inhibiting rather than facilitating effective performance.

To counteract these deficits, better training and increased emphasis on supervisor accountability is needed. Increased supervisor training should include: conducting task hazard analyses; imparting task performance instruction to subordinates; establishing techniques for making individual personnel contacts; planning personnel observations; and inspecting equipment and facilities.

To upgrade accountability procedures, the following tools seem to be most effective:

1. Putting IDR specifications into the supervisor's annual performance appraisal.
2. Charging injury and damage events and losses to a supervisor's unit.
3. Periodically reviewing the records of all supervisors to recommend retraining in IDR activities.
4. Monitoring supervisor records of safety observations, individual IDR contacts, and results of inspection.

At several points in the discussion, I mentioned IDR committees. The formation and active functioning of these committees are recommended to fill the IDR knowledge and interest void present in most departments.

The IDR policy committee should be chaired by the chief or deputy chief. Its primary responsibilities are to review progress of the IDR function, to check departmental IDR progress, to offer and evaluate recommendations for future programs, to review injury and damage cases when recommended by the supervisory IDR committee, and to report agreed-upon recommendations to the chief.

Most IDR programs depend on the cooperation and agreement of the individuals under whose responsibilities program activities will be undertaken. Therefore, the membership of the IDR policy committee should include command personnel who are involved particularly in a service or line capacity in carrying out IDR programs.

A supervisory IDR committee should be established within each bureau, be chaired by the bureau commander or his deputy, and include division directors. The function of this committee is similar to that of the policy committee but focused on the bureau level. The additional tasks of interviewing and directing supervisors and personnel who are experiencing definite IDR problems would also be within this committee's domain.

Finally, a personnel IDR committee should be established at the division level and be chaired by the director or his assistant and include sectional directors and at least two sergeants and three officers on a rotating basis. The personnel IDR committee of each division holds major responsibility for the review of injury and damage cases. The members' main function in this capacity is to assess the recommendation of the supervisor in regard to the disposition of each injury and damage case. Injury and damage events that pose special problems for the department, or

that contain unusual circumstances that are beyond the committee's purview, should be forwarded to the supervisory IDR committee.

This suggested committee system replaces a departmental accident review board and substitutes what we believe to be a more active, productive, and educational control system.

Operation

One role of the IDR function director is to serve as a secretary for the IDR policy committee and report on the operation of all committees. His main task, however, is to organize and coordinate the motor fleet and personnel IDR programs.

These programs complement and supplement those already existing in municipal departments. They can be categorized broadly to include training and inspection.

In the training area, three types of programs are envisioned:

1. Motor fleet IDR training.
2. Personnel IDR training.
3. Supervisory IDR training.

Current police practice in training is extremely divergent in terms of both content and method. The lack of uniformity seems to stem from a basic failure among municipal departments to communicate with one another even though the need is acute. Conversations with Police Advisory Committee members and other groups indicated that the need to develop national training standards for municipal police is not limited to the IDR problem.

Most IDR training is developed internally in a way that is not easily susceptible to formal validation. In many departments, review and updating of training is haphazard, suffering almost as critically from internal communication gaps as from the inadequacy of useable injury and damage data.

It would be naive to say that these internal problems are the only obstacles to creating an effective IDR training effort. The dubious success of driver education and many industrial safety training programs bear witness to the fact that a great deal of time, money, and evaluative effort is certain to precede any significant breakthroughs in municipal police training.

With these difficulties in mind, it is recommended that IDR training programs be instituted on the basis of current practice where feasible and that a concentrated effort on the validation of these programs be given priority. Our findings indicate that we are in a better position to recommend concrete training elements for motor fleet than for either personnel or supervisory training.

In regard to motor fleet IDR training, the following programs are recommended:

1. A core recruit training program stressing principles of defensive driving and vehicle control.

2. A mechanism for training evaluation that includes assessment of achievement, on-the-road performance, and the reduction of vehicular injury and damage events.

3. An in-service training program that includes roll call, department-wide training, individual retraining, and problem driver improvement.

To establish a core curriculum for municipal police driving training, two areas of concentration should be considered: principles of defensive driving and the attainment of a high degree of vehicle control. There is a good deal of consensus among police and driver educators about the efficacy of the lecture and behind-the-wheel material recommended. Based on a department's local access to training facilities, as many as possible of the recruit phase exercises should be covered in vehicle control training.

It is not felt that any of the courses presented, taken alone, fill the needs of municipal police driving training. Even so, some offer convenient packages for in-service training (i.e., NSC Defensive Driving Course; GM Advanced Driver Education Course; Liberty Mutual Skid Control School). If selected for in-service training on the basis of current injury and damage problems, evaluation of effectiveness on a selected sample of drivers should be a requisite condition.

Evaluation of driver achievement should be made at the completion of IDR training. Performance should be evaluated during on the job or field training and thereafter periodically by the supervisor or by assigned driver evaluation specialists. The problem of driver performance evaluation is most complex. Achievement should comprise both knowledge and skill tests covering all sections of training. Ideally, the score a student obtains on the knowledge tests should indicate his grasp of the lecture material, while his rated competence on the test track and skid pan should reflect his ability in the techniques taught.

Since both knowledge and technique must be translated into improved on-the-road performance, a behind the wheel evaluation before and after IDR training should be given. The post-training evaluation should be made by a field trainer, driver evaluation specialist, or supervisor during the on the job evaluation of recruit performance. The evaluation form used should be comprehensive.

The importance of periodically evaluating the driving performance of all officers cannot be overstressed. To assist supervisors in this activity, it is recommended that a sufficient number of driver evaluation specialists be trained. Their task would include riding with each officer for at least an hour annually. They would evaluate performance and suggest ways that driving skills might be improved. Such evaluation would also serve as a means of assessing supervisor effectiveness in observing and correcting the driving deficiencies of his subordinates.

In departments where manpower or economic limitations prevent the use of driver evaluation specialists, the supervisor must be responsible for the formal annual evaluation as well as for periodic observation and correction of driver deficiencies.

The contents of in-service IDR driving training should be based on a definition of departmental motor fleet injury and damage problems, evaluation of the driving difficulties of individual non-problem drivers, and diagnosis of problem driver deficiencies. The contents and training methods of available programs should be adapted to meet these three conditions. Our complete report discusses these programs in depth.

In the area of personnel injury reduction training we were unable to produce as specific a set of training recommendations as we desired. In most police departments, personnel are already receiving a certain amount of injury reduction training. Study of such subjects as arrest, search, transportation of prisoners, use of handcuffs, and crowd control indicate that a number of precautionary measures are already known and being taught. However, most departments lack a formalized system for revising or updating training based on current injury and damage experience with the result that: (1) the adequacy of personnel injury reduction training for recruits and other personnel in critical hazard areas, is unassessable; (2) supervisor contacts with subordinates remain, for the most part, an individual matter and not susceptible to follow-up; and (3) roll call training and training bulletins do not treat personnel injury reduction topics in a well-directed manner.

These deficiencies, coupled with the wide disparities in police training practice, prevent the recommendation of personnel injury reduction training curricula material. A more ordered and precise definition of police task performance with the attendant hazards must be achieved before such material can be presented. For this reason a method that offers promising possibilities for analyzing police task performance is recommended for immediate use by departments. It is called task hazard analysis.

Task hazard analysis recommendations are drawn from a technique referred to as job safety analysis throughout industry. The steps for conducting task hazard analysis are: (1) select the task to be analyzed; (2) break down the task into successive steps; (3) identify hazards or potential hazards; (4) develop ways to eliminate them or their injurious effects. Our report contains a detailed description of these techniques with appropriate police-oriented examples.

Supervisor training is perhaps the weakest link in current IDR programs. Considering the importance of the supervisor to the achievement of IDR goals, training in the crucial phase of IDR activity must be provided. The content of this training was discussed a few minutes ago and basically involves doing task hazard analyses, instructing and observing subordinates, and inspecting equipment and facilities.

Personnel observation and equipment in-

spection to reduce injury and damage can also be seen as supplementing the on-going police routine. The purpose of observation and inspection is threefold; to detect, to analyze, and to correct.

Personnel inspection or observation is keyed to detecting human errors before they result in injury or damage. Both driving skill and task performance should be observed, noted, and corrected. The specific procedures supporting these activities are contained in the full report.

Both vehicle and equipment inspection should also be done regularly. Daily and weekly vehicle inspection routines are required. Two aspects of the daily vehicle inspection system are most important: (1) inspection procedures should cover at least three major vehicle systems—tires, steering, and brakes; (2) clear criteria for taking a car out of service should be presented on the inspection checklist so that serious discrepancies are not merely noted but immediate action is taken to correct defects before the vehicle is driven.

The existence of a vehicle inspection system implies the possibility of correcting defects or replacing equipment within the time constraints put upon the inspecting officer. It is obvious that the tendency *not* to report defects would be stronger in situations when it is inconvenient or overly time-consuming to obtain the necessary service. To prevent this, staff inspections should be conducted to monitor the availability and speed of repair services.

To prepare an adequate equipment inspection program, the IDR staff in conjunction with planning and research should examine the use pattern of the various pieces of equipment together with maintenance and storage specifications as indicated by the manufacturer. This information should serve as a basis for determining a reasonable schedule for inspection and routine servicing or maintenance.

Of particular interest in modifying equipment inspections is incidence of repair and incidence of equipment failure in the field. These two factors should be monitored regularly.

Other programming aspects that are covered in our complete report include facilities inspection, officer fitness and selection programs, vehicle and equipment specifications, and safety for office personnel.

Fundamental to all of these programs and activities is of course the maintenance of detailed injury and damage records obtained from the flow of primary injury and damage reports into the IDR operation. Much of this information is contained on the recommended IDR report form. It contains all data elements necessary for reporting vehicular and non-vehicular injury and damage events. Because there was so much local variation in the form design of the police injury and damage reports currently in use, an attempt was made merely to list the important data elements. The form itself is to be used with a coding manual that is presented in the report. Also presented in the report are a complete coverage of bilevel injury and damage reporting; proposed methods for setting program priorities based on cost/effectiveness and criticality analysis; and a total plan for using accident, injury, and damage information as a basis for making more effective countermeasure decisions.

Finally, it must be stated that the wholehearted cooperation of the members of the Police Advisory Committee and their departments was the key factor in the successful completion of this study. Their participation in the planning and evaluation of our final product was of immeasurable value and rightfully commands our deep appreciation.

TRAFFIC SAFETY EDUCATION AND THE POLICE

By CAPT. CHARLES W. MURPHY
Commanding Officer, Accident Investigation District,
Philadelphia Police Department

What is the role of the Police Department in a community traffic safety education program and who will implement it?

As the population grows in our nation at a rapid pace, it has never been more evident that programs for traffic accident prevention must continue to increase if we are to reduce the senseless slaughter and suffering on our highways. When the figures were published by the National Safety Council listing the traffic accident facts for 1970, they left no doubt in anyone's mind that the traffic problem has mushroomed into an enormous enigma.

Police departments possess responsibility in the area of traffic safety, and since they are in fact a public protection agency they are in a position to assist through a coordinated effort on the part of other agencies such as judicial branches, traffic engineers, safety educators, and safety organizations in the establishment of plans to be enacted for the prevention of traffic accidents.

The police department should assist by every means possible toward the successful accomplishment of the safety programs initiated by other agencies. However, one of the primary problems confronting the police will be to determine precisely what role or roles they are able and willing to assume in this joint endeavor. Ever since the introduction of the motor vehicle into our lives there have been varied thoughts on the role of the police relative to the general area of traffic safety education. There are some who suggest that the police are the focal point of any traffic safety education program, and there are those who insist that this area could best be handled by organizations not associated in any manner with police. Each of the opinions presented in this area has merit which under particular circumstances could be considered the best for a certain community.

It is this writer's opinion that the public traffic safety education program should be a community effort and not defined as the responsibility of the local police department alone. The main difficulty of the police in isolating itself with a program such as safety education is the fact that the police department has many variables to deal with before it can implement and deliver its proper role in the safety program to the civilian community. The police should assist in the various activities such as parades, public meetings, supervision of school crossing guards, and the like—not as the planners, but rather as informed advisors and active guides, working with the rest of the community for the success of the program. Too often in the past, the police have taken it upon themselves to become involved in such programs as the main impetus. This has often proved to be extremely costly, both in manpower and money, with the end result most often a duplication of effort.

However, their job does not end there. The police also have a definite responsibility for their own departmental traffic safety education program. One of the intradepartmental roles of the police is to educate the members of the department in the correct theories, procedures, and techniques of traffic safety.

The decision of the chief, which will have tremendous impact on the overall effectiveness of such a program, is to determine where the task of developing this program will be assigned. If at all possible, the planning for an effective traffic safety education program should be done by a research and development section of the department. The contents of the education program should be divided into two phases. The initial or

basic phase of the program should contain such subjects as traffic laws and ordinances, automobile highway and traffic engineering, motor vehicle operation, pursuit driving, and other related topics. The secondary or supplementary phase of the program should be such that it will allow all members of the department to review procedures in existence and possibly suggest new techniques where applicable, especially in problem areas. Not only will this phase of the program give the members a feeling of personal involvement and satisfaction, but it will permit constant evaluation which should prevent duplication and overlapping in the program. The program, in addition to covering a variety of related subjects, must be organized so as to reach all members of the department despite shift work, absence for sickness and leave, etc. This can be enhanced by roll call training, posters, training bulletins, etc.

When the operational phase of the program is being considered, the chief has another decision to make—who should be responsible for selling the program. The traffic division? Its very duties make it conducive to the program. Or should the presentation of the program fall within the control of the training unit? In most police departments, the traffic division has barely enough personnel to effectively perform its required functions. This additional assignment would more than likely decrease the efficient performance of that unit (and tend to layer) and could result in misunderstandings and disagreements. It would seem to be more logical then that a more complete implementation of the program might be expected by the training division since it is oriented toward instructing personnel. The role of the traffic division should be to provide all the current data and accident facts and rates to the training specialists who will utilize the information. A clear delineation of the role of each division head should eliminate overlapping and duplication, while at the same time providing a sound basis for the conservation of men, manhours, and money.

It is the duty of every police department employee, regardless of position or assignment, to display the proper attitude and example for the success of the safety program. It must be emphasized and continually repeated to all employees that the attitude of the department toward traffic law enforcement is very important in determining the attitude of the community motorists and pedestrians. Employees of the department who violate the law and safe driving practices are not going to firmly motivate the citizenry toward the objectives of the programs. Nothing disrupts the confidence of a community in their police department more than to have the feeling that the police have no interest in their well-being. This is especially true for the young and inexperienced driver. What could be more detrimental to a safety program than to have a police officer issue a summons or warn an operator for improper driving when the officer is later observed needlessly violating the same traffic laws?

It can safely be said that the best safety device recognized to date is the attitude of the motorist and pedestrian. Their attitudes are influenced by what they actually want in the way of police support for the community. The police should assist in the formulation of these attitudes by applying professional standards in their own daily operation. A good objective, a sound program, and constant evaluation of the program will allow the police to plan, implement, and assist in this area with the minimum of expense and delay.

We in Philadelphia feel that our joint efforts in the area of traffic safety education have been fruitful, since we realized a 13 per cent decrease in traffic fatalities in 1970 and a 25 per cent decrease in accidents in our own police fleet operations.

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THE SAFETY REQUIREMENTS OF THE FIRE SERVICE

By JAMES F. CASEY
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I would like to begin this presentation on safety by telling you a story---not a funny story but a true story, and one that is a little sad. Several years back, a fire chief friend of mine called me at my office to ask if I had any statistics on fire fighters' injuries. I thought that he was about to embark on a safety program and as a result spent several hours digging up what information I had available.

He was in a big hurry for this information, incidentally, so I called him back. But when I had given him the information, he was somewhat disappointed. It seemed that what he was really looking for was statistics to show that a fire fighter's job was more dangerous than a policeman's.

He couldn't have cared less about safety. He was in the middle of a hometown fight to keep policemen from getting more money than his fire fighters. In the course of our conversation, I discovered that he didn't keep injury records in his own department. But the police department did, and I'm sure that this had a lot to do with the cops eventually getting more pay than the fire fighters.

This story leads me to the first and foremost safety requirement of the fire services: The fire service must develop an awareness of safety per se and, having done this, must develop safety programs that will lead to a reduction in accidents. Traditionally, fire fighters and their leaders have been indifferent to injuries and their consequences. Fire fighting is a tough occupation, right? So you got to expect to get hurt once in a while.

Or, as Professor Firenze puts it so eloquently, fire fighters have "developed a level of psychological adaptation to the consequences of accidents."

So, the first thing the fire service has to do is reduce this level of "psychological adaptation" to Point Zero. This can be done by delving into the behaviorial sciences for the answer. It can be done by threat of disciplinary action. It can also be done a little more sneakily. One fire department of my acquaintance became alarmed at the number of cut hands that were showing up on injury statistics. So, an order came down from on high that when a member cut his hand, the officer in charge had to forward a report on whether or not said member was wearing gloves, and if not, why not.

Anyone here who is familiar with the fire officer's traditional aversion to writing reports will know that the incidents of hand cuts decreased dramatically and almost instantaneously.

An awareness of safety, however, is not enough. Each fire department must have a formalized safety program in charge of an officer who works at it full time. The details of such a program are too much to fit into the space available, but I'm sure sample programs have been published by the Federal government or perhaps the National Safety Council that can be adapted to the needs of the fire service.

As a matter of fact, Bob Firenze has such a program, called "Hazard Control Management for Fire Service Organizations." This program lays heavy stress on the officer—from the chief down—for the responsibility for safety in the department.

Now, let's turn to the more practical aspects of safety.

A fire fighter operates in what are really three different environments. The first is the fire station where he spends most of his time. The second environment is the apparatus and the streets through which this apparatus responds to alarms. And the third is the fire ground or the emergency scene, where he is subjected to a variety of risks, all posing dire threats to life and limb that can be compounded by a loose attitude toward safety.

In each of these environments he must be "packaged," so to speak, either mentally or physically or both.

In the fire station, he is subjected to all the hazards of the homeowner; unlighted stairs, defective electrical appliances or wiring, the accidents that evolve from cooking on a stove, and others too numerous to mention. We must remember, too, that the fire station is a garage, with all the inherent hazards of this type occupancy. On top of this, there is the ancient and unique piece of equipment called the sliding pole which should have been retired years ago.

You can see, then, that the safety officer has his work cut out for himself even before the fire fighter goes out the door. Accidents in the fire station represent a high percentage of all accidents in a fire department. And they are the ones most easily subject to elimination or, at least, reduction.

Now, let's take a fire fighter relaxing with a book in this not so safe environment of the fire station. All of a sudden, the bell hits in for an alarm. He dashes out to the apparatus floor, grabs boots, helmet, and coat, and hops into the driver's seat. His glands, meantime, are preparing him for battle. Breathing and heart rate are up, as is his blood pressure. Out the door he goes, carrying himself and four or five others into the fire fighter's second environment: that relatively brief run, often through congested streets, from the fire station to the fire scene.

The safety requirements in this second fire fighter environment should naturally lead off with driver training, and even before that with driver screening. The highly emotional type man that nature provides with a very short fuse should never be permitted to sit behind the wheel of a fire apparatus. Nor should anyone be permitted to drive until he has completed a recognized course in driver training that was designed specifically for the fire fighter-driver.

Let's not forget that this driver will have a co-pilot sitting beside him, usually an officer. This co-pilot helps the driver to stay alert to the conditions of the road, and cautions him in a calm and helpful manner. I repeat, calm, and I would even be so bold as to state that the officer, too, should have the psychological screening. But I am fearful of losing my card in the officer's local of the I.A.F.F. Getting on to the physical packaging in this second environment we must remember that here the fire fighter is subjected to all the accident ills of the ordinary motorist and, to a degree, those ills of the racing driver.

The fire fighter should be enclosed in a cab and seat-belted. The days of hanging on in the breeze while standing on a narrow running board are or should be long past.

Another and most important factor in this second environment is the condition of the apparatus that the fire fighter rides on. Safety and apparatus maintenance go hand in hand. Brake failure because of a lack of proper maintenance can cause death and injury, just to mention one item. And beware of the man who brags about his 1943 aerial ladder that is "just as good as the day it was delivered." Maybe it is just as good, but by today's standards it is obsolete and unsafe.

Finally, we come to the fire fighter's third environment, the fire ground. Here he must be protected against heat and smoke, primarily. But he must also be protected against falls, falling objects, cuts and bruises, strains, and what have you.

It seems to me that the basic safety requirement for this third environment is that the fire fighter be thoroughly trained in all aspects of his job. No man should be given a tool to use at a fire that he hasn't used in practice sessions over and over again until it is second nature with him. In fact, no man should be put on the fire scene until he has had weeks of training in the use of all his tools at real or simulated fires at a training ground.

Another basic requirement for safety is discipline, or the control of forces on the fire ground. The fire fighter who wanders off on his own is just begging for injury or death. So is the tee-shirted and helmetless fire fighter. This discipline or control must be exercised by the officers.

Good judgment and fire fighting skill by superior officers play a great part in any safety program. Often, men who are operating in a particular position at a fire are not aware of danger on their flank and rear. Somebody has to look out for them.

These last few requirements, of course, come under the heading of mental packaging. Now, what about the physical packaging? The fire fighter should be packaged in a manner that will keep him from all injury. This, of course, is the ideal and probably never will be reached. But the least we can do is to take advantage of the technology that is already available in an attempt to reach the ideal.

Let's start with the helmet. The traditional leather helmet (which, incidentally, I wore for twenty four and a half years) was developed 130 years ago. And I would hazard a guess that about 90 per cent of all firemen still wear this helmet. The helmet has withstood the test of time, so it must be pretty good. I wore it to many fires and had a variety of objects rain down on me without ever getting knocked unconscious. It was also designed to keep water from running down my neck, which it did, and in the winter it had a liner that kept my neck and ears warm. Now, this is pretty good for a 130 year old design, but can't we have something better? Lighter perhaps, more comfortable, better impact resistance on top and sides, non-flammable?

Actually, there are such helmets on the market, but they don't look like a fireman's helmet. Tradition is probably the major factor militating against them. Here again, we are back at the mental packaging as a safety requirement.

The next safety requirement of the fire service that comes under physical packaging is breathing equipment, or what we commonly call the mask. The self-contained unit that we have today is good; far better than it has ever been in the past. But it can be made better. For one thing, it is too heavy to carry around at a fire. For another, it is too bulky to get through narrow spaces. Its time limitation should be expanded.

The technology for improvement of our self-contained breathing apparatus is already here, but engineering takes time and money. It might take five or ten years, but within that time the fire fighter will be wearing a mask vastly different than today's.

Next, we come to clothing, and particularly the turnout coat, which has received much attention over the past several years. Traditionally, a turnout coat had two functions. It kept you warm and it kept you dry. Later, it was decided that a turnout coat should be fireproof, or at least flame resistant. But when these new qualities were incorporated into the coat, the coat became considerably heavier and bulkier. They also increased the insulating qualities of the coat to the point where body heat started to boil the wearer in his own sweat.

What we need, of course, is a lightweight coat that is at least flame resistant, that can provide warmth and dryness and can somehow ventilate a man's body heat. Turnout pants and boots would have to meet the same criteria.

While visiting the National Bureau of Standards, I found out that the traditional cotton duck turnout coat of the fire fighter could not pass the flammability tests used for children's sleepwear. However, I would like to point out that for more than twenty years I wore one of these cotton duck coats in the busiest fire department in the world. The coat never went on fire, even once—and I don't think I am any more cowardly than the next guy.

The point I want to make here is that, when somebody sits down to design the perfect coat, he's going to have to make some trade-offs in functions and qualities.

At the National Bureau of Standards I also learned that about 45 per cent of all fire department injuries were impact injuries caused by falls, falling objects, vehicle accidents, and others. To date, the only impact resistance built into the fire fighters' gear is in his helmet and the steel toe in some boots. But every Saturday I see padded football players pick themselves off the ground after apparently being crushed to death—this sometimes under a broiling Texas sun with the temperature over 100°.

Here we have an added function for our turnout coat that wasn't even considered until recently—another trade-off for the guy who sits down to design the perfect coat.

Remember, I stated before that ideally a safety program should reduce accidents to Point Zero. This, of course, is never going to happen. In fact, we aren't even going to approach Point Zero. And this fact leads me to the next safety requirement of the fire service, which is that every department

should "provide prompt and adequate medical care for the fire fighter injured on duty."

I heard these words spoken by Dr. Marshall B. Conrad at the recent Annual Conference of the International Association of Fire Chiefs in St. Louis. Dr. Conrad, incidentally, has been around fire fighters for a long time as medical director of the St. Louis Fire Department.

Dr. Conrad mentioned that "there are three things necessary for the provision of adequate emergency care. The first of these is an adequately designed vehicle, the second is the availability of the equipment necessary to deal with life threatening conditions, and the third is adequately trained personnel to administer emergency care."

Dr. Conrad warned that "if the principles of good emergency care are not observed, a significant number of badly injured victims will not survive to be transported to a hospital."

I wonder how many fire fighters with serious but survivable injuries died because there was no training in accident care within his own department.

In summary, the safety requirements of the fire service demand (1) an awareness and appreciation of the value of safety, (2) a safety program that implements this awareness, (3) that the fire fighter must be packaged mentally and physically for the three environments that he works in, (4) that training plays a most important part in any safety program as does discipline and control, (5) that injuries are bound to occur, and must be cared for promptly and adequately on the scene.

CHEMICAL SAFETY INFORMATION SYSTEMS —GENESIS II:8 or XI:9

By H. H. FAWCETT

My message is suggested by two passages from the Book of Genesis. Chapter II, verse 7, chronicles: "The Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life, and man became a living soul." Verse 8 notes: "God planted a garden eastward in Eden, and there he put the man whom he had formed." Verse 9 notes: "Trees grew in the garden, pleasant to the sight and good for food; as well as the tree of life, and the tree of the knowledge of good and evil." All was good for a short time.

Chapter XI assures us that the whole earth was of one language and of one speech, until the building of the Tower of Babel on the plains of Shinar. This tower was planned so its top would reach unto heaven. Verses 7 through 9 tell us that God was not pleased with this engineering project so he confused their language, and scattered them (we assume the engineers and scientists, too) across the face of all the earth.

In many ways these two passages illustrate the promise, yet failings, of our recent attempts to design, implement, and properly use information systems. The availability of electronic storage, processing, and retrieval by computers has held out hopes that the Garden of Eden was near; that anyone, anywhere, at any time could have immediate access to the best chemical safety information simply by dialing a telephone or pushing a button.

Needs

The present confusion and fragmentation involving chemical information systems stem from three main areas:

1. The first problem is to identify the users and their specific needs for such information (who needs what?).

2. The second problem is the limited availability of the knowledge in "open literature" or in easily retrievable form, which clearly suggests that much knowledge is either not available or cannot be easily obtained (where is it?).

3. The third area involves the sudden increase in awareness of the interrelationship of much safety, health, and fire prevention data previously pigeon-holed into highly specialized activities and centers (where does "chemical safety" begin and end?)

Of the 3.5 billion people in the world, 206 million are in the U.S.A., with 50-60 million in industry. Of these, one million are in the chemical and allied industries.

It is recognized that not everyone realizes his need for chemical safety information in the form we are discussing. To most people, there is little concern. It is assumed that chemicals are "safe"; that "someone" has overlooked their safety, that labels, if read at all, are at best of limited interest, and that, until some direct contact or connection is made, safety information sounds of little value or interest. In an emergency, however, the highly discounted value of information becomes invaluable. Few people need the same information; yet relatively obscure data, e.g., the adiabatic compression sensitivity of a substance, such as nitromethane, or the flammable limits of substances previously believed non-flammable (as with trichloroethylene and 1,1,1-trichloroethane) may be vital to the safe use of the material.

Magnitude

What is the magnitude of the problem?

Estimates of the number of chemicals (or substances identifiable by chemical structure) in our present knowledge include 4.5 million chemicals (Chem. Abs.), 1.8 million numbered (Chem. Abs.). There are 250,000 drug products (F.D.A. estimate) and an unknown number of household or consumer substances. It is fully appreciated that the numbers cited are, perhaps, upper limits, and that we are not likely to encounter significant amounts of many substances simply because they have never been prepared in kilogram or pound quantities to date. This is of little comfort, however, since the continuous parade of new substances and ever larger quantities of existing ones make the "knowledge gap" ever wider. (By "knowledge gap" is meant the difference between having complete and accurate knowledge at the scene of the decision, as opposed to incomplete or inaccurate knowledge.)

The following table attempts to estimate the present-day magnitude by the scene on which it may be encountered:

Classification, Evaluation, or Listings

If we assume that all chemicals have certain hazards to some degree (depending on use and other environmental factors), it becomes imperative to list or classify those which are recognized by persons with specialized knowledge as having unusual hazardous aspects. Such a listing would include 9,000 toxic substances (1971 list of NIOSH); 800 hazardous by DOT regulations; ? NOS by DOT; 334 hazardous polluting substances (defined by E.P.A. for water); 520 threshold limit values (air) (1971 A.C.G.I.H.); 7 threshold limit values (physical agents) (1971 A.C.G.I.H.). In no sense of the word should this list be considered complete, either in numbers or in scope. It is included solely to suggest some available "lists."

Data Sources

Since even the admittedly incomplete listings above become a major problem if one is heading for the nearest library or abstract service without a more extensive orientation, some data sources are: National Safety Council; Manufacturing Chemists Association; National Fire Protection Association; American National Standards Institute Z-37; American Conference of Governmental Industrial Hygienists; American Industrial Hygiene Association; Industrial Health Foundation; National Center for Poison Control Centers; and Underwriters' Laboratory. This tabulation of some major recognized references, systems or sources suggests the widely scattered nature of chemical safety knowledge. No attempt will be made to discuss the literature of chemical safety (for discussion of specific references believed credible, see *The International Directory of Com-*

puter and Information System Services, 1971.

As previously noted, we have reluctantly concluded that a confusion of tongues exists in chemical safety information. This is because there has been no systematic overview of users' needs or of who will develop the data into a properly-retrievable base. No mention has been made of foreign data sources, which, on the basis of our experience do not seem to offer much in the way of coverage or completeness. The one exception is the C.I.S. system of the International Labour Organization.

It is hoped that the recent marriage of safety, health, and fire protection within the framework of the Occupational Safety and Health Act, PL-91-596, will bring about a closer and more complete understanding of the needs, resources, and retrieval methods of chemical safety information. Certainly, the present Babel of confusion cannot be expected to provide for intelligent preventive action in the interface between man and the chemicals necessary for his economic and personal health.

Another factor, which impinges in the sociological arena, suggests that it is undesirable to have several totally unrelated and uncoordinated data systems. The user must insist on the accuracy and completeness of the information he obtains from a system or source. If such accuracy and completeness is not achieved, (and there exist today widely-used references which are less than accurate and complete), confusion and anxiety will be compounded. Writing in *Behavioral Science*, Vol. 16, No. 5, September, 1971, under the title "Surfeit of Attractive Information Inputs: A Hallmark of Our Environment," Professor Z. J. Lipowski notes that affluent, industrial societies provide people with a surfeit or overload of attractive information inputs. One consequence is that many persons suffer from a high degree of psychological conflict among incompatible alternatives. The more conflicts in the basic chemical safety information supplied by the many different sources, the greater the psychosocial complications which "safety" activities will encounter. As Albert Einstein once said: "Concern for man himself and his fate must always form the chief interest of all technical endeavor; never forget this in the midst of your diagrams and equations."

THE USE OF SAFETY NETS ON BRIDGES AND OVERPASS WORK

By LUTHER U. FLEMING
Chief Safety Officer, Ohio River Div., U.S. Army Corps of Engineers, Cincinnati, Ohio

Safety nets reduce construction injuries. For many years their use was limited almost entirely to bridge erection, where they proved their worth as life savers, but recently they have been successfully used in high rise steel structures, silos, surge tanks, grain elevators, bridge piers, and similar structures.

The National Safety Council Data Sheet 608-1967 discusses the recommended minimum design requirements and usage of safety nets made either with manila rope or with rope or webbing (tape) or synthetic fibers, filaments, and their combinations.

The Associated General Contractors of America, Inc., in their *Manual of Accident Prevention in Construction*, recommend the use of safety nets wherever workmen "are likely to fall, especially where safety belts and life lines, guarded platforms and scaffolds or temporary floors, are not feasible." The manual recommends that the safety net protection system be installed as soon as work has passed the 25-foot level and that the system remain in place so long as workmen are required to be on an unguarded work surface 25 feet or more above ground or water and are not otherwise protected against falls.

The U. S. Army Corps of Engineers Manual EM 385-1-1, March 1967, *General Safety Requirements*, requires similar protection. Workmen on unguarded platforms or scaffolds more than 20 feet above the ground or over water and machinery shall be protected by the use of safety nets.

Safety and health regulations for constuction: (April 17, 1971, *Federal Register*).

1. Safety nets shall be provided when work places are more than 25 feet above the ground or water surface, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts are impractical.

2. Where safety net protection is required by this part, operations shall not be undertaken until the net is in place and has been tested.

3. Nets shall extend eight feet beyond the edge of the work surface where employees are exposed.

4. The maximum mesh size of nets shall be 6 inches by 6 inches, of 3/8-inch diameter, No. 1 grade, pure manila, 1/4-inch nylon, or 5/16-inch polypropylene rope.

5. Forged steel safety hooks or shackles shall be used to fasten the net to its supports.

6. Connection between net panels shall develop the full strength of the net.

Makers and suppliers of safety nets are requested to furnish photographs of various uses of safety nets. I do not recommend any particular net, supplier or fabricator. If you have a need for nets, buy the one that meets your particular requirements.

Avoid using old nets, they may not provide the protection you need, may be improper size and configuration. Remember, they must withstand the loads mentioned in NSC Data Sheet 608. Plans to use nets must be made in advance.

All the work area under workmen should be protected so that the nets do not have to be moved from one section to the other—full length of bridge, whole perimeter of building.

(There followed a series of slides demonstrating the installation and use of nets in a variety of construction situations.—Ed.)

PREVENTION OF TRACTOR TURNOVERS

By JAMES L. WILLIAMS
Public Relations Mgr., Country Cos., Bloomington, Ill.

Farm and light industrial model tractor turnovers result from a variety of causes and they happen in a variety of ways. Most important, however, they can be prevented. The fatality rate resulting from tractor turnovers in agriculture is estimated to be from 1.6 to 2.2 deaths per 10,000 tractors per year. The conditions that highway tractors operate under would appear to provide circumstances to cause at least an equal number if not more turnovers because of the mowing of slopes, the presence of abutments, ditches, culverts, obstacles, and highway travel.

When there is an accident involving tractor turnover the chance of fatality is high. In agriculture it is about 40 per cent. This results from the inability of the driver to judge at what point the tractor is about to tip, the difficulty of jumping off the tractor, and the speed of the tip. In past years I have met a number of tractor operators who have tipped tractors and were among the lucky because they jumped off in time, but I am sure they did not know if they jumped as the tractor was turning over or if, in fact, the tractor traveled a few feet and turned over after they jumped.

Another factor affecting the number of fatalities is the absence of roll-over protection which is now available both through protective frames and roll-resistant cabs.

I am sure the concern we all share is that of how to best communicate, to the people who drive tractors, this danger of the tractor turnover and how to prevent them. We use a demonstration kit which we think is effective in communicating these problems to tractor drivers. This demonstration helps to explain some of the reasons for tractor turnovers and some of the measures drivers can take to avoid this type of accident. This particular demonstration has been used as a part of a program by my department for some years before farm groups, occupational agriculture classes, and as a part of various schools developed to train underage drivers under the Hazardous Occupations Order by the Department of Labor. The kit consists of a small model tractor which has an electric motor, various pieces of scale model equipment, a ramp to simulate banks, steep slopes, and some small wedge blocks to simulate hazards that might cause turnovers. I would like to emphasize that this equipment is not laboratory type equipment. If this small model will turnover under a given circumstance, a real tractor would also. The model tractor has a center of gravity that is similar to the real thing. The center of gravity is just ahead of the rear wheels. In a realistic situation, if the center of gravity of a tractor shifts outside the base of stability, the tractor will tip. Depending on the equipment, the center of gravity can shift in several ways. I use this model to illustrate how a tractor may act differently in terms of possible turnover because of the change in slopes, in the way it is being used, and how it might be equipped. Two other forces that relate to tractor turnover are force of power and centrifugal force. (There followed a demonstration of various situations which result in tractor turnover.—Ed.)

All the factors I have mentioned and many others I have not mentioned present a tremendous challenge to an operator's ability to operate safely and eliminate any possibility of taking risks.

So far, my comments have related very much to the man and our need to communicate to him. We can also do many things to the machine to make it safer. Protective frames and crush-resistant cabs, along with seat belts, provide a reasonable solution to reduce and eliminate death and injury. If you are thinking this is the only solution, we have to recognize that turnovers with these devices still pose possibilities for injuries.

Illinois has the following law:

217.2. Beginning January 1, 1970, no tractor unit over 16 engine horsepower designed for mowing or tractor-mower combination unit over 16 engine horsepower owned or leased by a municipal corporation or political subdividon shall be operated for the purpose of mowing vegetation on highway right-of-way unless the tractor of such unit is equipped with an approved operator protective frame and a seat safety belt.

Prior to this legislation, the Illinois Highway Department was experiencing numerous fatalities and injuries and was spending thousands of dollars on medical compensation. In a very recent year injuries were cut to three, with little or no time lost and little or no dollars spent for medical compensation. Another aspect which I think we must recognize is that this turnover protection will serve to provide protection to an operator in the event the vehicle is struck while mowing on the highway.

We have a challenge in continuing to work with employees who drive tractors so that they know the dangers. We must ask for the best in equipment design and we must provide equipment with roll-over protection. Lastly, we must design areas that tractors can be operated safely on or restrict them from dangerous areas.

FOLLOWING TOO CLOSELY

By ARTHUR MARSHALL
Arthur Marshall & Co., Richmond, Va.

The purpose of this presentation is to unveil a new invention relating to highway safety. Its specific purpose is to combat accidents caused by following too closely. The impetus for this device came from the many requests made by police officials throughout the country when I was promoting another of my inventions, VASCAR. These requests, coupled with the statistical data we will later see, made me aware of the surprising scope and costs of the tail-gating problem.

Today there are more than 110 million motor vehicles on the highways of the United States. One out of every four, or 27.7 million were involved in an accident last year. Rear-end collisions, typically caused by following too closely, cost this nation last year over $4 billion. This annual cost has just about exactly doubled over the past 10 years. Four billion dollars is a lot of money. With our government dealing in hundreds of billions it may not sound like much but, for instance, with $4 billion you could pave a highway with one dollar bills from Washington, D.C. to San Francisco and have enough money left over to make a center strip for this highway with $20 bills.

Now that we are focused on the scope of the problem of following too closely, let me present to you a new highway safety device designed to combat accidents caused by tailgating. This new device we call the FTC Monitor System. It is a relatively simple, but, as you will see later, highly effective traffic safety tool.

In order to explain the rationale behind this new device, let us for the moment compare it with VASCAR, which is a speed detecting device designed for police to combat the speed problem. The flagrant speeder knows he is doing something wrong. He is aware that he is breaking our country's speed laws. He is gambling that he will not get caught. He has, indeed, even weighed his chances, or has considered the odds for and against his getting away with breaking the law. To combat the danger that he creates, the obvious thrust is to change the odds favoring him to the point where he changes his mind about whether or not to gamble. To change these odds, more rigorous enforcement of the speed laws is the obvious answer.

The flagrant speeder is aware of his action. He has a gauge on his automobile that makes him aware. The motorist who follows too closely, however, does not have a gauge in his automobile to tell him that he is doing something dangerous. We cannot assume that he is aware of what he is doing. The reward for speeding is great enough to make the habitual speeder commit a dangerous act knowing that he is gambling, but by comparison the reward for following too closely is so insignificant that we can assume that the average offender is not aware of danger.

We combat law-breaking with enforcement. We combat ignorance with education.

The FTC Monitor System is designed to educate the tail-gater by showing him his error while he is committing it and thereby giving him a better feeling for safe headway. This device is a logic system which measures the time lapse between two vehicles passing a point on the highway and gives a signal to offending motorists. In order to explain this further let's examine in detail what proper minimum safe headway is. Let us take a look at what is required of a driver to follow at a safe distance.

In the past there have been two rules of thumb used by motorists. One rule was that you should follow at a distance of one car length for each 10 miles per hour of speed. For example, if you were traveling at 60 miles an hour you should be six car lengths from the car in front of you. Another rule often expounded was the so-called one-second interval. This meant that you should follow in such a way that your automobile was at least one second away from the car in front of you. If we compare these two rules we find that they are actually the same. The one car length rule was developed when automobiles were about 15 feet long. We see that a motorist traveling at 60 miles an hour should be six car lengths, or 90 feet, from the car in front of him. With the one-second interval rule, this car going at 60 miles an hour would travel 88 feet in one second. A car going 30 miles an hour having three car lengths headway distance, or 45 feet, compares with the one-second interval of a car going 30 miles an hour, or 44 feet.

The National Safety Council has recently been promoting the two-second interval which doubles these past minimum safe headway rules. We see now that these rules are changing, properly so, to a two-car length per 10 miles an hour along with the two-second interval. The reason that the two-second interval is a better gauge for safety is because it covers not only reaction time and perception time but also covers distraction time. The normal good driver is constantly and rightfully being distracted from the situation in front of him. He looks at his gas gauge, his speedometer, his rear view mirror, his ash tray, his windshield wiper switch, the intersecting roadways, etc. Should a problem suddenly arise in front of him while he is distracted, he will need this extra time to avoid trouble. In addition to this, for those of you who are primarily concerned with moving traffic, there have been studies proving that this type of proper headway room smoothes the flow of traffic and actually increases the highway capacity.

Let's examine this two-second interval even closer by means of a breakdown of the two seconds into components. First, we have reaction time. It has been firmly established that the reaction time of the average motorist in applying his brakes to avoid a dangerous situation is three-quarters of a second. In addition to that, very few alert drivers can become aware of or perceive the dangerous situation in less than one-half second. This adds up to one and one-quarter seconds.

Now, we add distraction time. Studies have been made, of rear view mirror glances that show the average distraction time is also three-quarters of a second. This adds up, as you see, to a two-second interval for minimum safe headway.

Comparing again the now two-second rule, to the two car lengths per 10 miles per hour rule, we will note that as the speed increases the distance between the two cars increases. But when we look at the two-second rule we find that the time does not increase. It remains constantly two seconds. Because this constant time is easier to deal with for the motorist, and because it is easier to measure, I have taken advantage of the time rule in my invention.

The FTC Monitor System consists of a sensor buried in the roadway that signals a logic system which measures the time lapse between motor vehicles. If the time lapse is improper the logic system throws a signal to a sign ahead of the sensor warning the motorist of his dangerous actions. The sign says "Following Too Closely When Flashing" and the word "DANGER" flashes to the motorist. As we said before, the primary object of this device is to educate and alert the tail-gater. However, in that enforcement is an important tool in our educative process, we feel that although the thrust is on education, some enforcement is needed to shore up its effectiveness. Therefore, the FTC Monitor System has two messages. The word "DANGER" warns the motorist who has himself in a dangerous but not unwonted situation. However, if he is flagrantly violating the rules of the road applying to safe headway, enforcement action is indicated. So if the motorist is following inside bare average reaction time, allowing no room for perception or distraction, the chances of trouble are so great that strong measures are indicated.

So much for theory. After we had perfected the device itself and thoroughly tested its accuracy, we decided that tests were necessary to prove its value. In doing this we received the generous cooperation of John Hanna, Highway Safety Director of the Virginia Department of Highways, the Henrico County Engineering Department, and the Henrico Division of Police. Henrico County is essentially a suburban county abutting the City of Richmond. The Henrico Police selected as a test site Dumbarton Road, a roadway that has a relatively high accident history, and we placed this system just upstream from a high-accident pocket. With their cooperation we conducted, first, a "before" study on this stretch of roadway by installing a sensor and the logic system of FTC without the sign. This logic system has the capability of counting the traffic, the number of dangerous offenders, and the number of violators. One-half mile down-stream from this site we put up another sensor and logic system to see what the down-stream effects would be. The "before" study showed us the pattern of the traffic before any attempts to monitor this pattern were made. We found, incidentally, that about eight per cent of the motorists were travelling dangerously too close and that slightly less than one per cent were following flagrantly too closely. After the "before" study was completed, we put up the sign at the up-stream location. We compared for approximately three months the effect of the sign on the behavior of the traffic. We found, one-half mile downstream from the sign, that the flagrant violators were cut in half and that the dangers were reduced about 30 per cent. This showed us that the sign was having at least a short-term, residual effect on the behavior of the motorists.

But this did not complete the answer. What we wanted to know was: Did this system prevent accidents? We therefore conducted our study over a one-year period. The Henrico Police went back into their files and gave us an accident history on this strip of roadway under FTC Monitor influence for the three years prior to the installation of the sign. They also gave us the figures of the accident history of the roadway surrounding the path of influence that the sign monitored. The sign was on the eastbound lane of Dumbarton Road, and we studied the accident history from the sign to the end of the eastbound portion of the roadway. These figures were compared with the accidents occurring in the westbound lane and the portion of the eastbound lane up-stream from the FTC sign.

The average daily traffic on Dumbarton Road has long since passed its designed capacity, and during the last five years it has increased at about five per cent per year. We can see that the annual number of accidents on the surrounding roadway has steadily increased at a much steeper rate, as did the rate in the lane influenced by the FTC Monitor System until we installed the sign.

According to the statistical data there should have been between 20 and 24 accidents on the east bound lane of Dumbarton Road. During the year after the sign was installed there were only seven.

Since then another year has gone by, and we can tell you that this dramatic change is still holding, and holding in the face of rising traffic and traffic accidents throughout the County.

These tests evidenced a reduced rate in all types of accidents, not just in rear end collisions. We are beginning to believe that many accidents not heretofore attributable to following too closely have had the following too closely as an underlying cause.

For an invention to be of value, it must be practical. Traffic Safety Scientists measure practicality of safety equipment by subjecting it to a cost/benefit analysis. Implementation is considered practical if the benefits derived are equal to the cost. Based on the estimated average economic loss of $2,000 per accident, the test study on Dumbarton Road reflects a benefit ratio of $90 saved for each one dollar in cost. These figures reflect the immediate and measurable savings on a relatively high accident roadway and do not take into account the obvious long-term educational benefit derived from the system.

The Dumbarton Road Tests, including the second year's data, reflect a 60 per cent reduction in accidents. We are prepared to say that adequate installation of the FTC Monitors over a large area could reduce overall accidents throughout the area no less than 15 per cent while still maintaining a tremendously favorable cost/benefit ratio. Based on this figure, the investment of one tax dollar should save automobile owners $33 in insurance premiums alone, not to mention the greater importance to all taxpayers of fewer deaths, fewer injuries, and, hopefully, an increase in highway capacity.

The implementation of this system cries for action. Its feasibility has been strongly indicated by the Dumbarton Road Tests. Other tests similar to this should be conducted around the country. We are now in the process of building twenty prototypes for this purpose. These sites have not yet been selected.

We believe the FTC Monitor has equal application in the cities, on the open highway, and on expressways.

In addition, an area-wide study is badly needed. The Dumbarton Road Study indicates we have at least alerted the motorists through an accident prone section of roadway. We think a number of these systems deployed throughout an area will show a long-term educational benefit just as important as its short term effect. To this end the Governor's coordinator in Virginia has asked for NHTSA funds to conduct an areawide study in Henrico County.

Here is a chance, we feel, to really do something for highway safety.

REFUSE COLLECTION—A LOOK INTO THE FUTURE

By TROY MARCELENO
Office of Solid Waste, Cincinnati, Ohio

The solid waste field as reported in the 1971 *Work Injury Rate* pamphlet, is plagued with the highest injury frequency and severity rates of any industrial category, and in one of these cases (that dealing with injury rates) had a rate of over 10 times that for industry as a whole.

Now we in the EPA have recognized this, and we have also recognized the need for positive action to deal with this problem. Accordingly, we recently entered into a contract with the consulting firm of Harbridge House, Inc. to assist us in developing a comprehensive safety training program which will benefit both the private contractors and those governmental agencies engaged in solid waste collection.

The package will be available for distribution commencing July 1, 1972. Those of you who have worked in this industry for a few years are probably becoming aware of the public-private interface that is emerging in the solid waste field. This project is a continuation of that and will reflect this attitude. It combines our (EPA) efforts with those of several trade and service organizations (the National Safety Council is one of these) which will serve to guide the development of this project and insure its acceptance by those collection agencies which they represent.

Despite the fact that there are some 200,000 people employed full time in the collection and transportation of solid waste, and that we have had high prevailing injury rates, no safety programs that are current in content or available for national distribution exist. I think that one of the reasons for this is that despite the excellent talent available, we didn't have the resources or the coordination that was necessary at the highest level to combine the efforts of the organizations that have had an interest in this matter. This has now changed, and we intend to make the most of it.

As currently envisioned, the training program being developed will consist of two separate parts. One of these is intended for supervisory personnel and one is intended for operating personnel.

The first program will be a one-day training session directed at supervisors responsible for municipal or private solid waste collection activities. The men will be brought up to date on the status of safety in the industry, including new developments in safety standards and practices. Our intent here will be to motivate them to implement an effective safety program within their own organizations. They will also be briefed on the training package prepared for them to present to their operating personnel (the second program). All teaching materials will be demonstrated so these supervisors can use the materials effectively when they present the course to their employees. As a final part of the session, case examples will be presented for discussion by those present. Their main purpose will be to emphasize the supervisor's responsibility for the safety of his men, to improve his ability to communicate, and to help him maintain an effective safety program.

The second training program, aimed at operating collection personnel, will include a motion picture in color (of about 20-25 minutes duration) and seven separate topical presentations, each one devoted exclusively to a major safety problem in solid waste collection. Included will be such topics as employee safety responsibilities, lifting, slips and falls, backing of vehicles, etc. Of course, we will also use slides and other graphic materials specially designed for each of these presentations. To be authentic and gain support, the visual material will utilize true-to-life personnel, equipment, and background. Hopefully, each topic will be presented in 30 minutes or less.

The program materials will be aimed at

overcoming a subject that apparently is boring to men who, judging by their record, are seldom convinced of the true value of adhering to safe practices. The program will attempt to interest and motivate these men to become safety conscious. Emphasis will be placed on personal involvement so a change can be effected in their attitude toward safety.

Our past experience has shown the practicality of safety programs which can be conducted on the job (and this program will reflect this), that are of short duration, and that are in a modular form so they can be conducted whenever possible. Further, to prove that we are no fools, we have also recognized the fact that in order to sell this program you've got to sell it first to the supervisor, the key person in a collection organization, before it can be bought further down the line by the field crewman. This is why, in our implementation plan which is still being developed, we are stressing the training of supervisors. We are utilizing the state solid waste agencies and the service and trade associations to insure that these men are trained first, so they in turn can go back to their organizations and train their own men.

This is an undertaking of tremendous proportions, requiring the integration of many individual talents and commitment of funds and personal energy. For those of you who choose to assist in this program to help people—not systems, equipment, or some abstract term such as ecology, but people—this so-called Mission Responsible to reduce or indeed eliminate the highest injury frequency-severity record among our nation's employees can prove to be a great source of personal satisfaction and accomplishment. I can only hope that each of you will choose to do your part.

PHILADELPHIA POLICE STAKEOUT OPERATIONS

By Capt. ANDREW P. SUTOR
Philadelphia Police Dept., Philadelphia, Pa.

The police stakeout unit has been so successful in prevention of bank robberies that it has been enlarged, made mobile and has expanded its operation into other areas.

In February 1964, plagued with a rash of bank holdups, the Philadelphia Police Department formed a stakeout unit comprised of sixty men working in two-man teams. The unit was successful in effecting many outstanding arrests, and the robbery rate declined. In 1967, the police commissioner expanded the unit to its present strength of 123 men under the supervision of a captain, four lieutenants, four sergeants, and four corporals. Their mission was to provide on-site coverage of financial institutions and businesses considered prime holdup targets.

The robbery rate for the first five years of the stakeout operations was held to an increase of less than one per cent at a time when in other cities robberies were skyrocketing.

Due to an increase in gun related crimes and attacks on police, the mission of the stakeout unit has been expanded. In addition to the normal stakeout duties of covering banks and commercial houses, the unit has been mobilized. Each of the seven police divisions throughout the city has a stakeout car on an around-the-clock basis. Their mission now includes support for the regular patrol forces on all felonies involving weapons, handling of barricaded persons, protection of dignitaries, and anti-sniper duties.

Candidates for the unit undergo a thorough and intensive screening prior to their acceptance. After qualifying with a score of at least 85 on the Practical Pistol Course, the applicant is tested on a moving picture course to determine his judgment. If the candidate is acceptable, he undergoes extensive training in the use of all equipment used by the units.

Due to the multiple types and numbers of assorted prime holdup targets in the City of Philadelphia and the limited number of stakeout policemen available for selected sites, a wireless alarm system has recently been set up in order to cover multiple sites by one team.

This alarm system has a maximum capability of covering twenty sites. Our use of it on a proto-type basis utilized only seven transmitters. We were successful in apprehending two bank robbers within two hours of installation on the first day the alarm was in service. Since then, we have had three incidents where apprehension of robbers was made in the act.

The alarm system has the capability of overcoming the serious problem of the victim or other civilians being between the police and the holdup man. We do not necessarily have to sit in the back of a store; we can take any tactical position feasible. In most cases, stakeout men can approach the holdup scene from a nearby external point. The console can even be placed in a vehicle to permit the men to cruise the target area.

It costs over $80 per day for a two-man stakeout team to cover a potential holdup site. Normally, to cover 20 sites would therefore cost over $1,600 in salaries per day, but this alarm system lowers the cost by lowering the manpower need.

The Philadelphia Police Department has recently received a LEAA grant of $146,445 to purchase ten wireless alarm systems. Included in the items to be purchased with the funds are ten decoders, 150 transmitters, 700 alarm activators, three mobile radios, five four-band radios, 26 two-band radios, 30,000 feet of wire, 110 lightweight armored vests, 110 wig disguises, and funds toward the purchase of two vans and one sedan.

Police Commissioner Joseph F. O'Neill said that, because of the increasingly high incidence of armed robbery in the city, the department recognized that it was inevitable it would have to expand its stakeout teams and seek technical assistance.

ALCOHOLICS ANONYMOUS PROGRAM FOR POLICE

By Patrolman HUGH McGINNISS
Philadelphia Police Department

In the two years since this unit was activated we have recovered 44 policemen who are now enjoying continued sobriety and fulfilling their duties to the department.

Using figures supplied by private industry which state that for every man recovered there is a saving of $30,000, this means that the department has saved $1.3 million. When we add the eleven others who are now having a degree of trouble achieving sobriety, we will add another $330,000 to this figure.

The cost to the department? One man has been relieved from his duties as an instructor—his salary is $11,000. Of course, there are some other costs such as training, but the cost figure is not over $12,000. In other words the Philadelphia Police Department is spending $12,000 and is saving (or will save) over $1.6 million, and we are only beginning!

Three to five per cent of any male work force is alcoholic; therefore, we can expect between 210 and 350 individuals of the 7,000 man force will need treatment.

We are now enjoying an 80 per cent success rate. This means that if we can maintain this rate we will arrest the disease involving 168 to 280 men and will save the department an estimated $80 million dollars in personnel.

This is what they mean when they say that industry suffers from a "billion dollar hangover."

What about the remainder? This 20 per cent we can't help. They will be separated from the rolls of the department the same as though they suffered from heart disease, cancer, or any other non-service connected disability.

Perhaps you doubt these figures. But the New York Transit Authority alcoholism unit, established in 1965, has treated more than 3,000 employees, rehabilitated 66 per cent, and saves the authority $2 million annually in sick pay.

This is why industry says that it has learned that it is cheaper to help a man recover than it is to fire him.

Alcoholic rehabilitation rates are impressive: Allis-Chalmers has dropped its dismissal rates for alcoholics from 95 per cent after World War II to five per cent. New York City police report 70 per cent rehabilitated. Con Ed reports 60 per cent. Equitable Life Assurance Society, 65 per cent.

How do we do it? The thing is to realize, and this is sometimes very difficult to do, that alcoholism is a disease. It is a disease which afflicts one who takes alcohol in any form and can no longer drink in moderation.

But it must first be conceded at the executive level that alcohol is a disease, and then to have the employee admit that it is not only a disease, but that he will do something about it. A program must be set up to implement this philosophy, The executive level must admit that alcoholism is a problem and an illness, then the employee must admit he has a problem.

It is easy when the man is ready for help. Once you start such a program you will find that there are many who have reached the point where they know they need help. These are the easy ones.

It is the others who present problems, who must be forced into it. These are the toughies.

A. A. says that a man must reach bottom to be helped. Industry has taken this truth and seeks to raise the bottom. It has done this by creating a crisis in the man's life. And the crisis is the possible loss of his job. In New York, when a man shows reluctance about taking treatment, Monsignor Dunn throws him the want ad section of the newspaper. This is called crisis precipitation.

As of this date, the Alcoholic Counseling Unit has worked with 87 men and one woman (meter maid) who have alcoholic problems. Most of these people are members of the Police Department, Fire Department, Fairmount Park Police, and retired policemen.

During the last two years the total persons involved numbered 88. Of the persons who accepted the program, 55 were in the program longer than five weeks, while 11 were in less than five weeks. Twenty-two rejected the program.

The Sobriety success rate (based only on 55 persons in the program for five or more weeks) is: Continuous Sobriety—44; Struggling but Slipping—11; Success Rate—80 per cent. The success rate is extremely gratifying. The 11 persons who were actively struggling for sobriety included one man who had been sober for over a year but recently had a slip, as well as a fireman dismissed in January for drinking who had been sober until after receiving an official notice of his dismissal in September. People in our program feel that if we had a two-hour therapy session we would greatly improve our success rate.

When a person takes part in this type of program, he must be prepared to accept great disappointments, but in the long run the deep satisfaction of bringing sobriety to the alcoholic and serenity to their families is beyond comprehension.

IT'S YOUR POLICE DIVISION— WORKABLE SUGGESTIONS FOR THE FUTURE

By GERALD L. HUGHES
Safety Officer, Phildelphia Police Department

As Chairman of the Police Division, I have been given the job of setting forth our goals, our hopes, and our ambitions, in order to attain proper status not only with the National Safety Council, but with other agencies related to police work.

I think that we should first look at the progress which has been made with regard to the Police Division. In 1966, the Public Employee Section of the National Safety Council authorized the formation of new Divisions as contemplated in the by-laws of the Public Employee Section.

The Police Division was established and activated in 1967, although the need for a Police Division had existed for some time. It was difficult to find appropriate leaders; however, Sergeant Walter Hayes of the Chicago Police Department was persuaded to form the Police Division. He enlisted the aid of John Juriss and myself, and plans were formulated to hold sessions at the National Safety Council Conference in 1968. Programs were scheduled for Tuesday and Wednesday afternoon and efforts were made to secure other members for the Committee, but without success. In 1969, the programs were again presented on a Tuesday and Wednesday afternoon. However, at this time, we changed to the workshop formula. Again, in 1970, programs were presented, thus making these sessions at the Conference our fourth meeting as a Police Division.

During the last four years, forty-eight speakers have presented papers and talks in many areas of police work. A copy of activities issued by National Safety Council for the past three years' sessions has definitely established a firm foundation of workable knowledge to aid any police department in the establishment of a safety program.

Dr. Planek's report covering a Police Safety Program is the result of a project from the Justice Department. When published and released, this will be an additional aid in establishing safety departments in various locations.

It is unfortunate that, at the present time,

Sergeant Walter Hayes is assigned to duties other than the Safety Department.

I would be remiss in my duties if I did not express our thanks and appreciation to Raymond Lascoe, our Staff Representative and contact man of the National Safety Council. He has done an outstanding job in making contacts, friends and members of the Police Division. He is definitely a tremendous asset to our Division. The Committee members for the coming year are: Kenneth E. Fox, Assistant Chief of Police Miami, Florida; Lieutenant James Martin, Detroit, Michigan; Sergeant Ed L. Smith, Dallas, Texas; and Sergeant Francis Jones, Seattle, Washington.

Please note that this covers various regions of the country and indicates progress for your Committee. Much, however, remains to be done, before satisfactory results can be obtained.

First, in the area of organization, we should have committees representing Federal police, state and county police, and security. All are closely related to each other. Yet, all have their own type of safety problems. We want and need men for these committees. I can only caution: This is a working committee. If you are only interested in prestige, etc., please do the Division and yourself a favor, do not submit your name.

Goals

All the goals could be wrapped up in a definition: Service and aid to all police personnel to prevent injury and resultant suffering. We have no goal other than to attain the above objective.

Basic to the above goal would be increased and updated training to attain a professional attitude toward safety and safety equipment.

Safety should be a basic requirement in all types of training, and adequate research should be utilized in updating and developing new procedures. As an example, because of increased use of drugs, we are having more and more policemen getting their hands punctured by hypodermic needles hidden on persons being arrested. Therefore, research in new patting and frisking procedures should be instituted.

More departments should participate in forwarding injury reports to our clearing house at National Safety Council in order to formulate bases to more clearly define our safety problems. This should be our initial drive.

We need go no further than the 1971 edition of *Work Injury Rates*, as published by the National Safety Council, which shows only 140 units under municipal police as reporting. They show an injury frequency rate of 62.98, which is approximately a 19 per cent increase over the 68 to 70 frequency. This is also the highest rate given under the government employee's section of the above report.

Adequate and immediate care for our injured policemen should be at least as speedy as on the battlefield. We take too long in having our injured men placed under proper medical care.

Some pertinent needs (and all of them are really projects in themselves), can only be achieved by an active and effective committee.

We could start with the uniform itself. Very few are made of material to serve the needs of the police today, such as being acid proof, fireproof, easily cleaned, and so forth.

Also, little provision has been made for carrying of necessary equipment. The uniforms are simply not designed to carry the necessary equipment, and if we keep adding to the job, as we do in Philadelphia, I believe you will all have to pull around a little toy wagon.

Safety glasses as such, for all men on police duty. I personally believe it is criminal negligence to place men on the street during this period of violence without this protection.

Safe toe shoes are another much needed piece of equipment which could be used to great advantage by a policeman and help reduce injuries to the feet and toes.

Hard hats, for head protection. Not riot hats, but hats designed for appearance and to give protection that is required not only when driving a car but at all other times, particularly when making an arrest. Much is needed in this area.

Electronic equipment. This covers a wide area, and foremost should be instant communications, with hands being free to attend to regular duties, cameras activated to take pictures and sounds during an arrest or chase. Flashlights that would not reveal the source of the beam. Stun-ray, to decrease resistance to arrest. Many items in the electronic area will also greatly aid in police work and reduce accidents.

The first obvious area that should be standardized is the cars we use in police work. Many cities have special specifications which are desirable and have proven beneficial in doing police work. However, no effort has been made to correlate and eventually to standardize as an aid to manufacturers, whose chief complaint has been, "We cannot supply a standard car; you require too many deviations".

The Justice Department has made many grants in this area, as well as the Department of Transportation. It seems very logical that unless a grant is made to American Standards, our Police Division, in conjunction with National Safety Council, would be a logical starting place to correlate and distribute this information.

I have heard many excuses and alibis by police officials who keep stating, "Safety programs won't work; police work is dangerous." To this, I readily agree, but I would also state that of all the cities in various sections of the country in which injury reports have been submitted, I have yet to see a report which reflected over 33 per cent of t injuries actually incurred during pol work. This is a high percentage and can reduced by proper training and professio procedures. However, in answer to those w say, "Safety programs cannot be acco plished in police work," what about t other 66 per cent which represent the co mon run of accidents such as falls, strai and sprains, which have been experienc by employees in all types of work?

Safety programs do and will work for p lice departments who will follow the basi fundamentals, showing a great reduction i hours lost due to injuries. This will result i a savings of money to the cities so that th people engaged in police work can receive fair remuneration for the work that they do

The Philadelphia Police Department be lieves that safety does work and is actively supporting the program. The results are apparent. We are showing a 26.9 per cent reduction in our fleet accidents, a 20.4 per cent reduction in injuries and in days lost, a 38.8 per cent reduction for the first eight months of 1971 as against 1970.

I am satisfied the above results can be duplicated percentage-wise in many and all police departments, and that is the number one goal of the Police Division.

PUTTING SPACE AGE KNOWLEDGE TO WORK

By S. J. UCCETTA
IIT Research Institute, Chicago, Ill.

During the past decade the American people have spent 35 billion dollars on the space program. To put these dollars in the proper perspective, however, it should be remembered that they also spent three times as much on alcohol in the same period.

While little profit is likely to be gained from the consumption of alcohol, we are certainly beginning to see some return for the money spent on getting a man to the moon. Some of the benefits—like the new "space-age" fabrics—are tangible; others like improved communications, may be harder to define. Nevertheless they are already beginning to alter the social and economic pattern of our existence. And this is only the beginning.

Behind the new machines and new techniques which have already been taken into use, there is a vast and growing bank of innovative knowledge which, as yet, has scarcely been tapped. This is the aerospace technology and when it is altered, adapted, refined or changed for practical use in the community, the resulting new machine or technique becomes what the journalists and politicians often refer to as "space spin-off". To those of us who are more closely associated with it, the process is known as "technology utilization".

Call it space spin-off, technology utilization or whatever you like, the fact remains that the ideas which have brought the technical breakthroughs in the space program are capable of resolving many mundane problems which are not even remotely connected with space. This is primarily the story of how we are trying to help find technology to solve just one of them—of efforts to provide an improved life support system for firemen.*

First, it is necessary to say something about how aerospace innovations are matched to specific problems. This task has been taken on by the Space Agency, NASA, which in 1958 was charged by Congress with making the results of the Space program available to all who might benefit from them. To do this NASA initiated the Technology Utilization Program, whose aim is the transfer of innovations and techniques from their original aerospace context to wherever they can be of use to the community. The process is known as technology transfer, and the TU Program already has notched up a sizeable run of successes.

A number of methods are used to disseminate knowledge about items of technology which show promise of secondary application. One is the conventional publishing of important work. At each NASA field installation experienced scientists and engineers serve as Technology Utilization Officers, identifying, documenting and reporting significant technological advances which then find their way into some of the 450,000 articles, books and papers generated annually by the U. S. Government. Another method is NASA's Regional Dissemination Centers. These are unique institutions, located at universities or non-profit research institutes across the country. Each Center is responsible not only for disseminating information, but for adding value to it. This is done by screening, interpreting, and assisting in applying the information to specific problems. Since these centers have the whole scientific and technical information resource of NASA available to them, and the key faculty members of their own institutions as professional interpreters, their potential is enormous.

Of most concern to the present topic is the work of the Technology Applications Teams. The first of these were assigned to biomedical problems. But when it was seen that their methods were bearing fruit new teams were formed, and the scope of their activities was extended. Each team consists of scientists and engineers with different backgrounds, and is based at a research institute from which it can draw on the experience of many more scientists and and engineers with even more diverse background knowledge. The work of the teams may be defined as putting aerospace innovations to practical use in such fields of public concern as pollution, mine safety, law enforcement and what is conventionally termed waste management. Needless to say there is no lack of problems.

How do the Technology Applications Teams work? Briefly, the first requirement is to examine the make-up of a problem and express its component factors in a scientific fashion. Before it is possible to say what sort of technological development is likely to provide a solution, the problem needs to be defined in detail. To do this it will be necessary to look at its environmental setting; to consider what physical properties might be used to effect a solution; to find out what methods are in current use; why they are inadequate; what has been tried before and discarded; and why.

Such information can be obtained only by discussing the problem with those directly concerned with it. More often than not a series of discussions are necessary before all the facts are elicited and the picture is clear.

When the problem has been defined and separated into its technical components, it is converted into functional engineering and scientific terminology. This is necessary for two reasons:

First, because aerospace scientists are accustomed to thinking and working in the precise language of science. Few of them are specialists in the subjects whose problems we are investigating and for this reason it is unlikely that they will appreciate all the ramifications of a generalized statement phrased in non-aerospace language.

Secondly, the problem must be stated in aerospace terminology if only because one of the main resources available to the Technical Applications Teams is the computerized data bank. This contains over 800,000 aerospace reports indexed in aerospace terms, and to obtain access to the information, the correct terminology has to be used.

So the first step is to define the problem in aerospace terms. When this has been done, a "Problem Statement" is sent to NASA research centers for circulation among the scientists and engineers. At the same time, a computerized search is made of the aerospace reports and any ideas resulting from it are referred back to the individual who set us the problem in the first place—the problem originator. With his cooperation the team considers the whys and wherefores of the information, to see whether or not it is useful. A suggested solution may also come back from the NASA scientists. This, too, has to be considered and *evaluated in conjunction with the problem originator.*

Eventually, one of three results will be obtained: either some device will be found to exist which exactly fits the bill; or one is located which needs some modification to adapt it from aerospace use. On the other hand it may be that there is no technological advance in the aerospace field which can provide a solution. When this is the conclusion, we have to "deactivate" the problem—relegate it to the limbo for a time.

New knowledge is being acquired, exploited, and diffused every day at a rate which is spiraling upward. Consequently if we return to the problem in another year or so, we may find that technological advancement has closed the very gap into which the problem in question had fallen.

More often than not, what transpires is that a solution can be found if some innovation or technique designed for the space program can be adapted or modified. How this works is well illustrated by what we are doing in relation to the Fireman's Life Support System problem.

As you will know only too well the inhalation of smoke and toxic gases is responsible for 80 per cent of the casualties among firemen. (According to a survey of the International Association of Fire Chiefs, in one year about 1500 firemen became inhalation casualties. Moreover, in the same year deaths of twenty were attributed to "smoke poisoning." In effect this "poisoning" was suffocation due to the lack of oxygen.) Thus, from the standpoint of effectiveness, there can be no doubt that the existing protective breath-

*An important finding made by AiResearch is related to the influence of pressure on candle decomposition rate. AiResearch has found that candles producing oxygen within a closed container have a burn rate which increases with pressure. A mention has also been made by AiResearch as to the potential of this pressure effect in producing a variable flow candle.

ing devices leave something to be disired, and the TA Team at the IIT Research Institute in Chicago was assigned the job of finding a new design approach.

To be acceptable, the system has to be reasonably cheap; it has to operate for at least thirty minutes and ideally weigh no more than 15 pounds. For visibility the facemask visor needs to be fog-proof, and the backpack harness should not restrict the wearer's movement. Finally, the mask should give the fireman protection against carbon dioxide, carbon monoxide, ammonium, hydrogen, cyanide, hydrogen sulfide and sulfur dioxide—the toxic gases which are common byproducts of today's industrial fires as well as smoke.

To the individual fireman these technical specifications rarely mean very much. He takes them for granted, and his prime requirement is for a less heavy, less bulky, and less restrictive piece of equipment than that which is now available, What he wants is something in which he can work without being impeded. And there is no doubt that it ought to be possible to devise better equipment than that which is now in use.

When we looked at the respiratory equipment now in service it seemed that there were five components where better design and the application of recent technological innovations could bring improvements:

—First: A smaller lightweight container, with a minimum storage capacity of 30 minutes of air, which will not impede the fireman's movements.

—Second: More efficient and simpler portable oxygen generators which will start to function within seconds of being required to do so, and which will provide oxygen under every conceivable condition in which a fireman may have to operate.

—Third: More efficient filtering and gas scrubbing chemicals, and a better container for them.

—Fourth: A lightweight, non-restrictive harness.

—Fifth: A fog-free facepiece permitting unobstructed vision, incorporating devices which indicate the temperatures the fireman is encountering and enable him to communicate with other firemen.

From the outset it seemed clear that the most important single factor in any new respiratory equipment was an adequate and efficient oxygen supply. Because the weight of the whole equipment should ideally not exceed 15 lbs. and not restrict the fireman's movements, the oxygen supply must necessarily be both lightweight and compact. So, if oxygen storage is a feature of the system it follows that the storage container must be small. It is also relevant to add that as the oxygen system will constitute the most expensive component, there is a clear need for its initial cost and subsequent maintenance to be economic.

Having established that the most important factor was the oxygen supply, we turned our attention to the means of storing it for use in a breathing apparatus. Three methods were considered:

1. High pressure gas storage, where the gas is compressed (to something like 5000 psi and above) to reduce its volume.

2. Storage as a 'cryogenic' fluid. For this the oxygen is compressed beyond its normal gaseous state and held at a low temperature.

3. Storage in solid form in a chemical compound which will release oxygen in a chemical reaction.

A technology search followed, and this disclosed that NASA had done a lot of research in all three areas.

The next step was to decide which of the three methods of storing oxygen was best suited to the fireman's purpose. No doubt a respiratory system could be devised, but the one which appeared to be the most attractive in terms of weight, bulk, cost, storage and safety, is that which relied on the generation of oxygen by the chemical decomposition of sodium chlorate. This is the so called 'chlorate candle'.

There is nothing new in the concept of using chlorate or perchlorates to produce oxygen. Under the trade name Naszogen an oxygen generator employing this principle was manufactured by the Germans in the 1920's for use in mine emergencies. Subsequently the Royal Navy attempted to adapt this device for use in submarines. It was rejected, however, because the oxygen contained an unacceptable quantity of chlorine.

During the Second World War the Japanese built something similar for use in military aircraft but, like the Naszogen generated gas, the oxygen was contaminated with chlorine; furthermore, there was some unwanted carbon dioxide. During the war the U. S. Navy had also been experimenting with chlorate generators and the development of improved filtration and purifying materials enabled the production of 99.9% pure oxygen. Recently, chlorate generators have been approved as emergency oxygen suppliers for use by the U. S. Air Force.

The space program, and its requirement for a portable oxygen supply to be used by astronauts operating in an airless environment has provided additional resources for research into chemical methods of producing oxygen. In particular, under NASA's sponsorship the AiResearch Division of the Garrett Corporation has performed extensive research work which has advanced the state-of-the-art of 'chlorate candle' generators. It is this 'candle' system which we feel may be adaptable for use in a Fireman's Life Support System.

The principle of the chlorate candle generator is relatively simple. Each candle is a compressed block of chemicals, in which the main constituent is sodium chlorate. When the candle is activated, the sodium chlorate decomposes at a temperature of about 600°F. into sodium chloride and oxygen. Much of the heat is absorbed by the candles and the oxygen is emitted at a moderate temperature, so there are no ill effects due to excessive heat loads. The actual oxygen output represents some 35 per cent of the weight of the candle; i.e. a candle weighing 3 lbs. will produce about 1 lb. of oxygen. In practice the candle is housed in a reaction container which also serves as a thermal shield. The ignition mechanism is located on one end and when this is activated the candle starts to discharge oxygen. Within two seconds the burning rate has reached its peak and from then on there is a steady flow of gas.

Uniform chemical composition and texture gives a constant burning rate.* Consequently, when a cylindrically shaped chlorate candle is activated, there is a steady and regular flow of oxygen—the rate of flow being determined by the candle's diameter and the duration by its length. So far, most candles have been manufactured as cylinders. But to vary the oxygen flow it is possible to mold them in other shapes. From a conical or tapered candles, for instance the amount of oxygen released would steadily increase as the candle burned down.

We selected chlorate candles as being best suited to a new design of respiratory equipment because they seemed to offer substantial savings in weight and space. They are also easier to store than the alternative systems we looked at. In some other respects the alternatives did appear to have advantages. For example one of them could probably be made into less heavy equipment than that which we have envisaged; it might also be less expensive to manufacture. But, it would be more bulky, and its maintenance costly and difficult.

To produce equal amounts of oxygen the chlorate candle generators require less than one-third of the weight and one-fifth of the space of compressed oxygen cylinders. There are other advantages also: Because the chemical is solid there are no pressure problems and no danger of loss by leakage. Because it is relatively unaffected by shocks, vibrations or even explosions it is safer than compressed oxygen. Chlorate candle generators have been punctured by bullets, yet their performance has not been affected. It is also relevant to comment on the fire risk. Chlorate candles can be stored indefinitely at temperatures of up to 400°F. In themselves they are not dangerous, although they will constitute a fire risk if ignited near combustible materials. Even then the fact that all of their oxygen is not immediately available, makes the chlorate candles preferable to cylinders of compressed and liquid oxygen.

The two ways in which chlorate candles can be used in a breathing apparatus are either in a closed-circuit or open-circuit system. We have concentrated our efforts on the open-circuit method. In such a system the air exhaled is not re-breathed, whereas in a closed-circuit the exhaled air is cleaned and revitalized with fresh oxygen to be

*Delivered at 58th National Safety Congress

re-breathed again and again as it circulates through the system.

Because the breath a man exhales contains a high proportion of re-breathable oxygen, the oxygen which needs to be added in a closed system is much less than that required to maintain the supply in an open-circuit system. But the closed-circuit requires a breathing bag, valves and a carbon dioxide removal chamber, and so it tends to be more complex and costly than the open-circuit type.

There are two basic methods by which chlorate candles may be used in an open-circuit. The oxygen can either be supplied in a constant flow—in which case we have the problem of how much that flow should be. Or, the oxygen can be supplied to some sort of accumulator tank, to be used when it is needed. In this case the amount can be regulated to fulfill the varying demands made by a man whose breathing rate will alter according to the way he is working. It is fairly obvious that this latter system will be more efficient.

Nevertheless we looked first at the idea of supplying a steady flow of oxygen directly to the man wearing the device because this obviates complexities like valves and a bulky accumulator tank. Two possibilities exist:

(1) To arrange for the flow of oxygen to be equal to the *maximum* amount needed by the firemen at moments of stress.

(2) To arrange for the oxygen flow to meet the *average* demand of the firemen.

In the first case, the flow rate would ensure the delivery of enough oxygen at any time, and is equivalent to supplying the most demanding firemen with the largest volume he will require in the shortest period of time.

The Bioastronautics Handbook* quotes approximately .13 ft^3 as the maximum inspirable tidal volume. A high volume of this order takes about 1 second to be inspired. Thus, the maximum oxygen flow rate to satisfy what may be considered the 'worst-case' situation would be approximately .13 ft^3/sec (7.8 ft^3/min).

A constant flow device emitting this 'worst-case' flow will be wasteful, and large quantities of oxygen will necessarily be vented into a potential fire atmosphere. An oxygen flow rate of .13 ft^3/sec (7.8 ft^3/min) will produce 224 ft^3 of O_2 in 30 minutes. But experience with pressurized gas bottles has shown that 40 ft^3 to 60 ft^3 of air (or oxygen) is sufficient to keep a man going for 30 minutes when he is breathing hard. So, with a device producing a total of 224ft^3 of oxygen in 30 minutes, between 164 ft^3 and 184 ft^3 of nascent oxygen will be vented and wasted.

A further drawback is that a candle to produce such a high flow rate as this will be excessibly large and will produce a lot of heat in its function. The obvious conclusion, therefore is that a high flow candle system appears to offer no advantage over existing respiratory systems.

We should note that the extreme flow demand quoted would normally occur only in a small percentage of the total use time for the breathing device. As already mentioned, pressurized gas bottles containing 40 ft^3 of air or oxygen have been rated sufficient for 30 minutes of use, but there are instances where this quantity of gas has been depleted inside 20 minutes. Thus it seems realistic to use these values as average use rates in an open-circuit system.

In breathing devices which use gas bottles and which are 'demand regulated,' gas flows out of the bottle only when the man breathes in; when he exhales the gas inlet valve is closed. Consequently, as inspiration and exhalation take approximately the same length of time, the bottle is required to provide gas outflow for only half of the time the device is being used. Thus, from a 40 ft^3 bottle which will sustain breathing for 20 to 30 minutes, gas is actually flowing out for 10 to 15 minutes. This corresponds to an average flow rate of .066 ft^3/sec for 10 minutes, or .044 ft^3/sec for 15 minutes. But it should be noted that these values represent a *mean* flow rate which includes abnormal breathing spells. (Which, as mentioned, can approach .13 ft^3/sec.)

To cater for this sort of flow rate, the constant flow chlorate candle system will be required to produce oxygen at a rate of between .044 ft^3/sec (2.66 ft^3/min) and .066 ft^3/sec (4.00 ft^3/min). As the gas is required only when the man breathes in, the oxygen emitted by the candle while he is breathing out will be wasted. And at these lower flow rates, between 40 ft^3 and 80 ft^3 of oxygen will be vented to the atmosphere. Although somewhat less than the previous case, this is still a large quantity of gas to be wasted. A smaller system of this type also has no provision for providing enough oxygen for any of the high flow demands.

From these facts the conclusion must be that an open-circuit "flush-out," constant flow system is not the most efficient way of using chlorate candles to supply oxygen to a protective respiratory device. But an open system incorporating an accumulator, and using a demand regulated valve to control the flow of oxygen from a chlorate candle, appears to offer a much more attractive alternative.

With this type of system the oxygen supplied by the candle is stored until it is needed. During exhalation the gas that is being produced is held in the accumulator and is not wasted. This means that the required candle flow-rate does not have to equal the peak flow-rate demanded by the man wearing the apparatus, since there will be oxygen available in the accumulator to supplement that produced by the candle. The main criterion for the candle flow-rate in this situation is the production of a sufficient volume of gas to sustain the wearer in the 30 minutes breathing time for which the apparatus is intended. Thus, to produce between 40 ft^3 and 60 ft^3 (for 30 minutes), a candle flow-rate of 1.33 to 2.00 ft^3/min is needed. By igniting the candle a few seconds prior to use, the accumulator may also be used to build up a suitable reserve for any extreme inspiration demands.

Thus, by choosing the proper accumulator size, right pressure, suitable materials and optimum size of candle, the weight and size of the respiratory equipment can be kept to a minimum. What can be achieved in the way of saving weight can only be determined by a detailed engineering trade-off and analysis.

Reference has been made to the use of chlorate candles in a closed-circuit system. This possibility is being studied, and a commercial firm is reported to be working on a respiratory apparatus of this nature. There is also the possibility of using chlorate candles as economical sources of high pressure oxygen. If a candle is allowed to burn in a closed container, pressure will build up without any deleterious effects on the evolution of oxygen. Consequently the chlorate candle can be used as a convenient high pressure re-charge source.

Turning briefly to the other components we have found which may be incorporated in a new life support system: Aerospace innovations which should be of value here include a simple technique to make face piece visors completely fog-free, non-restrictive harness designed for an astronaut rescue air pack, and a liquid-crystal device incorporated in an astronaut's helmet to indicate the temperatures he is encountering. Putting them together with an optimum chlorate candle system in a compact design may indeed settle the breathing apparatus problem.

Finally, some mention should be made of a new fireman's suit, which is currently being fabricated at NASA's Manned Spacecraft Center. A five layer sandwich of fire-resistant materials which were developed for the space program is being used. The outer layer is of a material called Durette—with inner layers of Fluorel on Durette, woven Fypro, batt Fypro on a liner of woven Fypro. NASA has paid for the development and manufacture of these suits. The Houston Fire Department will test and evaluate them in the field. We believe that these suits together with a new respiratory system should be the answer to many fire fighters' prayers.

In conclusion I would like to revert to the theme of technology utilization. The new fire resistant suits and proposed breathing apparatus have evolved from the application of only a minute fraction of what NASA has learned and invented in the course of the past decade.

The story is told of a character who appeared before the Roman Emporor Tiberius with a new type of glass goblet which he had invented. When the Emperor had handled and admired it the man purposely

*NASA publication #SP-3006

dropped it on the marble floor. It neither cracked nor broke. Tiberius asked: "Have you told your secret to anyone?" "No, Caesar, to nobody." Tiberius turned to his guards: "Cut off his head—glass like this will depreciate the price of gold."

Mercifully times have changed, and in 2000 years the world has turned a full circle. We do not wish to conceal the technological and scientific outputs of the space program; our purpose is to exploit them, to put them to use solving problems of everyday life on earth. Firemen have—or will have—other problems for which a technological solution may be found.

As I indicated at the beginning of this talk the Technology Applications Teams exist for this purpose, and we shall be happy to serve you.

A CITY SAFETY ENGINEER LOOKS AT OSHA

By DARREL R. BARNES
Safety Engineer, City of Colorado Springs, Colorado.

George Guenther, of the U. S. Department of Labor, has stated, "The name of the game is Occupational Safety and Health." In every circle of the safety man today, OSHA is the source of conversation. We might hear topics as, "Have you been hit with an inspection yet?" "What are you doing to comply, or are you going to wait until the 'Feds' look you over?" "I thought that the Act did not include the municipal government!"

Under Section 3 (5) of the Act, the term employer means "a person engaged in a business affecting commerce who has employees, but does not include the United States or any state or political subdivision of a State." By this interpretation, a city government is excluded. Let us then look at Section 18 (b) which reads, "Any state, which at any time desires to assume responsibility for development and enforcement therein of occupational safety and health standards relating to any occupational safety or health issue with respect to which a federal standard has been promulgated under Section 6, shall submit a state plan for the development of such standards and their enforcement"—as long as the state plan contains satisfactory assurances that such state will, to extent permitted by its laws, establish and maintain an effective and comprehensive occupational safety and health program applicable to all employees of public agencies of the state and its political subdivisions, which program is as effective as the standards contained in an approved plan. It then becomes obvious that we in the municipal governments are subject to the Act in one form or another. I, therefore, agree with Mr. Guenther—the name of the game is occupational safety and health. Almost all states have submitted a state plan or will be doing so soon. The U. S. Department of Labor hopes to have the state plans in effect by July of 1972.

We must ask ourselves then, what are we as cities going to do to prepare ourselves for this program? It appears that it will be two or three years before the potential benefits of the act are felt by a majority of the workers. Until the state Department of Labor and Employment in Colorado comes forth with standards, our city is forging ahead using present standards now in effect and implementing others as they are put in effect.

Let us look now at what we in Colorado Springs are doing to comply with the Act. First of all, in conjunction with the local chapter of American Society of Safety Engineers and the Colorado Safety Association, a number of seminars have and are being set up to acquaint all persons concerned with the act. Speakers in these seminars are from the Federal OSHA Regional office in Denver and also from the State Department of Labor, as well as a member of one of the target industries that has been widely received and have been instrumental in aiding businesses and industry in supplying many answers to their questions.

My department is currently recording accident and injury statistics in a method similar to the recordkeeping requirements under the Act. Since Z16.1 is a consensus standard and is primarily intended for external comparisons such as one industry against another, it provides a gross measurement of safety performance and not the detailed measures of safety performance. Since most employers keep several sets of injury records such as workman's compensation cases, a first aid log, and a log or register of all cases reported, the new method might well serve as a single form. It is my understanding that the National Safety Council will continue to publish Z16.1 rates, and its awards programs and safety contests will also continue to be based on Z16.1.

Code Enforcement. At the present time we in cities are faced with a problem of discrepancies in the codes. The Federal inspectors have adopted some codes such as Construction Safety and Health Regulations, Volume 36, Number 75, of the *Federal Register* and Volume 36, Number 105, the National Consensus Standards and the Established Federal Standards. The state is still operating with their codes that have been in effect for some time.

Perhaps it would be well here to mention at least one of the discrepancies. The new Federal code for trenches reads: "Banks more than four feet high shall be shored or sloped to the angle of repose, where a danger of slides or cave-ins exists as a result of excavations. Excavated material shall not be stored nearer than four feet from the edge of the excavation." The State of Colorado excavating and trenching law reads that "All trenches or excavations five foot deep shall be shored or taken to the angle of repose and that excavated material must not be piled nearer than two feet from the edge of excavation." With this, then, you can see how some problems have arisen for a municipality that follows the state laws to be faced with the new Federal laws; and, if an inspector from each level, state and federal, were to inspect one of your operations, confusion could reign as to what standards would prevail. We have adopted the state standards and all of our rules within the city must be changed. We have also printed in our specifications to bidders, bidding on a city contract, that they follow existing state and local laws pertaining to the nature of the contract. These specifications must also be changed to include this portion of code enforcement. Since it is at least a year or two before the states assume the inspection procedures, we in the cities can bring our own house in order more or less at our convenience.

To bring your own house in order, I would suggest the following: If you don't have a copy of the codes or the recordkeeping requirements, obtain them. Review the codes and update your present city ordinances or rules to comply with the Federal standards and set an effective date of compliance. Make a thorough inspection of your own facilities as soon as possible to determine any and all violations. Then those violations requiring minimum amount of money and time should be corrected immediately. For those violations requiring reasonable amount of money or time, set a realistic deadline, and meet it. It would probably be well to document this aspect. Since OSHA feels that expense is not a valid factor to be utilized in appeals, budget the money needed as soon as possible; and in the interim, if there is a time factor involved on a serious violation, you should apply for a temporary variance immediately. A variance could preclude a citation.

Review all layouts for new or changes in facilities for possible violations. Set up procedures with your purchasing department that orders for new machinery or equipment be issued only if manufacturers comply with Federal standards. Certainly, with all of the above precautions taken, they could be used as an act of good faith if an inspector should arrive at your plant, and would certainly be considered before any citation or penalty was assessed. Except in certain circumstances, OSHA will probably restrict citations with respect to violations abated at the time of

inspection. Assistant Secretary Guenther has stated, "It is the intention of the Labor Department to encourage voluntary compliance to the maximum extent possible."

Another idea worth pursuing is that you meet with your state officials in charge of the inspection program and jointly resolve any major differences before the full scale program is implemented. I feel we have one of the finest relationships with the state inspectors and their supervisors that could exist due to levels of enforcement. Prior to OSHA, if a state inspector arrives in town to inspect trenching or ditching operations, and a city contractor was involved, the state inspector would contact my office and we would furnish an inspector or myself to accompany him. If a contractor was in violation of a state requirement and would not want to correct the violation immediately, steps were taken by the city inspector to immediately shut the job down and withhold funding of the job until compliance with the inspectors' regulations was met. The state inspector assigned to my city and I meet at least weekly to review any jobs needing special enforcement. I have, on occasion, due to absence of the state inspector, investigated faulty operations and recommended to the contractor suggestions to improve his operation, and the state inspector has done the same for me. I realize under OSHA that the Federal inspector is not allowed to give advance notice of an inspection; but, under the conditions described above, my office did not always know when an inspector would be in the area or what job he wanted to inspect. So, further, I recommend that you meet with your state safety officers and jointly inspect your facilities and correct deficiencies immediately.

Finally, I believe the cities have sat back long enough and let someone else, such as the state, enforce regulations on them. It is time we stepped forward and initiated local safety rules applicable to your particular city needs. Not all cities are faced with the same problems as ours wherein we own our own utilities such as gas, water, sewer, electrical generation, and transmission. We have many large contracts yearly with private construction firms, and we should set the standards for these contractors working on our facilities, so that all may fully comply with requirements of OSHA.

Let's all get into the new game. No game can be played without officials, rules, and time limits. This game of OSHA is no different. Let's get in on the kick off and play the game to win.

INVESTIGATE BEFORE YOU EXCAVATE

By DEAN SWEETWOOD
Ottawa Area System Operating Supvr., Northern Ill. Gas Co., Ottawa, Ill.

Continuing population and industrial growth is creating a continuing need for more extensive underground utility facilities.

Provision of these facilities in the space available on private property as well as in public right of ways is creating constant problems of co-ordination at both design and construction stages.

We, as a public utility who builds and maintains underground facilities, must continue to recognize our responsibilities.

Each utility company has different problems, depending on its size, geographical location, area served, and many other variables. Some of you work for different agencies—it could be local, township, county or state departments, and I am sure that each of you have many rules that you must adhere to, especially since the new Federal regulations touch all of us in one way or another. No set of rules or regulations can make you or your men safe; it has to come down to the individual person. How do we get to him to start thinking safety, to start thinking about buried underground facilities? There are no magic words that can be said that will make him safe. All the responsibilities do not fall on the utilities; the responsibilities fall upon you.

I would like to describe some of the problems you might encounter if you worked in the area of Northern Illinois Gas Company. We serve better than a million customers in more than 500 communities covering over 16,000 square miles of northern Illinois. There are over 20,000 miles of various size mains in our system and they operate at various pressures.

With this background I would like to tell you what we at Northern Illinois Gas Company do to safeguard our underground facilities. This can be broken down into three categories: (1) the company's policy and standard practices; (2) the training of employees; (3) the contact with the contractors.

First I will discuss our company's policy and practice. Annually in the spring of the year we mail a letter to all excavating contractors and public works departments who have done work within our service area. A letter is also sent to the engineering firms who design the public improvement type work. Between four and five thousand letters are mailed. This letter requests cooperation in notifying us so we can locate, free of charge, our facilities in advance of the actual work.

We have fixed rates that we charge per man for repair of our facilities. This rate reflects the charges for men and tools. We also have established rates for material and transportation. We have pursued a rigid collection policy since 1962. Our policy is to recover cost as a result of damages. Because of this policy, I believe the contractors in our area are more willing to cooperate than in the past.

Many of our cases go to Court for settlement. Of course, we must and do report certain damages to various government agencies as required per Department of Transportation.

Training of our own employees is one of the most important parts of our Watch and Protect Program. Our men are equipped with radio trucks and electronic pipe locators and carry I.B.M. views and a set of microfilms of our gas system. Each man is a self contained mobile atlas. We can give him all the latest equipment and information we have, but unless we train this man properly all this expense is lost. What we try to do is to put a new man in the field with an experienced man. This on the job training is invaluable, he can pick up many tricks of the trade. We do not ask our men to excavate our facilities, just to locate and mark them. We feel that the hand excavation over our facilities is the contractor's responsibility.

This brings me to the third part of our program, the contractor or municipality or

state maintenance departments. What can we do for you? We have all of our people waiting to help you with your job. Let the utility know what you are going to do and when, give them some advance notice. These men can be invaluable to you. They can point out areas where conflicts might exist with your project. They help make your job safe for you and your employees.

Let's discuss some of the problems that you could run into in some gas companies' area. First, you could come across many different combinations of meters, regulators, and pressures. In some areas you will be able to see the regulator and the meter on the side of the house. This should be a clue to call the local utility company. In other areas the meters may all be inside, so if you rely on just looking you may be in for a few surprises. In many rural areas you may find regulators or meters out by the property line.

Let's not forget about the various pressures that you may encounter. It will vary from six inches wg (¼ psi) to several hundred pounds, so if you would hit any of the above combinations the dangers could be different in each case.

We in the gas industry are using different materials than we did a few years ago. We used to use cast iron main and steel services, then we went to steel main and steel services; now we are installing steel main and copper services, and in the future you may see steel main and plastic services or even plastic main and plastic services. In days gone by you knew that when you hit something solid it might be the gas line; now with copper and plastic lines you can't tell until it is too late.

To safeguard you and your crews, there are a few easy steps you can take to avoid most injuries or accidents:

1. Contact your local utility and see if they will speak at your local safety meeting—if not, what information they can supply you with.

2. Check with the utilities in advance of any excavation. (Investigate before you excavate)

3. Locate, measure, and hand expose any utility before starting to excavate.

4. Educate all of your men, not just the crew leaders or foremen. After all, safety is everyone's responsibility.

5. Do the steps over and over until it becomes part of the job. (Investigate before you excavate)

Fortunately, many of the problems can be eliminated by better communications between the utility industry and the many local public works departments. With the establishment of good communications much of the damage can be eliminated completely without the expense of excessive sums of money, but with the exertion of the priceless commodities of good will and cooperation.

HOT PAINT VS. COLD PAINT FOR HIGHWAY STRIPING

By HARRY O. PRICE, P.E.
Traffic Control Engineer-Supervisor, DOT, Wisconsin Division of Highways, Madison, Wis.

About four years ago we first became aware that there were economical materials available which would dramatically reduce the drying time of pavement marking paints. The Wisconsin Division of Highways had long been aware that there were certain drawbacks in the pavement marking system which had been utilized on Wisconsin's state trunk highways for over a quarter of a century. These included:

1. Numerous vehicles crossed the wet lines during the 30 to 60 minutes between the time that the lines were applied and the time that they were fully dry. This tracking was unsightly at best and could be hazardous if enough paint was picked up to obliterate the lines.

2. In an attempt to minimize this tracking we and all other jurisdictions placed some sort of line guards on the wet lines. These have been produced in many different configurations but in Wisconsin we used a small rubber block to which was attached a red flag. Passing traffic frequently knock these blocks off the wet line and into any portion of the highway where they could be hazardous to traffic.

3. Once the lines were dry, it was necessary for a member of the pavement marking crew to pick up the flag blocks. This required operating at 15 to 20 mph in a high speed traffic flow, which was a distinct hazard to the personnel involved as well as to traffic generally.

Through the years various products had been produced to minimize these problems. Principal among them were the plastics, both hot and cold. While these were effective they were also costly, and for this reason were used very sparingly on only the most important highways. More recently a heated pavement marking paint had been placed on the market utilizing temperatures of the order of 180° F and once again being considerably more costly than the standard cold paints. In addition, these were generally applied with an "airless" spray system which could involve spraying pressures of 1,000 psi or more. We had therefore not given serious consideration to this material both because of its cost and because of the combination of high temperatures and high pressures which were involved.

It was early in 1968 that we first heard of a material which could be applied at temperatures of 120° to 140° using pavement markers which were essentially similar to those which we had previously been using but which were modified to include heating equipment. Reportedly, this material would dry in three minutes or less. In the fall of 1968 we were authorized by the Commission to equip one of our pavement markers with a paint heater and to purchase 6,000 gallons of the 120° material for use during 1969. One of the pavement markers based in our district office at Waukesha was selected as the machine to be converted. The conversion was accomplished in our own shop at a cost of approximately $5,000 and utilized the cooling fluids from the truck engine and the compressor engine as a heat source.

During 1969 we very carefully studied the operation of this crew and the serviceability of the lines which were applied with the heated paint. When using the heated paint the crew did not place flag blocks or any other protective devices on the wet line. They did, however, use a truck following the marker to discourage traffic from crossing the lines. Where we had previously had wet line some five miles or more in length with the cold paint, this heated paint gave us a wet line of only one-half to one mile. Drying time as low as 75 seconds were observed on hot days in midsummer, although two to three minute drying times were more common. More recently in early Spring and

late Fall we have found drying times as long as four minutes. Serviceability of the lines was carefully studied with a preliminary conclusion that the length of life of the lines was approximately the same as that which we would expect with cold paint.

On the basis of these observations we were authorized to purchase 16,000 gallons of heated pavement paint in 1970 for use by the same crew. During 1970 we confirmed our previous observations and gained new experience with the heated paint. We found among other things that it was possible to increase the speed of marker operation from 10 to 12 miles per hour and, on the basis of the materials purchased, we estimated that our materials cost would increase by about 27 per cent if we were to convert completely to the 120° paint.

While this experimentation was underway we continued to study the 180° material and a newer material designed for application at about 275°. Both of these materials reduced the drying time below that which we were achieving with the 120° paint, but both of them would increase the cost of both the pavement markers and the paint materials rather considerably. On the basis of manufacturer's literature we estimated that the cost of the 180° paint would be over twice the cost of standard cold paint and that the pavement marker would cost some three times as much as the machines which we had previously been using. On the plus side, however, this material would dry in a period of one to two minutes or about ⅔ of the time that we were routinely achieving with the 120° paint. The 275° materials would cost some five times as much as the cold paint and would require a marker which cost between four and five times as much as the previous markers. With this material, drying times of the order of ten seconds could be expected, and in one demonstration which I observed a seven second dry was obtained. For all practical purposes, then, this material could be said to dry instantaneously. In the case of these higher heat materials we were concerned about the possible hazards to our pavement marking personnel working around the lines carrying the heated material which would be under pressures of 1,000 pounds per square inch or more.

During the period when our studies were underway, one additional material was brought on to the market. This was a hot plastic which could be sprayed, whereas previous hot plastics had been extruded onto the pavement. Because of the newness of the hot spray plastic it was not included in our study, but we have placed one test installation using the material and are currently observing its performance.

Our studies were summarized and presented to the Commission in August 1970 with a recommendation that our fleet of pavement markers be converted to utilize the 120° paint over a period of three years. We emphasized at that time that the 120° paint would materially reduce the amount of tracking although tracking would not be eliminated. It would also eliminate the need to place protective devices on the wet line with their attendant hazards to traffic and to the personnel who were required to remove them. The drying time of the material would be reduced from a period of some 45 minutes to about 2½ to 3 minutes, while marker speed could be increased from 10 mph to 12 mph. The cost of the conversion of the equipment would be about $5,000 per machine and subsequent new pavement markers could be expected to cost about $5,000 more than previous markers, without allowing for the inflation present in the economy. Also, we felt that we could expect a cost increase of about 25 percent in our materials costs.

Largely on the basis of increased employee safety and traffic safety, the Commission approved our recommendations. We then asked the state Bureau of Purchases to obtain samples of paint from various manufacturers which could be utilized in the heated machines. Eighteen manufacturers responded, thus giving us assurance that we were not dealing with a proprietary product and that we could expect to have good competition when bids were requested.

On these bases, we converted four additional machines to use the heated paint, making a total of five machines in the state

during 1971 which used about 150,000 gallons of the heated paint. Somewhat to our surprise, when bids were received on this material they were essentially similar to the bids received on the cold paint which would be used on the remaining six machines.

During 1971, with five of the heated pavement markers in operation, we made one more discovery which further increased the attractiveness of the heated paint. Whereas we had previously utilized a crew of five men to place pavement markings, it was possible to reduce that crew to four men without jeopardizing the increase in production which was achieved by higher marker operating speeds. It would be somewhat oversimplified to say that the man who was eliminated from the crew was the man who had originally placed the flag blocks; however, this had previously been one of the larger portions of his duties.

We expect to convert four more pavement markers during the coming winter and the remaining two in the winter of 1972-73.

In summary, we can say that we are quite satisfied with the revisions in our pavement marking operations which we have made, but that we are still looking for further improvements. Pavement marking technology at the present time is a very rapidly changing one, and we have high hopes that additional improvements can be made within the next few years.

I should also emphasize that the heated paint system which we are presently utilizing was tested under the particular conditions in which we work in the State of Wisconsin, and that our results may or may not be valid in other jurisdictions. In particular, we have heard that some of the cities in Wisconsin do not feel that our drying times are short enough for urban conditions. We also have some doubts as to whether the drying times are adequate for certain of our high volume freeways. For these reasons we are continuing our own studies, both of those materials which we have previously evaluated and of other materials which are being brought onto the market, and we would urge other jurisdictions who are considering a change to carefully study all of the various products which are available before reaching a decision.

HOW TO PREPARE DO-IT-YOURSELF TRAINING AIDS FOR THE REFUSE COLLECTION OPERATION

By WILLIAM DUNCAN
Safety Director, City of Grand Rapids, Michigan

The subject of training in any form is one that always turns me on. This is so because I have long been convinced that much of our accident experience can be traced to a lack of well-planned, organized job instruction and training. My research and comparing notes with other cities has also convinced me that this is a problem which many municipal government agencies share.

If you accept the premise that JIT is an essential road to accident prevention, then you must consider the many methods of accomplishing your objective that are available. These may range from sending selected personnel to schools conducted by other agencies, to formal classroom instruction conducted by your agency, to instruction of an employee on the job by his foreman.

The problem most often faced by a safety professional when trying to organize safety training is the reluctance of department heads to release employees for any length of time to conduct formal training classes. They must be sold on the idea that the training package you offer has a reasonable chance of achieving its objective—that training employees to perform safely will result in increased production, decreased cost of operation, and more available manpower. The best way to attract a department head's interest in the beginning is with effective training presentations that require little effort by his staff and involves a minimum loss of man hours to conduct it.

The answer to this requirement is development of short training sessions that can be conducted at the beginning or end of a shift, can be presented at the normal assembly point of his department units, and are easily conducted by department supervisors with a minimum of preparation. Such a training effort should make use of training methods that promise a high degree of success in communicating your message.

In studying methods of training, we are told that we shall increase the amount of communication that is received and retained by appealing to as many of the student's senses as possible. Experience in industrial training and in sales promotion has proved audio-visual presentation to be a highly effective tool for communicating ideas, information, and instructions.

There are several types of audio-visual display that meet the requirements just described. Sound movie films are the most effective if they are relevant to the subject you want to cover, and relevant to the application of that information by the audience in their work environment. There are many good ones available, and we use some of them. They are expensive, however, and they can become obsolete with changes in equipment or methods. They do require some expertise in their use.

An economical substitute for sound movies is the film strip or color slide program synchronized with a taped narrative. The initial outlay for equipment may equal or even exceed the cost of top grade movie projection equipment. However, the use of this type program costs less on a continuing basis, and offers several advantages. For instance:

1. A program can be produced by your people that is completely relevant to the experience and work environment of the viewers.

2. The actors in your program are known to the viewers and in most cases are performing on actual job sites they recognize.

3. The quality and uniformity of safety training content can be controlled.

4. The supervisor inexperienced in conducting safety meetings can present a quality program and may learn from it how to organize his own presentations.

5. The content of the program may be more economically changed.

6. The scope of training subjects that may be covered is far more comprehensive than that offered by most of the available sound movie films.

We have started a project in Grand Rapids of producing color slide programs for audio-visual orientation of new employees, and specific training of all employees in selected safety subjects. We are concentrating on orientation of new employees first. Analysis of our accident experience consistently relates about fifty per cent of our disabling injuries to seasonal employees and permanent employees in their first five years of service.

Our orientation program is based upon this philosophy: the new employee is grateful because we just gave him a job. He has many questions about us as an employer. He wants to know about his new job and the working conditions related to it. He is probably more receptive at this point to any relevant information we wish to communicate than he will be later. It is a golden opportunity to provide correct answers to his questions and, while we have his interest, to emphasize some key points about his employment that we want him to know at the start.

Our orientation program will consist of two parts:

1. A general orientation shown to new employees at time of hire. Our objectives are to help the new employee understand: the difference between a city government employer and private industry employers; our organizational structure and the occupational tasks performed in the various departments; public relations responsibilities; and our safety program and its objectives.

2. A job orientation shown to the new employee when he reports to the department to which he will be assigned. Our objectives in this program are to help him understand: the department organization and its mission; how his job will fit into department operations; the nature of the tasks he will perform, and key work procedures involved; types of equipment he will work with; and potential hazards and equipment or procedures designed to protect him from the hazards.

We are also considering a third phase consisting of special interest programs designed to educate in specific problem areas. For instance, we plan to produce programs in some of the following areas where accident frequency is high, or where the potential loss severity is high: trenching and excavating in utilities maintenance work (including some study of soil compositions and reactions to stress); signing and barricading utilities repair work in public streets; snow plowing and snow removal; working in confined spaces; correct use of ladders, scaffolds, suspended platforms, etc., for maintenance and repair tasks.

I have chosen the color slide route over film strips because I believe they are more versatile. Slides from one program may be duplicated for use in other programs. Slides can be replaced easily at low cost when changes in equipment or work procedures make them obsolete.

Like any other teaching effort, the production of this type of program requires a logical, organized approach. The objectives must be determined—they must provide reasonable assurance of fulfillment. A lesson plan, or outline should be developed. I work with the department safety committees on these steps. We list all the information the new employee should be given. We then review the list to identify key points that should be in the program and information better saved for follow-up instruction on the job by supervisors. I feel we should limit the program to a maximum of 30 minutes duration and try to stay within a reasonable limit of new information the average new employee can absorb and retain.

We then write the narrative, leaving space in the left margin for notes on what pictures to take that portray the thought we wish to communicate. There are usually places in the script that just don't work out in the picture sequence. You have no alternative then to changing the slide sequence or the script itself.

I spend a large part of my work week touring city work sites or inspecting and poking around shops and plant facilities. The camera goes with me along with a list of pictures I need, and I get as many as possible on the job site of actual operations. Department su-

pervisors keep me informed in advance of scheduled jobs they know I am anxious to photograph. It is sometimes necessary to stage an artificially posed scene to portray a specific mood or thought. Department supervisors help with technical advice and men and equipment to stage the scene.

It is necessary to explain to the crews being photographed how I plan to use the pictures. I had our city attorney draft a release form to obtain each employee's release to use their photographs for showing in training and seminars and conferences like this. When artificial scenes are posed, the amateur employee actors should be told the contents of the script and scenario so that they understand the part they are posing for.

There are sometimes parts of the script you find you cannot portray with a live-action picture. If it cannot be changed to something suitable for live-action shots, and is too important to eliminate, then consider still shots. It may be possible to use one of the many varieties of posters available, or pictures, diagrams, charts, drawings, etc. Whatever you select may be sprayed with adhesive, tacked on the wall near a window, and arranged for a picture. I purchased a set of accessory lenses for about $12 which will allow me to focus down to a distance (camera to subject) as close as six inches. A tripod and cable release to avoid camera movement are essential equipment for this project. I use high speed Ektachrome film with a film speed of 160. This film can be pushed in developing to a film speed of about 100, but you are stuck with that setting for the entire roll of film and the processor must be told to push it.

As I begin to collect slides, I file those selected for the audio-visual program in plastic Visi-files. These are note-book size and hold 20 slides per sheet. I number each pocket with a grease pencil to correspond with the numbered sequence on the narrative. The narrative and Visi-files are punched to fit a three-ring binder. The Visi-files allow easy review over a light box or at a window, and frequent handling to make substitutions, etc., without getting finger marks on the slides.

For equipment, I am using a 35 mm camera, single lens reflex, with an automatic shutter. When set on automatic, you select the shutter speed and the built-inlight meter automatically sets the lens opening for correct exposure. With certain exceptions, all you have to do is focus and shoot the picture. I chose this camera because I can take it off of automatic and manually set the lens opening to allow more exposure for back-lighted subjects or deep shadows. You lose some of that control in cameras that automatically set shutter speed instead of the lens opening. I bought the standard 53 mm f2 lens, a 28 mm wide angle lens, and a 125 mm telephoto lens. The cost, including some accessories such as a tripod, electronic flash, fiber carrying case, etc., was about $400.

For the slide projector, I bought a heavy duty, commercial use, carousel model with auto-focus, zoom lens. It is designed for remote control and automatic slide changing from taped cues. The zoom lens adapts it easily to use in either large or small rooms. It will accommodate carousels that hold up to 140 slides. The cost was about $180.

My tape recorder is a heavy duty cassette type, built for commercial audio-visual program use. It will accommodate tapes for up to 90 minutes running time. An auxiliary speaker is mounted in the cover, with a 50 foot cord, which allows me to locate the sound source by the screen. It can be used as a P.A. system, and the micro-phone control can be used to over-ride the tape for comments during the program. It has an automatic level control that produces very good tone quality without having to constantly monitor the volume control. The cost was approximately $350.

Taping the narrative involves some techniques that may be as new to you as they were to me, particularly, if you want to add some refinements like background music. It is usually easy to get free professional advice from local radio and television stations and school audio-visual departments. I also found our public museum people have some expertise in this medium. Many college audio-visual departments stock music especially suitable for background that can be borrowed or rented.

For my first effort, I borrowed a taped Dvorak symphony, selected the passage I wanted to use, and borrowed another tape recorder from the audio-visual equipment supplier who sold me some of my equipment. One of our electrical inspectors helped me do the recording. He operated the separate tape with the music on it, adjusting its volume on my signal as I recorded the narrative. The script is paragraphed to separate the narrative applicable to each slide. I recorded with a slight pause (about two seconds) between each paragraph and slide change. This makes it easier to back up and re-record a paragraph without lapping the rest of the recorded portions.

Let me share with you some of the problems I found in recording techniques and what I learned from my mistakes. I have never been able to record a 20 or 30 minute narrative without getting my tongue twisted around a difficult word here and there and having to back up to record that paragraph over. I found that when I started the tape again in the recording mode, I often got a metallic impact or scratch sound on the tape. I learned that, by turning the recorder volume to zero and then turning it up to the previously marked recording level after the tape is again started in the recording mode, these tape defects can be eliminated. Another source of unwanted sounds on the tape is holding the microphone in your hands. I plan to buy a neck harness so that I can suspend the microphone on my chest with the pick-up just below and slightly in front of my lips to eliminate the need to hold it in my hand.

I would like to make one more point about this type of program—the attention span for still pictures (slides) is very short. The minute the viewer digests the meaning of a picture, his attention will wander from your narrative. There is no movement, as in movie film, to attract continued attention. Slides should be spaced close together to retain attention. A long paragraph of narrative without changing slides will turn off the intended listener.

A SAFETY PROGRAM FOR PUBLIC EMPLOYEES IN HOSPITALS AND INSTITUTIONS

By WEDO FRANK ESPOSITO Assistant for Administration, Hospital of the University of Pennsylvania, Philadelphia, Pa.

Lip service and paper programs have been replaced by functioning safety programs through the combined efforts of Philadelphia hospital fire marshals.

Hospital safety has been pregnant for 50 years—let's let it give birth. Let us do in the roaring 70's what we failed to do in the past. Is it going to be the roaring 70's or the sorry 70's for us in the hospital safety field?

The hospital safety revolution began in December of 1961 due to the fire at the Hartford Hospital, which had been described by some, including its architects, as "one of the safest buildings in the world." But the fire did happen—seven patients, four employees, and five visitors died.

The fire itself has been described as a freak—something that could happen only once in a lifetime. It just couldn't happen in this brick and concrete building which was designed and constructed in accordance with the building and safety codes of the day; with its sprinklered hazardous areas, its smoke-stop doors, its enclosed stairways, its alarm system, and its employee training program. But it did happen and the flaws were very

obvious after it happened. Delayed transmittal of the alarm, hazardous rubbish-handling chute, combustible fiberboard ceilings in corridors, partial sprinkler protection, and other defects.

Hospital administrators became alarmed about the fire safety in their hospitals. For many years, lip service or paper programs were all that was included in the fire safety programs of most hospitals, and even today this practice still exists. Hospital administrators went out and hired anyone with any type of fire experience or they delegated someone in the hospital to take over the fire safety program. Frequently it was some old-timer who had run out of gas in his department or whose department had been phased out, and they had to make a position for him.

In 1968, nine hospital fire marshals from Philadelphia got together and decided to do something about fire safety in hospitals. An organization was formed and appropriately named the Philadelphia Hospital Fire Marshal's Association. The association's first meeting was held at the Jefferson University Hospital on February 9th, 1968. At this initial meeting it was decided that membership would be open to all fire marshals of Philadelphia area hospitals and that there would be no membership fee or annual dues involved. Meetings are held on a monthly basis at various member hospitals on a voluntary basis. Minutes of the meetings are sent to all area hospitals, the Fire Department, and the Department of Licenses and Inspections.

The purpose of the Philadelphia Hospital Fire Marshal's Association is to secure closer official and personal relationships among the member hospital fire marshals throughout the Philadelphia area and adjacent communities, including those in nearby New Jersey; to devise and suggest means for the advancement and perfection of a uniform hospital safety system; and to enhance the professional knowledge and capability of the members of the association and their personnel.

As far as I know we are the only hospital safety association in the United States and, consequently, have received many inquiries on how to form such an organization of hospital safety people from interested individuals throughout the country. Many of our members have been accepted by and are members of the American Society of Safety Engineers.

The Philadelphia Fire Department in 1969 held Seminar II, which dealt with schools and hospital fire safety and was held at the Philadelphia College of Textiles and Science. This seminar was the first in the hospital safety field. The Philadelphia Hospital Fire Marshal's Association was deeply involved with this seminar.

In March 1970 our association sponsored the United States Army 69th Ordnance Det. (E.O.D.) in a full day training session on explosive ordnance reconnaissance and bomb and sabotage devices, held at Women's Medical College and Hospital, with over 200 in attendance.

Our most recent venture was a fire and safety seminar for hospital fire prevention held at the Philadelphia College of Textiles and Science. Topics for the seminar were electrical safety, electrical codes and standards, are hospital safety committees an effective tool, hospital fire safety training methods, hospital patient protection, hospital fire brigades, inspections and corrections, outdoor sessions on oxygen tent fires, Halon 1301, and flammable liquids. Over 140 hospital personnel representing the Delaware Valley area hospitals attended.

For the past two years, hospitals in the Philadelphia area have been sending their employees to the industrial fire school sponsored by the Greater Philadelphia Chamber of Commerce. The course includes classes on fire prevention and protection and consists of two ten-week sessions, a primary course for ten weeks and an advanced course for ten weeks. The training course consists of lectures and demonstrations, participation in class room discussions and activities, and inspection of hazards and plant protection facilities with individual evaluations of each attendee. The program has been very successful, and over 50 per cent of the classes have been made up of hospital personnel. We also send our employees to the industrial safety engineers course at Villanova University, sponsored by the Philadelphia Chapter of the American Society of Safety Engineers. This course is designed to give background information on solving the day-to-day problems in accident reporting and analysis, machine guarding, office safety, the legal aspects of accident prevention, promotional technique and procedures, plant protection and security, fire protection, and other subjects vital to those who have responsibility for safety on a collateral or full-time basis.

How do we go about having a good hospital fire and safety program?

The elements of a fire safety program are management, the fire marshal or safety engineer, the department heads and a safety committee, in that order.

Management must declare its intent and design the basic frame of action, set the limitations of authority, establish the goals or the final objective, and appoint a responsible person to lead and guide the effort. This person should be in a staff position in order to enforce, if necessary, safety considerations in the line management chain. The person appointed by management must be responsible for fire prevention, containment and extinguishment activities, fire brigade training, fire drills, disaster control, fire inspection, investigations, all necessary corrective measures, and all fire fighting equipment and its maintenance and control. Other responsibilities include the safety program, accident prevention activities regarding employees, patients and visitors, accident investigation, statistical records, and building inspections. Close cooperation with all regulatory agencies such as city agencies, the fire department and insurance companies is a must.

The program's objective and goals should be declared in a published policy to all employees. Most hospitals, even when they write a safety policy, do not design any procedures to fix accountability—to measure the safety effectiveness in performance of line supervisors. Until this is done, the safety policy cannot live. We seem to stop with the writing of this policy when it is really just a beginning point. As important as a policy is, it is still only a piece of paper, and by itself it is meaningless. Only when we succeed in getting our hospital people to live by it does the policy become effective.

For years, instead of preaching that the line has responsibility, we should have been devising procedures to fix accountability to the line. When an individual is held accountable, he will accept responsibility; if he is not held accountable, he will not accept responsibility. People will do those things for which they are measured. Department heads must be delegated the responsibility for safety within their areas. They must be made aware of these responsibilities and they must be held accountable for them. They should not be permitted to turn these responsibilities over to the safety committee or the safety engineer.

A formal safety committee must be formed to assist top management on matters relating to fire and safety. Members should be from the department head or first line supervisor level.

A good measure of any management team's commitment to safety is the amount of resources—money for materials and manpower—actually expended toward a program of loss prevention. The amount should be gauged against the total operating maintenance budget. A survey on fire safety progress shows that the management team at the Hospital of the University of Pennsylvania scores well in this regard, having made a significant commitment of resources to advance the cause of safety.

The Hospital of the University of Pennsylvania's loss prevention investment annually is ten per cent of its total plant maintenance and plant operations budget. All administrative and design costs for safety work have been excluded. Tabulation does not include expenditures for extra-code features of fire and safety protection incorporated in major renovations and new construction programs. It is true that we have spent most of our efforts on fire prevention, but as the continuous efforts in this direction make an impact and conditions are brought to a high degree of acceptability, it will become less necessary to emphasize the spending of heavy volumes of money on physical plant fire and safety improvements. Then, we can turn our attention to safety programming in its broader institutional sense. More professional manpower can be applied to an expanding loss prevention program. More emphasis can then be placed on the human

element of the loss potential.

Each year we send ten or more employees to the Greater Philadelphia Chamber of Commerce sponsored industrial fire school, mentioned earlier. Department heads and first line supervisors attend the industrial safety engineers course at Villanova University, sponsored by the American Society of Safety Engineers. These are all evening courses and on the employee's own time.The only expense to the hospital is the course fee. We have a waiting list for our employees to attend these courses.

It is well to remember that fire prevention is the only positive approach to the fire problem. All other approaches are negative. Your fire department, aside from its fire prevention work, is only of value to you after your hospital is burning. Your fire insurance is only of value to you after lives and property have been destroyed.

The Hospital of the University of Pennsylvania is inspected annually by the Philadelphia Department of Licenses and Inspection, and by our insurance company. A recent inspection found the hospital in full compliance with the fire codes of Philadelphia. The safety recommendations of the insurance company have been carried out. Another form of inspection is what we call "administrative rounds," which takes place every Monday afternoon. The goal of administrative rounds is to provide an opportunity on a regularly scheduled basis for key members of the administrative staff to visit all areas of the hospital at least once every three months. Each of the four teams making weekly visits is composed of one individual from each of the following four departments: executive director's office, nursing service, maintenance, and housekeeping. During the rounds, the teams observe carefully the overall appearance of the various areas, paying particular attention to housekeeping, maintenance painting, and safety. Upon completion of the rounds, a report is prepared and directed to those individuals who have responsibility for taking action indicated. A follow-up procedure has been established which assures accomplishing all of the items within a reasonable time. Our experience with this plan has convinced us that rounds are an extremely important administrative tool.

We have an active and interested group in our Board of Women Visitors and our doctors' wives, who also inspect the hospital once a month and submit a report to administration. They have been oriented on what to look for on these rounds and have been extremely helpful in making recommendations on fire and safety. The hospital's security force is well trained in fire and safety, and each man has completed the fire and safety courses. The director of the department is also the assistant director of safety. His men are probably the first to come in contact with a condition that creates accidents on their rounds. This includes, but is not limited to, slippery pavements, abandoned items on streets as well as interior, holes in parking lot and streets, blocked or inoperative exit doors, spills in hallways, blocked fire fighting equipment, blocked doors, and lighting, both interior and exterior. He is not only required to correct the situation where possible, but also to make a written report which is filled out at the end of each round and turned in to the security office. This report has been accepted not only by the administration of the hospital but also by the departments concerned.

The director of security and I are on the orientation team of the hospital and present the hospital fire and safety program to each new employee. We also, when invited, go into a department and give safety lectures. This is not a one shot deal but is done on a continuing basis.

The Philadelphia Fire Prevention Unit comes to the hospital annually and presents an excellent program which consists of the chemistry of fire, drill procedures, fire extinguishing instructions, and life saving and evacuation procedures. Outdoor demonstrations give our employees an opportunity to extinguish different types of fires.

The hospital is a member of the NFPA, and it is highly recommended that all hospitals become members of this organization. It is also recommended that all hospitals have their own technical library, which should include various NFPA standards and regulations, city codes, and other books and reference material pertaining to fire and safety. Get involved with your local agencies—the chamber of commerce, the fire department, insurance companies. These people are there to help you with your problems.

I must mention Public Law No. 91-596. This document came into being a short time ago but is going to require a great deal of knowledge in the safety field. The public law is commonly referred to as the Occupational Safety and Health Act. It not only makes it mandatory for you to have a safe place in which to work but requires certain documentation of accidents and certain reports. It is to be noted that one of the basic guides for implementing this act is the National Fire Code, published by the National Fire Protection Association. Twenty-seven states have adopted NFPA 101, "Code for Safety to Life from Fire in Building Structures," and made them a part of their legislative acts. More states, if not all, will follow this precedent. This makes these acts the law of the land.

Safety is a public relations job, and you play a very important part in your job and your daily tasks. Your ability to get along with people plays an increasingly important role. Being on a friendly basis with all whom you may contact will pave the way for a smooth operation. Your experience would indicate that selling safety is a very tough job. But if you can sell the boss on a safety and fire prevention program that is serious in intent, then you will find also that the people in the hospital will respond to the extent that the boss responds. Don't downgrade your job or let anyone else downgrade it. It is one of the most important in the hospital.

BREAKING THE ALIBI BARRIER TO ALCOHOLISM AND ACCIDENT CONTROL

By LEWIS F. PRESNALL
Mgr., Corporate Alcoholism Control Service, Kemper Insurance Group, Chicago, Ill.

A review of the alibi structure through which the employer and the employee evade action on the problem of alcoholism, an examination of the mystique of alcoholism, and some suggestions on breaking through these barriers to treatment of the person who has alcoholism.

Someone has said, "If you are not part of the solution, you are part of the problem." Dr. Daniel P. Moynihan expressed a similar thought regarding complex urban problems when he observed, "Everything is related to everything else."

Anyone who has been around the safety or industrial fields long enough to become "dry behind the ears" knows that problems involving people and their environment are never simple.

By their nature, however, the problems related to alcohol use, alcohol abuse, and alcoholism are as complex as any in our society. For instance, proper understanding of these problems involve considerations of medicine, manpower planning, law, safety, psychology, social prejudice, organizational structure, the so-called Protestant Ethic, personnel administration, education, bio-chemistry, and behavioral research, not to mention the history of Western thought.

Within business, industry, and the work world of government employees, effective al-

coholism loss control and accident reduction involve equally broad considerations. These cover matters such as corrective disciplinary systems, union-management relations, hiring and placement policies, occupational health services and staffing, personnel administration by line executives, supervisory orientation methods, and plant rules enforcement, to mention some of the major inter-relationships.

Yet, in the face of our evolved knowledge of these complexities and proven methods for analyzing and synthesizing them into workable, economically feasible in-plant approaches that will dramatically reduce employee alcoholism and related accidents, we now observe two regressive tendencies that block action in this area.

First, industrial leaders in many companies have been so often exposed to inept advice about the control of alcoholism that they simply do not wish to hear more about it. This has come about, in my opinion, because there have been so many enthusiasts anxious to promote industrial control programs, many of them very knowledgeable about alcoholism but almost totally lacking in experience or knowledge of the industrial relations field.

A second dangerous tendency, related in some ways to the first, is the proliferation of "lame duck" control programs in situations where managements have become sufficiently interested to initiate action but have adopted oversimplified programs without adequate study of the complexities mentioned above. There was no real understanding of why alcoholism had been shoved "under the corporate rug" previously, or of what steps were necessary in truly getting it out from "under the rug."

Consequently, most company alcoholism programs were extremely lucky if they succeeded in identifying and motivating to treatment as many as 20 per cent of the total number of alcoholics on the payroll. True, the recovery rates of 50 per cent or more of the cases identified were most encouraging but, while everyone talked about early case identification, very few companies developed sufficiently sophisticated programs to achieve it.

In an attempt to simplify some of the obstacles that must be overcome if we are to deal more effectively with alcoholism, I have chosen the device of reviewing the alibi structures by which we excuse our evasion of action. Like the geologist exploring complex sub-strata, I will display some core samples of the alcoholism alibi structure commonly developed in our society by two groups: first, by employees having active, untreated alcoholism and, second, by executives, managers and supervisors within employing companies.

Along with this review I will indicate what I believe to be the principal causes of these alibi structures and, finally, suggest some of the methods by which we can break through these barriers to get more effective action on the specific problems of alcoholism and accidents.

The Alibi Structure of Alcoholics

It has been commonly known for a long time that alcoholics are notorious liars about how much they drink, when they drink, and why they drink. This prevarication pattern is so universal that Dave Meharg, who for more than twenty years directed the alcoholism program for Du Pont, used it for a somewhat facetious but fairly accurate description of the difference between a social drinker and a person having alcoholism. He used to explain, "An employee has alcoholism when he stops bragging about how much he drinks and begins to lie about whether he drinks."

In the late 1940's and early 1950's Dr. John Norris, formerly medical director at the Kodak Park Works of Eastman Kodak, became fascinated with the alibi structure that usually emerges during the early middle stages of the illness among employees who develop alcoholism. He noted that the alibis become increasingly elaborate as the illness progresses, and that the alibi structure is so patterned and consistent from case to case that a clinician can often approximate an estimate of how advanced the illness is by the kinds and degrees of elaboration of the victim's excuses. He also noted, as others have also, that it is necessary to find ways of helping the victim to break through the facade of his alibi structure before he can be

motivated to accept therapy.

The alibi structure is such a common characteristic of alcoholics that some behavioral researchers theorized a tendency toward psychopathic lying as a distinguishing characteristic or predisposing factor in the development of alcoholism. If one cares to dig into the older research literature, he will see that a good deal of time and money was spent in what proved to be fruitless pursuit of proof for this theory.

There is no doubt that of the several million employees having alcoholism in this country, some of them are psychopathic liars. Some of them also suffer from cancer, tuberculosis, severe emotional disturbances, and ingrown toe-nails. (To the best of my knowledge, there is no universal law that prohibits a person having one disease from having one or more others simultaneously.) However, we are now reasonably certain that, rather than being caused by some personality quirk peculiar to alcoholics, the alibi structure development is the victim's reaction to the social mystique of alcoholism.

Like the rest of us in society, the person who develops alcoholism has been conditioned to accept the mystique. (By "mystique" I mean the collection of stereotypes, social stigma, misinformation, and prejudices commonly associated with alcoholism.)

Like the rest of us, the person having alcoholism believes that inability to control one's drinking is an indication of weak character or deficient will power. Like us, he pictures "the alcoholic" in terms of the late stage, falling-down-drunk type of case. In short, he views alcoholism as a disgrace or a tragi-comic drama, not as an illness.

As alcoholism begins to affect family life or the job, society tells the victim in many ways, "If you loved your wife or family, you would control your drinking"—"If you valued your job, you would not let drinking interfere with it"—"If you had any will power or sense, you would not drink and drive at the same time."

Yet, in actuality, the person who has alcoholism loves his family, values his job, and is also as knowledgeable about the dangers of drinking and driving as the non-alcoholic, if not more so.

What he does not know is that he has an illness that is treatable—an illness which is characterized by the progressive loss of control of one's serious intentions about when one drinks, where one drinks, how much he drinks, and when he intends to stop once he starts drinking.

In the early and early-middle stages of alcoholism this loss of control can be fairly easily concealed. As it progresses, however, the person finds it necessary to develop alibis for two purposes: first, to retain his own self-respect; second, to protect himself from the consequences—within the family, his social circle, and on the job—of behavior which society considers irresponsible. He also considers it irresponsible, so he begins to develop rationalizations to explain his behavior.

It is as though we universally considered tuberculosis to be a problem of etiquette, rather than a treatable illness. So, we might say to persons with tuberculosis, "Why don't you stop coughing in public, it isn't polite."

A typical employee alcoholic alibi pattern, where chronic absenteeism is the predominant performance problem (seldom the major work problem with salaried employees), can be seen in the following summary covering an eight year period.*

Year	*Periods of Absence*	*Lost Days Absent*	*Excuses and Alibis Given*
1959	6	6	Teeth pulled, family trouble, cold, AWOL.
1960	5	19	Death in family, sore arm, auto accident, car trouble, cold
1961	3	4	Sore back, car trouble.
1962	7	7	Sick, car trouble, car accident, headache.
1963	8	9	Out-of-town, car trouble, sore feet, sick, weak, AWOL.
1964	11	26	Car accident, sick, family trouble, stomach trouble, nervous condition, in jail, sore back, car trouble, AWOL.
1965	13	50	Sore back, car trouble, wife died, sick, in jail, child to hospital, AWOL.
1966	5	19	Car trouble, suspended, sick, death in family

*This case and all subsequent cases have been fictionalized enough that they cannot be identified with any person living or dead, but not to the point where the essential facts were exaggerated or minimized.

In reviewing the records on several dozen such day-paid cases selected at random from in-plant surveys at various companies throughout the United States, excuses noted on the records were used in the following rank order of frequency: 1—Cold, 2—Flu, 3—Sick, 4—Stomach trouble, 5—Car trouble, 6—Personal business, 7—Accident, 8—Sickness in family, 9—Death in the family, 10—Up-set because "the boss was riding him."

A sample including salaried employees would add to the list, since these excuses are simple compared with the highly elaborate alibis formulated by executive and professional employees having alcoholism.

Some company records do not contain the employee's specific absence excuses, but only list the cause as "illness" or "accident." The following record indicates how varied an employee's alibis must have been over a period of twelve years for him to have avoided termination or corrective company action:

Year	*Periods of Absence*	*Total Days Absent*	*Stated Cause*	*Supervisory Action*
1951	3	54	Illness	None
1952	(No record Available			
1953	2	38	Illness	None
1954	1	8	"	"
1955	1	12	"	"
1956	3	58	"	"
1957	1	21	"	"
1958	1	77	"	"
1959	2	52	Off the Job Accident (41) Illness (11)	"
1960	1	55	"	"
1961	1	14	"	Warned
1962	7	70	"	7 Warnings
			(5 AWOL's)	one 5-day suspension
*1963	2	64	Illness	Warned
Nov. 1963	1	1	Reported for work intoxicated—sent home	"

*Company visitor report: "Wife said to check whether he is really sick or drunk. Says he goes out all day, does not return home until after 2:00 A.M., and always arrives drunk."

The Alibi Structures of Managers

The remarkable thing about the mystique of alcoholism is that it causes similar alibi structures among non-alcoholics as well. Joseph Kellermann, the Executive Director of the Charlotte Council on Alcoholism, has written an outstanding pamphlet called, "A Merry-go-round Named Denial." In it he describes the virtual conspiracy of denial in which the alcoholic, his spouse, and his supervisor are all involved.

The alibi structure of the company managers and of alcoholics are remarkably similar. When this similarity of pattern began to strike me about ten years ago, I began to collect quotations from alcoholics and match them up with parallel statements made by managers whom I had contacted about the need to develop company alcoholism programs. I assembled quite a long list of these alibis, which occurred over and over in various interviews. You have to see this to believe it, so permit me to give a few samples:

Quotations From Alcoholics	*Quotations From Managers*
1. "I don't have alcoholism. I can quit any time."	1. "We don't have alcoholics. We fire them."
2. "Sure, I have a couple of beers now and then. Who doesn't?"	2. "Sure, every company has some alcoholics, but it's not a serious problem in our company."
3. "I did have a little trouble about three months ago. But that was the last of it. I can control my drinking."	3. "We had a little trouble a couple of years ago with three of our employees. We fired two of them and the other died of a bad liver or something. We haven't had any trouble lately."
4. "Man, I've got problems. The wife nags me all the time and no one can get along with my boss. I figure I'm entitled to a drink now and then."	4. "There's a lot of tension and pressure in business. If we could eliminate more of the pressure, I'm sure people would cut down on their drinking."
5. "Join AA? You think I want the neighbors to think I can't handle my liquor?"	5. "We don't want to become known as the company with all those drunks on the payroll."
6. "You want me to refuse to drink with my friends?"	6. "We don't approve of excess, but our people, especially in sales, have to drink with the clients."
7. "Of course I drink once in a while, but I go to work every day."	7. "We have a very low absenteeism rate. Obviously, we have very little alcoholism."

I have given illustrations of the alibi pattern of executives when they are approached about the need to develop in-plant alcoholism control measures, and examples of the alibi structures common among employees having the illness. It will now be of interest to show some of the lengths to which immediate superiors of alcoholic employees go in development of their own alibi structure for avoiding constructive action.

Remember that immediate superiors generally share the alcoholic's unadmitted, but deep-seated conviction that anyone whose drinking causes serious harm to families, one's job or his health, must be either weak, irresponsible, or slightly crazy. Yet, because of the great spurts of work efforts the alcoholic makes between drinking bouts to convince the boss and himself that he is normal, the superior will invariably state when questioned, "He is one of my best people—when he is here." There are a number of other reasons, related to mystique, which motivate supervisors to develop alibis.

Here are a few representative samples of supervisory alibis and attitudes:

Case 1. After fifteen years of company records showing chronic absenteeism, tardiness, frequent garnishments, and 13 warnings and disciplinary actions, the employee receives his 15-year service award and his supervisor's notation in the personnel record states, "Attitude—good, never has caused trouble, attendance has been excellent and the quality of his workmanship high."

Case 2. Another employee in the late middle stages of alcoholism had this notation by

the supervisor in his record, "Talked to him about giving in to the same weakness (alcohol) as before. He admitted this was a problem. He was informed he must show more effort, or else face more discipline." Since the company had not insisted that alcoholism must be dealt with as an illness, the supervisor and the alcoholic had no guidelines other than their supposition that it was a character weakness that simply required more effort at control.

Case 3. After a history of five years of chronic attendance problems and frequent verbal warnings in the case of a female employee having nine years service (age 32), the supervisor made this comment on a performance rating, "Although your attendance has not improved, you are to be commended for coming to work on several occasions to complete dead-line work, even though you did not feel well." (Here we not only see the alibi systems of both the employee and the supervisor, but also the tendency mentioned earlier of supervisors to evaluate on the basis of performance peaks, rather than the valleys.) Subsequently, the attendance problems become worse, but a performance review two years later is full of superlatives with no mention of tardiness or absenteeism. Four months after this glowing report, action was started on termination of the employee.

Case 4. An office employee with a long history of performance problems and neglected alcoholism received the following supervisory comment on his record, "You sleep during working hours much less frequently than formerly, also the periods of sleeping are much shorter. This is a definite improvement. This factor is no longer of major importance in your over-all performance."

Case 5. A typist was given an annual performance review which rated quality as "outstanding" and all other factors as "standard." The supervisor commented, "You are fast, accurate, and neat in typewriting. Your attendance has recently improved, but you have been occasionally tardy. It is suggested that you try to improve this." During the year covered by this "satisfactory" review, other company records disclosed 58 occasions of tardiness with an aggregate lost time of 14 hours, 50 minutes. Subsequent reports show the progressive decline of health, attendance behaviors, and increased alibi structure typical of untreated alcoholics. She had a severe attack of gastroenteritis and many minor gastro-intestinal problems, had an auto accident, and was finally dismissed from employment without any effort made that might have resulted in medical diagnosis or treatment for alcoholism.

Case 6. Records of a junior executive employee had shown indications of possible alcoholism since the time of his employment at age 28. The patterns of progressing alcoholism had become increasingly confirming. Nine years after employment, when the spasmodic work performance and the periodic absences had both become severe, the following example of superlative supervisory alibi art appeared on a performance review: "You have shown willingness to make extra efforts to see that the work gets done. While I would not recommend this as a regular practice, an example would be the morning you arrived at 2:30 a.m. in order to work on a special report I needed for a deadline that week."

Case 7. The superior of another middle-management employee had made this pathetically superficial comment on his record at a time when all data indicated alcoholism was probably present in the late middle stages: "At times you show considerable restlessness, manifested by frequently leaving your desk, wandering out to the car, feeding pigeons, or going to the store for some errand." The employee's record showed a long history of attendance and performance problems of such nature as to be indicative of alcoholism, accompanied more recently by other complicating physical mal-functions. Four years after the above supervisory notation he was dead at age 56, no effort having been made by his management or the company doctor to explore the possibility of alcoholism diagnosis or treatment.

Alcoholism and Accidents

As a result of research done by Milton A. Maxwell at the Rutgers Center of Alcohol Studies and from numerous other in-plant studies, we have known for over a decade that employees with alcoholism experience an average of three to four times as many off

the job accidents involving absence from the job of eight days or more than non-alcoholic employees. For a variety of reasons, on the job accidents among alcoholics are not nearly as significant, either in frequency or severity.

My own intensive review of many hundreds of alcoholic employee records indicate that a group composed of somewhere between 40 per cent and 60 per cent of all the employees having alcoholism account for the bulk of the severe and high-frequency off the job accidents attributable to employed alcoholics as a whole. I have noted that a significant percentage of employed alcoholics who have reached the late middle stages of the illness do not show any significant correlation at all between alcoholism and accidents.

The data is available for a study of these phenomena in more detail, and I have made several efforts during the past decade to interest various agencies and companies in financing a small pilot research project. To date, I have been totally unsuccessful, which is only another evidence of the alibi barrier common to the alcoholism field. No group in our society is immune to the alibi structures regarding alcoholism, and this includes safety engineers who, as a group, have generally shown even less interest than the medical profession in learning much about alcoholism or taking any in-depth action to combat the accidents it causes through earlier identification and referral to treatment.

Breaking the Alibi Barrier

Breaking the alibi barrier is essentially an individual matter for each one of us. I do not know of any way that I can convince another person he or she should take action on alcoholism as long as he persists in his alibis, whether he is an alcoholic rejecting diagnosis or a manager rejecting the need for an in-plant study to determine what actions, if any, would be desirable for loss reduction.

However, there are steps in both instances which can maximize the possibility of breaking through these alibi structures. First, let us consider methods related to employees having alcoholism. This is probably the easiest area of action in breaking the barrier, since all one has to do basically as an employer or a union representative is to start dealing with the person suspected of having alcoholism as though he had an illness.

This is simple in principle but difficult to do, since we have not been in the habit of doing it. Where we have been in the habit of doing it is in all situations where employee performance appears to be affected by an undiagnosed or untreated "respectable" illness and the employee for any reason has failed to seek treatment.

Under properly designed and administered alcoholism control measures a company essentially does two things to accomplish case identification and motivation of suspected alcoholics to seek treatment:

1. It removes the effects of mystique from the company personnel practices and the hidden economic premiums for keeping the alcoholism problems under the rug.

2. It sets up in-plant systems to assure that employees will be rewarded, rather than penalized, for promptly accepting diagnosis and help, and to assure that alcoholism will be handled in a manner consistent with company practices regarding other illnesses.

Where these things are done consistently and thoroughly, we find that an experienced staff person ordinarily has little difficulty breaking through an alcoholic's alibi barrier. When the economic advantages and company status symbols which reward alcoholics for their alibis are removed, one of the major reasons for these lies ceases to exist.

As long as we treat alcoholism as a moral problem and give company "merit badges" for concealing it, we can hardly expect employees having the illness to discard their alibis. They may have alcoholism, but they are not stupid enough to discard one of their major means of retaining job security and promotion opportunity.

Removing the alibi barrier of supervisory personnel is likewise not too difficult in principle. It has been done repeatedly on a large scale within companies which have developed comprehensive alcoholism and behavioral-medical control, particularly those that have utilized the improved methodologies implicit in the above comments about the alibis of alcoholics.

The alibis of executives and company staff

personnel which they use to excuse the failure to investigate and act forcefully on development of in-plant control measures are more difficult to deal with.

The frustrations one encounters are aptly illustrated by an interview I had many years ago with the manager of a plant employing about 9,000 people. I had been urging him to initiate an in-plant behavioral problems control program. He said, "If you can demonstrate to me that we have a sizeable alcoholism problem in this plant, I will get you in here to help us develop your proposal."

That whipped me. He would not let me inside the plant to start action without proof of a sizeable problem, and at that time I had no method to demonstrate the need other than an in-plant pilot operation which would have identified a significant case load after a year or two of operation.

Several years later, I had evolved the methods for confidential, unobtrusive in-plant surveys, which I have now used with many major firms. Even with these available, however, another barrier is often encountered.

Many managers are so thoroughly convinced that the problems are minimal within their own shops that they will not even consider the small expense of having a survey made. But there are several approaches that are helpful in minimizing the vague fears and misconceptions that re-enforce the alibis for inaction.

First, when one discusses alcoholism among employees with an executive, the picture that often comes to his mind is the stereotype of the late-stage case. Obviously, such alcoholics are not on company payrolls. Consequently, it is advisable to point out that when one speaks of employees with alcoholism he is referring only to early and middle-stage cases, most of whom still have drinking patterns which, to the casual observer, appear little different from those of the social drinker.

Second, managers in general, and industrial relations staff in particular, often feel that the admission of significant alcoholism prevalences on a payroll is a critical commentary on the efficiency of their recruitment and employment procedures. Therefore, these fears are alleviated when they are informed that there are presently no effective methods by which most early and middle-stage alcoholics can be screened out at the time of employment.

Third, there is a lot of confusion between drinking and alcoholism. Since a high percentage of the adult population uses alcohol as a social beverage to some extent, there are some personal fears, uncertainties, and ambiguities in the minds of managers when alcoholism is discussed. I find it is helpful initially to inform managers that when I am discussing alcoholism, I am not talking about drinking, but rather about the loss of one's control over his serious intentions about his drinking.

I emphasize this by pointing out that it is not the quantity of alcohol consumed which characterizes alcoholism. While the tolerance and the consumption goes up during the middle stages, often to the level where an executive may be consuming a fifth a day and still making it to work every day, the amount typically declines as the later stages are reached. Similarly, the quantity used during the early stage may not be excessively high in many cases.

Although none of these approaches may be effective in lowering a manager's alibi barrier sufficiently for him to view the problem with semi-objectivity, I have learned that when they do not it is futile to batter at the barrier with a barrage of facts and figures from other companies having successful alcoholism programs. This will only strengthen a manager's alibi barrier. He is convinced that his company is different. From that viewpoint, the data from other companies is totally irrelevant.

I receive requests constantly from enthusiastic recovered alcoholics who want cost, prevalence, and savings figures on alcoholism programs, which they can use as ammunition in attempts to sell the managers of their firms on developing alcoholism programs. I shudder a little whenever I receive one of these requests. Even though I generally avoid giving such data and explain why they would not be useful, I know what will happen: The enthusiast will secure cost/benefit data from some source. Not understanding that the nature of managers' alibi structures is similar in many ways to those of untreated alcoholics, he will get some appointments, make some presentations and, in the process, make it all the more difficult for a proper presentation to be made subsequently to the managers whose alibi structure has been strengthened by his call.

Dealing with alcoholism and the accidents it causes is not easy, but it is only more difficult than some problems because of the barriers to understanding, objective investigation and action erected within our own minds by the mystique to which all of us have been exposed since childhood.

After ten years experience working with alcoholism I thought I was relatively free of the mystique. Then Marty Mann, founder of the National Council on Alcoholism, told me of a clergyman who said to her, "You say alcoholism is an illness, so why do you always refer to the victims as 'the alcoholic'? You do not speak of the victims of other illnesses that way. You say that someone *'has* diabetes' or so-and-so *'had* a coronary.'"

That is how subtle the mystique is. Since that time I have always tried, whenever appropriate to sentence structure, to use phrases such as "the person who has alcoholism" or "employees with alcoholism."

Alcoholism is something one gets, like the measles, arthritis, emotional illness, or polio. It is always a person who gets alcoholism, and one never characterizes a person solely by the illness he has.

But, unfortunately, most of us do not yet understand or believe this deeply, including many of the people who have alcoholism. So, all of us together continue to construct our alibis. And we believe our own alibis.

We know how to treat alcoholism. We know the reduction of active alcoholism through treatment will markedly reduce non-occupational accidents among employees.

But a company which only attacks alcoholism and related accidents will achieve minimal results. As far as action orientation is concerned, alcoholism is not the central problem. The points for most effective attack are the alibi structures and all our action patterns based upon the distorted opinion that the falling-down, late-stage alcoholic is either a disgrace or a comic, but certainly not a disabled person.

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MARILYN P. PETTERSEN
Notary Public, State of Illinois
My Commission Expires 10/26/03