

volume 12

PLAINTIFF'S EXHIBIT

NSC-219

1972

National Safety Congress Transactions

INDUSTRIAL SUBJECT SESSIONS; ASSOCIATIONS



NATIONAL SAFETY COUNCIL
425 North Michigan Avenue
Chicago, IL 60611

60th NATIONAL SAFETY CONGRESS

Papers Delivered in the INDUSTRIAL SUBJECT SESSIONS

SAFETY FROM SPACE

Nonflammable Materials for Use in Space Have

Commercial Potentials.....Martin L. Raines 1

WHAT'S NEW IN GUARDING?

What's New in Safeguarding Machine Tools?.....Charles A. Carlsson 4

Improving the Welder's Environment.....R. R. Hoffman 9

What's New in Guarding People and Property?.....Bruce Bishop 14

AIR SAMPLING TECHNIQUES

Valid Representative Air Samples — Location, Time, Duration, Work

Cycles, Peaks and Time-Weighted Average Concentrations.....Jeremiah Lynch 18

Problems and Pitfalls in the Application and Use of Portable

Direct-Reading Air Sampling Techniques.....Richard S. Brief 24

Sample Collection for Laboratory Analysis.....Robert G. Keenan 32

OFF-THE-JOB SAFETY

The Necessity for a Product Safety Program.....D. E. James 41

Pro and Con — Safety Belts and Air Bags.....Edward R. Klamm 43

Developing an Off-the-Job Safety Program at Uniroyal.....D. E. Dudrow 48

LABOR RELATIONS CONSIDERATIONS

Overview of Potential Impact of Recent Legislation.....Joseph P. Lamb 52

OSHA in the System of Social Transaction.....Sheldon W. Samuels 57

Philosophy and Practices of the NLRB.....John S. Irving 62

TRANSPORTING HAZARDOUS MATERIALS

Advances in Safe Transportation of Hazardous Materials

(Introduction).....H. H. Fawcett 70

The NTSB Role in Hazardous Material Control.....RADM Louis M. Thayer 71

Studies of the National Academy of Sciences-National

Research Council Committee on Hazardous Materials.....Donald L. Katz 76

Essential Facts and Intelligent Action for Safe Transportation,

Handling and Storage of Hazardous Materials.....Miles E. Woodworth 78

The Chemical Transportation Emergency Center.....John C. Zercher 82

OSHA — AN 18-MONTH REVIEW OF PROGRESS

Introduction.....Howard Pyle 85

Opening Remarks.....Chain Robbins 87

OSHA Review of Progress.....George C. Guenther 88

Penalties Under OSHA.....Robert D. Moran 92

OSHA: Bullseye of the 'Big Government' Issue.....The Hon. William A. Steiger 96

Papers Delivered in the

ASSOCIATIONS SESSIONS

What Associations Can Do with OSHA.....	Kenneth L. Patrick	101
Your Association As an OSHA Information Center (And We Are Sitting on a Time Bomb).....	William J. Moshofsky	104
Members of the Industrial Conference 1972-73.....		107
Members of the Associations Committee 1972-73		108
Five Years of Future Dates of the National Safety Congress.....		110
Other Volumes in 1972 National Safety Congress Transactions.....		Back Cover

Papers Delivered in the ASSOCIATIONS SESSIONS

What Associations Can Do with OSHA.....	Kenneth L. Patrick	101
Your Association As an OSHA Information Center (And We Are Sitting on a Time Bomb).....	William J. Moshafsky	104
Members of the Industrial Conference 1972-73.....		107
Members of the Associations Committee 1972-73.....		108
Five Years of Future Dates of the National Safety Congress.....		110
Other Volumes in 1972 National Safety Congress Transactions.....		Back Cover

NONFLAMMABLE MATERIALS FOR USE IN SPACE HAVE COMMERCIAL POTENTIALS

By MARTIN L. RAINES
Safety Manager, Manned Spacecraft Center, Houston, Tex.

Because of the hazards from fire of nonmetallic materials aboard a manned spacecraft, NASA, from the Mercury program through Gemini, Apollo, Skylab, and on to the Space Shuttle, has been continually concerned with materials development. The tragic Apollo fire in 1967 underscored the importance of such development and further widened its scope. The results of such activities have broad application throughout many professional and industrial groups and it will be my purpose to describe some of the materials developed by and for NASA and their practical application to improvement of fire protection and prevention in our own communities.

The highest degree of fire safety can be achieved with nonflammable materials made of inorganic fibers such as asbestos and fiberglass. Asbestos, a natural mineral fiber, is not used in any exposed areas of the spacecraft because of a tendency to shed particulate matter. This shedding is caused by the extreme brittle characteristics of the individual fibers, which work loose from the fabric surface with only slight movement. Asbestos, therefore, is used primarily in composite layups in which the asbestos is fully contained within an assembly; such that any shedding that does occur is retained within the assembly. So, while asbestos has excellent flammability characteristics, its physical characteristics place severe limitations on its use. One important item used in spacecraft is Ladicote, which contains asbestos and is used as a fire-resistant conformal coating in all of the instrument panels and in many electrical components of the spacecraft. Commercially, Ladicote can be used as a fire barrier to combustible materials around electrical components in aircraft, automobiles, industry and homes.

Fiberglass is the inorganic glass fiber most

extensively used within the spacecraft. The type of fiberglass used in manned spacecraft by NASA almost exclusively is called Beta Fabric. This fiber is characterized by an extremely fine diameter (three microns). Because of this fine fiber diameter, textile structures can be fabricated that provide the maximum flexibility and performance characteristics within the limits of the inherently low abrasion-resistance of fiberglass. Beta Cloth is used to fabricate stowage bags and fire protective covers on electrical connectors in the spacecraft.

Commercially, fiberglass is being used in curtains, firefighter suits, automobile racing drivers' suits and many other items.

A fiber known as PBI (polybenzimidazole) was developed by USAF. It retains 50 per cent of its tensile strength at 700° F. and is used extensively in the spacecraft. The fiber is completely nonflammable in air. The natural color of PBI is a golden brown and while some success has been achieved in attempts to dye the fiber, it must be considered that a true dyeing process has not been achieved. Applications of PBI in the spacecraft are primarily in the astronauts' restraint harnesses, which are required to withstand dynamic flexing. Some potential non-space applications for PBI include forest fire "smoke jumper" equipment, fire fighter parachutes, straps and risers.

Teflon is another material which comes in fiber form that can be woven into fabric and has essentially the same flammability characteristics as PBI. In bleached form, Teflon is used for the Apollo astronauts' inflight coverall which has a pants and jacket and is what the astronauts wear most of the time in flight. Because of its high dielectric strength, noncorrosive properties and light weight, Teflon also has been used as spacecraft wire

insulation. For nonspace applications, to help protect against fires, Teflon can be used as insulation in wiring for homes, aircraft and industrial uses such as electronic components for computers, induction coil windings, etc.

Another group of high temperature fibers used in the space program is the metallic fiber which is available in fine-filament form (approximately half a mil diameter). Fabrics with the flexibility and sewing characteristics of conventional textiles can be woven of metallic fibers. A chromel-R fabric is used on the Apollo space suit and on the lunar boots to protect areas that are particularly susceptible to abrasion. Chromel-R is a nickel/chromium alloy fiber. In nonaerospace applications, steel fabrics are being used more and more in automobile tires, steel mill gloves, etc. Stainless steel fibers also are being used extensively to enhance safety from the static electricity produced on floor coverings made from synthetic fibers.

Durette (X-400) is a Monsanto-developed material made from a modified aromatic polyamide (nylon derivative). Durette is nonflammable in air and in moderately-enriched oxygen atmospheres. The natural color is golden. Fabrics designated X-410 and X-420 are modifications of the X-400 and are available only in black. These fabrics have better flame-resistance than X-400, especially in oxygen-enriched atmospheres. Durette will be used as sleep-restraints and astronaut bedding in the Skylab program which is scheduled to fly in 1973. Durette X-400 has nonspace application in firefighters' suits and thermal undergarments used under the bunker gear. It also has been fabricated into firefighters' boots. Other items include such things as seats for commercial airlines, buses, trains, ships and auditoriums. Durette can also be used for baby clothes, tents and household curtains.

Kynol is a phenolic-type fiber recently developed by the Carborundum Corporation. Kynol is orange-yellow in color and will not burn in air. The material while degrading somewhat, nevertheless retains its whole fiber identity when exposed to flame temperatures as high as 2500° C. This material is not currently used in spacecraft because it is a new

product, but it is under investigation for future usage. The manufacturer has indicated that significant progress has been made in the spinnability of the fiber such that conventional knitted and woven fabrics should be available in the near future. Kynol fabric is proposed for future astronaut restraint harnesses. It has many commercial applications. It is especially suited for such uses as ironing cord sleeves, and particulate filters for high-temperature gases such as those emitted from carbon black plants and cement mills.

Nomex is foremost among the more conventional fire-resistant organic fibers that have been evaluated by NASA. It is a chemically-modified nylon which has a carbonization temperature of 840° F (and does not melt). In contrast, nylon melts at 482° F. This is a significant improvement in the high-temperature resistance of Nomex as compared to nylon. Nomex cloth is used as the comfort layer between the astronaut's body and his space suit. In fiber form, it is also used as the thread for stitching Beta bag tissue dispensers. This material is widely used in nonspace applications such as fire fighting "Red Adair"-type suits, and in crew garments in military aircraft.

A german concern, Scheufelen, has developed a cellulose-type material which has been processed primarily as a nonflammable paper. This material carbonizes in the presence of a flame but does not support combustion. This nonflammable characteristic is evident both in air and oxygen-enriched atmospheres; and with some minor exceptions, its other physical properties are comparable to those of conventional paper. Although Scheufelen paper tends to embrittle in a vacuum, it lends itself well to printing; the use of this paper as flight data files on the Apollo 12 mission proved to be very satisfactory. The paper can be made into a half-inch thick ceiling tile and it can also be used as wall panel insulation, air filters, documents (securities, bonds, insurance policies), with the additional advantage of fire-safety.

Fluorocarbon elastomers, normally referred to as Fluorel, are another important group of materials used in Apollo spacecraft with many nonspace applications. By themselves, the elastomers are flammable in the

spacecraft atmosphere. However, through the proper use of compounding ingredients and plasticizers, they become nonflammable with a wide range of physical properties. The compounded elastomer can be foamed, cast, molded or extruded. The material can be controlled as a paste, coating, or spray solution. The replacement of flammable spacecraft components has been achieved in many cases by using this material. Of special interest is the fact that fluorel coatings will effectively protect flammable substrates and will do so in minimal applied thicknesses. In spacecraft, Fluorel materials are used as oxygen and smoke-mask hoses, shoulder pads, and as spacers in survival kit packages. In an effort to determine what could be done with Fluorel in commercial aircraft, a series of sample decorator fabrics and coatings were

fabricated at the manned spacecraft center. These samples included wallpapers and other wall coverings, ceiling tiles, rugs and paints. Generally, a significant increase in time to flame-breakthrough was achieved; it increased flame-breakthrough from seconds to minutes when the substitute nonflammable materials were used.

I have reviewed a few of the more interesting and useful materials developed as an outgrowth of requirements for nonflammable materials for the U.S. space program. As these items are produced in larger quantities we can expect to see significant reduction in costs. Then their further application to our everyday life is limited only by our vision, ingenuity and dedication toward saving lives and property by the prevention and control of fire.

WHAT'S NEW IN SAFEGUARDING MACHINE TOOLS?

By CHARLES A. CARLSSON
Mgr., Safety & Health, Barber-Colman Co., Rockford, Ill.

There is no doubt the Occupational Safety and Health Act and its many safety standards have created some confusion and misinterpretation. Hopefully, my presentation will give you information on the safeguarding of machine tools and clear up some of the misinterpretations that seem to be plaguing us all.

The intent of the Act is for the employer to provide, so far as possible, a safe and healthful work place for his employees. To do this the employer must meet certain standards or criteria. I will discuss eleven standards that will outline the safety requirements for the construction, care, and use of certain basic machine tools.

Many ask the question, "What's new in safeguarding machine tools?" It could be answered by saying, "nothing." Nothing is really new. The machine safeguarding principles have been in existence for 30, 40, 50, or more years. The difference today is that some of these standards are now being enforced by the Federal Department of Labor and the standards have become federal law. Take for example the American National Standard Institute's B11.1 safety requirements for the construction, care, and use of mechanical power presses. The B11.1 was originally written in 1922. It was a voluntary safety standard. In September 1972 it celebrated its 50th birthday. The "no hands in die" requirement has been in existence these same 50 years, and now that the Department of Labor is enforcing this requirement there is a great deal of concern and frustration caused by this enforcement.

The American National Standard Institute is one of the approved consensus standards-setting groups. Its standards are written by knowledgeable individuals. Originally, the B11 standard contained requirements for power presses only. Recently, the decision was made to expand the scope of

the B11 safety requirements to cover almost every type of machine tool. The sponsors for the machine tools safety standards are the National Safety Council and the National Machine Tool Builder's Association.

The change in scope of the B11 safety standard was necessary to help American National Standards Institute reach its objective or goal, which is to develop and publish safety standards for almost every type of machine tool. This is certainly a large task, but ANSI, the NMTBA, and the NSC feels that it can and must be done if we are to prevent accidents.

The expanded scope of the B11 safety standard reads: "Safety requirements applicable to the design, construction, installation, maintenance, and use of all power driven machines, not portable by hand, used to shape or form metal or other materials by cutting, impact pressure, electrical techniques, or a combination of these processes."

To complete the job of writing some of the safety standards for machine tools, 11 subcommittees were formed. Specialists from management, design engineering, safety, quality control, and production were called upon to assist in the writing of these standards. Each of the 11 subcommittees works on an individual safety standard. Each writing subcommittee has "observers" who attend some of the meetings and contribute their knowledge and comments. Each subcommittee has also many "consultants" who are unable to attend meetings but do receive copies of the draft. All observers and consultants are encouraged to submit additions, corrections, or comments in writing on the specific standard. All comments are considered and answered by the writing subcommittee. It is estimated that through the above process over 2,000 people from all over the United States are involved in the writing of the 11 safety standards which will be discussed to-

day. The people are employed by machine tool builders and machine tool users. They are employed by large and small companies. A good cross section of expertise is assured by the above process.

It is recognized that good safety standards are needed and are needed now. Safety standards cannot be written to serve a specific industry, builder, or group of users. They must be written so that they will safeguard operating personnel and reduce or prevent accidents. They must outline safety requirements that are reasonable, understandable, and economical. To assure the fairness and adequacy of a given safety standard, it must be approved by the B11 voting committee, which is separate from the writing subcommittee. The voting committee is comprised of 35 delegates representing 35 different organizations. The voting committee member is almost always a person who had no part in the writing of the standard.

Each safety standard is written so that, if followed carefully and completely, it safeguards the operating personnel. The standards writing subcommittees approached their accident prevention objective from four points.

1. Eliminate hazards by design. Similar machines should have similar operating characteristics. Operating controls on similar machines should be designed in such a way that there would be some uniformity in their operation. For example, in an automobile the brake pedal is always to the left of the gas pedal on an American-made car. This standardization has helped drivers prevent many accidents over the years. Imagine the chaos that would exist if every time you got into a different car you had to hunt for the brake pedal. The same design principles should apply to similar type machines. In today's mobile society, where the machine operator may work for several employers over the years, this is important.

2. Keep hands and fingers out of the point of operation. If hands, fingers or other body members are kept out of or are prevented from entering into the hazardous pinch points during the operating cycle, it is a cinch that they won't get hurt.

3. Establish training guidelines. Training

guidelines are listed in each standard so that users would have some uniform guidelines for safety training as it relates to that specific machine. It is a basic fact that if people are to do a task well, in an efficient and safe manner, they must be properly trained. The safety standards recognize this and provide certain guidelines. Employers are encouraged to broaden these guidelines.

4. The fourth point in developing a safety standard is to establish requirements that will safeguard the defined point of operation or other hazardous pinch or shear point. Please note the word "safeguard." To safeguard does not necessarily mean that a barrier or complete enclosure is required. The safeguarding requirements are spelled out in each specific standard. Also, please note the word "defined" as it relates to the point of operation. Much confusion and misinterpretation exists as to what the point of operation is. This has been a continuing problem for users, for builders, and for the people who must enforce the safety standard. The standards writing subcommittees recognize this problem and are attempting to resolve it by the explanations and definitions contained in their specific standard.

Following is a listing and explanation of the eleven specific safety standards:

B11.1—Safety requirements for the construction, care, and use of mechanical power presses. The requirements of this standard apply to those machines that shear, punch, form, or assemble metal or other materials by means of tools or dies attached to slides, commonly referred to as mechanical power presses. Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses, and hammers, riveting machines, and similar types of fastener applications are excluded from the requirements of this standard. The machine builder, the machine user, the owner, and the employee all have safety responsibilities that are spelled out in this standard.

B11.2—Safety requirements for the construction, care, and use of hydraulic power presses. The requirements of this standard apply to only those hydraulically powered machines that shear, punch, form, or assemble metal or other materials by means of tools

or dies actuated by slide(s), commonly referred to as hydraulic presses. Excluded from the requirements of this standard are mechanical power presses, hydraulic and mechanical power press brakes, hydraulic and mechanical shears, forging presses, and hammers, die casting machines, balers, punch presses, and powered presses, manually positioned "C" frame punching and riveting presses, high energy rate presses, plastic injection molding machines, expanding equipment, packaging machines, riveting and welding machines, and similar types of fastener applicators and laboratory devices used to determine properties of metal.

B11.3—Safety requirements for the construction, care, and use of power press brakes. The requirements of this standard apply to powered machines constructed with a plate type ram or slide and plate type bed, classified by the generic term "press brake." This machine is sometimes referred to as a "bending brake" or "brake press." This standard excludes straight sided presses with four or more gib points. (For requirements of this type of machine see ANSI B11.1 1971—Safety requirements for the construction, care, and use of mechanical power presses.) Hand brakes, folding machines, tangent benders, apron brakes, and other similar types of metal bending machines are also excluded from the requirements of this standard.

B11.4—Safety requirements for the construction, safeguarding, care, and use of shears. The requirements of this standard apply to machines constructed with a plate/cast type ram, bed, table, hold down, and housings, utilizing one fixed and one moving non-rotary blade for the shearing action and having a constant rake for any one shearing stroke. This standard also applies to shears designed for shearing other types of material and having the basic configuration as outlined above. Mechanical, hydraulic, and pneumatic power shears are included. Power shears that are automatically, semi-automatically, or manually fed are included. The following specific shear types are excluded from the requirements of this standard: slitting-rotary, nibblers, coil slitters, portable hand tools, rotary blade slitters and shears, and iron worker.

B11.5—Safety requirements for the construction, care, and use of iron workers. The requirements of this standard apply to those combination multi-purpose power machines that punch, press, shear, notch, cope, and form metal or other material, commonly referred to as iron workers.

The requirements of this standard also apply to those single and/or multi-purpose powered machines similar in construction to and identical in the use of an iron worker or portions thereof, such as (but not limited to) single end punches, double end punches, structural shearing machines, coping machines, or any combination of the above. Excluded from these requirements are alligator bar shears, billet shears, manually powered shears, nibblers, portable hand tools, portable machines, power press brakes, power presses, and power shears.

B11.6—Safety requirements for the construction, care, and use of lathes. The requirements of this standard apply to a general class of basic machine tools which rotate the work against a tool or tools, causing a change of shape by the process of metal cutting. This standard applies to lathes designed primarily for metal cutting; however, it also applies to lathes designed for cutting other types of material except those specifically excluded. Excluded from these requirements, but not limited to, are: wood turning lathes, machines designed exclusively for grinding, burnishing lathe, hot metal cutting lathe, cryogenic cutting lathe gear hobbing, pressure forming of metals, impact forming of metals, and EDM and ECM.

B11.7—Safety requirements for the construction, care, and use of cold headers. The requirements of this standard apply only to those mechanically powered machines commonly referred to as cold headers or cold formers which shear, upset, extrude, cold work, or warm form material by means of tools or dies. Included are pointing and roll forming when mechanically they are an integral part of the basic machine. Excluded from the requirements of this standard are mechanical, hydraulic, and pneumatic power presses, hot formers, hot benders, hot metal presses, forging presses, and hammers, swagers, and wire drawing equipment.

B11.8—Safety requirements for the construction, care, and use of drilling, milling, boring, and related type machines. The requirements of this standard apply to those machines that by use of a rotating cutting tool remove metal or other materials in drilling, milling, boring, and related operations. These machines may be used for a single or combined function with a single or multiple spindle at a single or multiple work station and may be manually or automatically operated. Excluded from this standard are power tools portable by hand and machines on which abrasive discharge or electro-mechanical machining or woodworking operations are performed.

Each of the standards discussed so far outlines the specific safety requirements for the builder or the user. Each of the specific standards mentioned thus far, and those that will be discussed following, has included in it a definition of the point of operation. It is important that you read the definition for the point of operation for the specific machine which as a user you are trying to safeguard. The method of safeguarding operating personnel may differ considerably from one machine to another because of the different hazards involved and different machining operations that are being performed.

In the B11.8 safety standard the words "trapping point" are used for the first time in any safety standard. Trapping points are where people or body members can be trapped and subsequently injured, whereas the point of operation for the machinery covered by the B11.8 standard offers little or no hazard.

B11.9—Safety requirements for the construction, care, and use of grinding machines. The requirements of this standard apply only to a machine tool which presents an abrasive tool against the work, causing a change in shape, size, or surface finish by grinding. The standard applies to grinders designed primarily for metal removal. However, other materials may be covered. Specific grinding machines excluded from the requirements of this standard are lens polishing machines, portable machines, and tumbling machines using loose abrasive grit.

B11.10—Safety requirements for the con-

struction, care, and use of sawing machines. The requirements of this standard apply to the machine tool which uses a saw blade tool against the work which causes it to be cut off or change its shape. The standard applies to sawing machines designed primarily for sawing metal (ferrous and non-ferrous) and other selected materials such as rigid plastic pipe. The sawing machines included are: circular cutoff saws, high speed and low speed types; power hack saws; and band saws, horizontal and vertical cutoff type and vertical contour type. Woodworking saws and stone cutting saws are specifically excluded.

B11.11—Safety requirements for the construction, care, and use of gear cutting and finishing machines. The requirements of this standard apply to machines that are specifically constructed to produce gear teeth by the process of hobbing, milling, shaping, and rolling. It also applies to those machines that shave, lap, or chamfer gear teeth, and machines used to produce ratchet, spline, or sprocket teeth. Excluded are gear broaching, molding, flame cutting, gear grinding, and impact forming machines. In the above processes, usually both the tool and the part are in rotary motion.

Some of the subcommittees have been working for over four years to write an acceptable safety standard, one that will provide for the safety of the operating personnel. To get an acceptable safety standard that is reasonable, enforceable, and to provide for the safety of operating personnel is not an easy matter.

Some committees were formed as recently as July and August of 1972 and have just about finished their safety standard writing task. This is noteworthy and they are to be commended for their outstanding accomplishments. It is true that they were able to capitalize on the efforts of some of the earlier standard writing subcommittees, but their dedication and accomplishments need to be recognized.

So we've talked about 11 safety standards. Big deal! "What's it all about?" you might ask. Well, the name of the game is *productivity and safety*. One needs the other. It is necessary to meet the productivity needs of industry and our nation, but it must be done in such

a way that a safe and healthful work environment is assured. The work place must be safe and healthful. In today's intensely competitive national and world market we must be realistic and seek new innovative ways to eliminate accidents, provide a healthy work environment, and maintain the economic stability our society demands.

It is not easy to accomplish all of the above, but I am optimistic enough to believe that it can be done. One of the better ways

to reach the objective is through planned industrial safety programs that will analyze the hazards involved and then take appropriate action to eliminate the hazards before accidents happen.

A well planned industrial safety program must include knowledgeable and dedicated people working together to eliminate hazards, understandable and reasonable standards, and enforcement of the agreed-upon standards.

IMPROVING THE WELDER'S ENVIRONMENT

By R. R. HOFFMAN
Corporate Safety Mgr., Caterpillar Tractor Co., Peoria, Ill.

Caterpillar is a multinational company of 25 manufacturing plants and 25 parts warehouses, 63,000 employees, and annual sales of over \$2 billion.

We build earthmoving machines, the type you usually see on highway construction, industrial engines, marine engines for boats, on-highway and off-highway truck engines and electric set generator engines. Also intertia welders and Towmotor lift trucks. Caterpillar is one of the leading U.S. exporters.

Our manufacturing processes vary from simple machine operations to various welding processes and highly sophisticated operations such as that at the Mapleton, Illinois Foundry, where the latest techniques for melting, core making and finishing are employed.

Our kind of business requires the welding of piece parts that weigh from a few ounces to over 4,000 pounds. Obviously, the potential for serious injury is always present.

So much for background. Now why did Caterpillar become interested several years ago in improving the welders' environment?

We have three very important reasons:

1. Welding is one of our most important production processes.
2. Young employees find it unappealing.
3. Government regulations to improve working environment.

Allow me to elaborate on these reasons one at a time.

First, welding is an important part of our business. We couldn't possibly build our products without the welding process. Caterpillar is one of the largest users of welding consumables in the world. In addition, we employ over two thousand welders. Welding, for example, is an integral part of our truck bed assemblies. There are hundreds of welded joints in each truck bed.

But hiring new employees for welding is becoming increasingly difficult. Since World

War II, we have had a formalized training program to train welders. In the late sixties we discovered that few young people wanted to become welders. The environment they must work in simply is not appealing. Welding heat and smoke, generally accepted in the past as part of the job, was rejected by the younger generation. They preferred the machine shop or assembly line rather than working with their head in a bucket holding a hot and dirty torch. Absenteeism and turnover among welders was almost twice as high as other employees.

Third, we anticipated government regulations on fumes, radiation heat and gases which would require us to give more attention to this process. Improve the welding environment, we thought, and we'll solve a host of production, personnel and government problems.

This, "unappealing" aspect is most important, so I'll expound on it. As we know it today, welding is a hot uncomfortable job. Just how uncomfortable and unappealing is it? Let me illustrate.

A welder must be in a good position to avoid the smoke and fumes. But sometimes, he cannot avoid the smoke, as when he has to place his head into a confined space to operate. And in some cases our welders are twenty-to-thirty feet off the floor. Those of you who have had experience under the hood will appreciate the fact that this can be a rather disturbing experience. Balance and equilibrium are often difficult with the hood down. Some welders refuse jobs that require climbing.

Also there is a need for heat-insulating gloves. In some instances, the backs of the welders' hand have been literally blistered, from radiation exposure, in five to 10 minutes.

We recognized welding smoke as a source of air contamination, and it is generally in-

creasing. This came about by increased use of welding for joining metal assemblies. Although processes had improved, little had been done to improve the welders' environment. Caterpillar took the lead in trying to improve the environment and well-being of its welders.

A task force was created several years ago at Caterpillar. Its goal was "to improve the welders' environment." The task force was made up of representatives from our manufacturing development, weld departments, research, medical and safety departments. We tried to cover all environmental problems in the welding process. Our group decided that before any action could be taken regarding welding working conditions, we should evaluate our major welding areas, as well as contact the leading weld equipment suppliers to determine if there were any supplier research and development programs in progress regarding welding work environment.

As a result of the evaluation the task force recommended that better ventilation be provided to remove smoke and fumes, also that improvement be made in the welder's personal protective equipment—and to help cool the welder in hot weather.

Two members of our committee talked with four major suppliers in an effort to determine what activity, if any, was currently going on to improve the welders' work environment. The first supplier, whom we will call Supplier "A", was doing nothing in this area. They did indicate that welder consideration was given when they developed a new product, but it was not a major concern. Supplier "B" said they had done very little in welding environment but would be responsive to any reasonable request made by our company. They said that we probably should do more automatic welding.

Supplier "C" said that 70 per cent of their research effort was on automatic welding and they felt this was a contribution to work environment by physically removing the welder from the operation. No further effort had been made to improve welding conditions other than to make sure no toxic elements, or what they considered to be toxic, were used in the fluxes, etc. They, too, indicated willingness to work with Caterpillar on this prob-

lem.

Supplier "D" designed and was working with an apparatus to measure content and volume of smoke produced by welding. They were working on a self-shielding electrode that will tolerate a fan blowing on the arc. This company seemed to be the only one doing any significant research in the work environment area. Prior to this time, when we asked suppliers to help us improve the quality of the weld, they did it. When we asked them to lay down more weld faster, they did it. When we asked them to work with us in improving the welders environment, only one was willing and eager to participate.

But as better and more efficient processes were introduced there was a general increase of smoke levels in the welding areas. As a result, Caterpillar invested considerable capital in low-level ventilation.

Traditionally, in designing a manufacturing facility, plant engineering and industrial hygiene personnel consider good ventilation first. This involves a certain number of complete changes of air and proper distribution to locations within the building. At a recently-built plant of Towmotor Corporation, a subsidiary of Caterpillar Tractor at Mentor, Ohio, low-level ventilation ducts were in place prior to the installation of welding machinery and fixtures. These ducts are supplied by fans located in penthouses on the roof. Matching roof-mounted exhaust fans were designed to leave a slight negative pressure in the area to discourage the smoke from invading other areas of the building.

Exhaust fans are usually designed with twice the capacity of supply fans for summer ventilation. In the winter a portion of exhaust fans are turned off to provide a slight positive internal pressure. It is expected that the welding smoke will rise by natural convection and induction created by low-level ventilation exhausted at the roof line.

In the building housing finish weld operations on Towmotor lift truck frames, the low-level ventilation ducts supply 2,750 cubic feet per minute each, and the floor spacing per weld station allows a good ventilation of 5,500 cubic feet per minute, per station.

Short welds and low welding duty cycle on the carriage and backrest weld line do not

present a great challenge for the general-ventilation system, but in the finish weld operation on drive axles, a general-ventilation system is of little help to the welder who must work over or inside confined weldments.

General ventilation has some disadvantages—for example, the gas shielded welding processes cannot tolerate excessive drafts over 200 feet per minute across the arc area because of porosity when the shield is disturbed. General ventilation also requires additional heating during the winter, which adds to the cost of moving large volumes of fresh air. And last, the mere dilution of smoke is not considered acceptable.

American National Standard Institute, Standard Z49. 1967 entitled, "Safety in Welding and Cutting," states that mechanical local exhaust ventilation may be by means of the following:

"A fixed enclosure with a top and not less than two sides which surround the welding or cutting operation and with the rate of air flow sufficient to maintain a velocity away from the welder of not less than 100 linear feet per minute."

A "Space Cleaner" installation at Caterpillar's Milwaukee plant is typical of this type enclosure. The unit was manufactured by United Air Specialists and includes an electrostatic precipitator with a flow rate of 1,000 C.F.M.

The Welding Standard further directs that mechanical local exhaust ventilation may be by means of:

"Freely movable hoods intended to be placed by the welder as near as practical to the work being welded and provided with rate of flow sufficient to maintain a velocity in the direction of the hood of 100 linear feet per minute in the zone of welding when the hood is at its most remote distance from the point of welding."

A Torit swing-arc smoke exhauster of this type is installed at the Towmotor Corporation, Mentor, Ohio, plant. It includes an American Air Filter Co. Rotoclon Dynamic Precipitator with a flow rate of 7,000 C.F.M.

At the Caterpillar Milwaukee plant, a Ruemaling welding smoke collector was installed with two ducts having a total flow of

6,000 CFM. Work handled includes the weldment of large bucket edges to be hard surfaced, necessitating frequent placement of the intake ducts for efficient smoke collection. Nozzles for this purpose are positioned by the operator, the second nozzle located a suitable distance away from the first to provide continuous coverage before relocation is required. Filtration is used with these installations.

After careful study of all extraction systems our task force concluded that the smoke was taken away after the welder was exposed to it. So we approved a program to develop and implement the installation of a low volume, high velocity welding smoke extraction system, specifically to remove the smoke at its source. We utilized the resources of Caterpillar research, plant engineering, medical and safety groups to assist the weld development group in devising a welding smoke extractor gun.

First, a nozzle was built to fit a conventional CO₂ welding gun and attached to a suitable vacuum source. In all, 32 designs were built and tested in our program to perfect a nozzle that would be small in size, durable and effective without removing the protective shield. This proved to be a rather complex fluid dynamics problem, since we were moving air and smoke at a rate of 30 cubic feet per minute, side by side, to a column of CO₂ shrouder gas going the opposite direction at a rate of 30 cubic feet per hour. If we disturbed the CO₂ shield we would create faulty or porous welds.

Our work resulted in the design and construction of an air-cooled 600-amp, rated welding gun equipped for smoke extraction. A vacuum tube was built into the gun handle and is brought forward to the nozzle area. Actually it's a vacuum sweeper at the end of the gun. A cast nozzle was designed to slip over the insulator and connect to the vacuum tube. A clamp screw was tightened to hold the nozzle in place. During the development program three separate shop trials were run to determine serviceability under actual conditions. These tests were run after the weld development group had run endurance tests in their laboratory.

It is only natural that welding operators

would object to increasing the weight and size of welding guns. Therefore, any development work had to carefully consider the balance and fatigue factor imposed by the addition of smoke extraction to the gun, and, extraction close to the arc would remove considerable heat that could not be allowed to interfere with continued use of the equipment.

Since most weldments do not always lend themselves to perfect welding conditions, the nozzle design had to be such that the smoke could be efficiently removed with various gun angles and without disturbing the effective shield and affecting the quality of weld. Feasibility and development study was successfully completed at Caterpillar and an agreement was negotiated with the Hobart Brothers Company of Troy, Ohio, to utilize this data to design and build a commercial welding smoke-extractor system. Mutual cooperation between our organizations has resulted in equipment that has been production-tested and marketed.

The removal of welding smoke at the source should reduce housekeeping and maintenance costs, for approximately one per cent of electrode consumed goes into the air in the form of particulate matter. In a shop having several weld stations, this welding dust can collect on any exposed surface.

Improved life of expendable gun parts can be expected due to lower operating temperatures at no increase to manufacturing costs. Lower space-heating costs are added benefits where large general-ventilation fans can be eliminated.

Today's low-volume high-velocity systems do add some weight and size to the gun, which cannot be avoided. We do expect further improvement to lessen weight of the gun. Best smoke extraction is obtained with a gun-angle near perpendicular to the weld axis; with reduced efficiency as the gun is moved to unusual angles. Since the nozzle is cooler than usual, spatter does not tend to adhere and can be wiped off by the hand. Therefore, anti-spatter compounds need not be used.

In production installations, we have observed that operators do require a training period to become used to the equipment, but seem to adapt quickly, and subconsciously

try to secure optimum smoke extraction. Once the operator has used the equipment, he is reluctant to part with it. For example, Robert Klimcko, welder at the Aurora plant, said, "after I used the new equipment in the pilot program, reduction of smoke in the area was quite noticeable. I'm looking forward to the time when the smoke extraction system will be installed throughout the shop. These guns will make all our jobs more pleasant."

Now, I would like to share with you some of our experiences with improvement of the welder's personal protective equipment.

First, our task force summarized the characteristics of available protective equipment. Next, we searched the literature to see if ideas existed that had not been commercially developed. Also, we considered ways of measuring heat through characteristics of material.

Nothing significant resulted from this first study of personal protective equipment other than to confirm our opinion that safety equipment manufacturers had not kept up with the process. In 1913 welders were wearing helmets, safety glasses, filter lenses, jacket and gloves—using 100-amp welder. Today, welders are still wearing the same type of items, but using over a 500-amp welder.

To protect the welder while providing as much comfort as possible, we invited a number of safety equipment manufacturers to work with us to try and improve the welder's personal protective equipment. One was selected and we entered into an agreement to jointly develop and test experimental protective equipment. In a brainstorm ideas-exchange session, we examined off-the-shelf systems of helmet, gloves and jackets; they were reflective, insulative, air-cooled and lightweight. During this session the lens system, helmet configuration and materials improvement were suggested.

Since the cooperating company had no way of evaluating the final configuration of personal protective equipment which might evolve from their development program, it was agreed Caterpillar would aid in this evaluation. To do this, we used a stripchart recorder to record temperature and effectiveness of personal protective equipment. We measured the heat inside and outside of the

helmet by placing a thermocouple on the outside of the helmet below the lens holder and on the inside of the helmet below the lens holder. Also a thermocouple on the chin rest inside of the helmet, to give an idea of air temperature being breathed.

We placed a thermocouple on the welder above each breast and on the great knuckle of the hand holding the welding gun. Also, we measured temperature of heat on the outside of the clothing and directly opposite on the inside.

We also wanted to know the temperature of the man before and after the test—total time of test, arc time and number of times helmet was raised. This was a standard evaluation we made on several generations of equipment development. When we had what we considered the optimum, we arranged a shop test of 60 welders at six midwestern Caterpillar plants. All welders participating in the shop test were given a clear explanation why we were conducting the test. It was important to success of the test that the welder wear the equipment for full duration of the test, also that he know that the goal was to provide protection and comfort with the least interference to him and his operation.

We wanted his honest evaluation on comfort, durability and interference. We had objective information from research; we needed the welders subjective evaluation.

The shop test revealed more design work was necessary to produce effective and acceptable equipment of gloves, jacket and helmet. However, the yellow safety lens glasses (Noviol) American Optical product, were, generally speaking, enthusiastically accepted by this test group.

The salient feature of these glasses is that they enable a welder to see better in the welding shop environment and give him protection equal to Calobar lens. Most of the welders felt the weld helmet had a lot of value but needed a little more development to make it more durable. Because of the welder reactions we only made Noviol safety glasses available to welders at this time.

We are convinced, from a technical point of view, that temperature can be reduced with appropriate personal protective equipment. For example, innovations on the helmet have proven that the temperature-rise at the end of a 20-minute cycle can be reduced from over 100°F to less than 5°F.

We have gained more insight but no major practical solutions have resulted. We are interested in talking with any manufacturer who has ideas that will improve the welders' environment.

If readers would make it one of their 1973 objectives to improve the welders' environment, more rapid progress could be made in this important area. I urge you to make this your objective.

The task force approach to improving the welders environment has been effective for us. We have introduced the smoke-extractor gun to the welding industry. We have had the cooperation of welders, local union leaders and the support of all management levels. Improvement of the welder's environment has resulted. *But don't think we are satisfied!* We are still looking for better safety equipment and a more comfortable environment for welders—and all production workers.

WHAT'S NEW IN GUARDING PEOPLE AND PROPERTY?

By BRUCE BISHOP

Director, Region 4, Defense Civil Preparedness Agency, Battle Creek, Mich.

Defense Civil Preparedness Agency is a new name for an old, old agency, none other than the Office of Civil Defense. We all remember the old days of the people with the flat WWI tin helmets that had Civil Defense written on them. Remember the arm bands? Remember the people with the buckets of sand and the air raid wardens who had responsibility for a block and the great number of people in that block? All of us in industry know that in the basements of most of our buildings we have shelter supplies, and outside of each door are signs that say so many people can occupy that as a fallout shelter. Many of us, too, are familiar with the radiological detection program and we know that there are warnings for attack. And just about everybody associates civil defense with some form of war-time disaster protection, defense, and recovery.

But only recently civil defense has taken on a new role, at least at the national level. We've said it's inconceivable that all of the talents that go into protecting people and property in industry and our nation itself passively from enemy attack should be dedicated purely to a role of wartime disaster readiness. We have said there is a great need especially in view of the many disasters that have occurred recently that have been made but not connected with the military, or that Mother Nature herself visited upon us. And we have said that civil defense should have a new role; it should not be just a wartime defense mission but should be civil preparedness. Additionally, we have set about helping local government, individual businesses, industry, and educational institutions to develop plans to cope with any disaster which might occur.

What kind of disaster can industry expect to be faced with? What might be the impact each of those individual types of emergency creates?

operating, as no electricity was available. In the downtown area, the churches were attempting to function with a foot to a few feet of water covering the floors and over the altars. In the entire area, huge blocks—not square blocks, but square miles—were completely impassable by foot or by auto. The only access was by boat.

As the river itself receded, the pollution that goes along with a flood of this type—the oil and debris—ultimately ended up as a deposit on floors of residences and homes or in basements. Industry was totally unable to function, totally unable to manufacture any product or take in any raw materials from which to manufacture any products. Agricultural lands offered wasted and rotted crops in the fields simply because they were unable to harvest. Apartment houses and motels reeked of the oily waters flowing down the main thoroughfare itself. Here and there a lawn chair came floating down into the debris.

One of the greatest fears of all fire fighters is that there may be a fire which starts in a situation such as this. The only way it can be fought is by boats rather than by the wheeled vehicles that carry fire fighting apparatus and fire equipment that was organic in the plant, factory, or industry itself.

Helicopter rescue teams flew endless missions, locating stranded people and rescuing them with their rescue slings. Throughout it all could be seen the long lines of people who were served by the Red Cross, Salvation Army, Menonites, and all of the many other relief and welfare institutions, as well as civil defense itself.

That is just one kind of disaster we might concern ourselves with if we were part of industry, but let's review all the various types of disasters that could affect your operation. First, I think the greatest fear we have is that of fire within the plant itself. It could come from chemical sources or it could come in various forms, perhaps the result of gasoline or petroleum products, or perhaps the result of an explosion. All in all, it results in the gutted insides of a building that was at one time turning out a very important product for the community, the state, or perhaps for the nation, maybe internationally.

And too, we have the fear of tornadoes, something totally uncontrollable and difficult to protect against. Once they strike, they can create untold damage and havoc to the factory areas, residential areas, and especially in areas where we have large gatherings of mobile homes that have been tied down improperly or not at all.

Then, too, there is the prospect of a flash flood, and we think immediately of Rapid City, South Dakota, or of Buffalo Creek, where a dam gave way and cascaded tons of water down onto an unsuspecting community, moving buildings around like matchboxes, leaving in its wake acres and acres of worthless mud, silt, and soil, buildings that are no longer habitable, unable to house employees that probably worked in many industries of the area.

Of great concern, too, is the earthquake. A small earthquake hit the midwest just this summer. We probably all recall the Alaska earthquake in 1964, where the streets dropped 20-30 feet below the normal level. Whole buildings were destroyed—houses completely gone—moved from their foundations and carried miles away from where they originally were located. There was a great deal of damage from tidal waves that resulted immediately after the earthquake.

Transportation accidents are a timely topic of the day. Let's talk about passenger carriers for a moment. We are not just concerned about inanimate cargo but lives of people, and the great problem as a result of attempting to bring in rescue units. There is a tremendous amount of passenger traffic by our air carriers today, and with it goes the ever-present danger of one of our large aircraft going down with great loss of life as well as great damage to personal property on the ground. With no control over where a falling aircraft might land, it could be a plant or industry, and not just the plane burning on an open hill.

Of great concern to us in industry are the effects of toxic gases from chemical fires. Many plants store toxic chemicals and, of course, we then have the problem of protecting people in the event these gases escape. What about the innocent attaché case which turns out to be a bomb planted somewhere,

either by some crank or in a protest against some commodity that the plant might manufacture? Of course, we attempt to provide protection through our bomb disposal squads, but sometimes that protection falls short, and the results are horrible.

We can't overlook the possibility of sabotage, should it be in the office areas or in the plant itself in the heavy machinery. And, in the plush areas of the United States, with great amounts of forest and vegetation, we have to consider the probability of forest fires. Of course, we are faced with the prospect of riots and civil disturbances. There is always the concern on the part of industry that we do not have adequate protection within the plant itself in a situation such as this.

In the Midwest there is a great concern for the winter blizzard, where lines are down and power transmission is impossible, with communication brought to a standstill and agriculture heavily affected. Even transportation on the Great Lakes is brought to a halt because icebreakers are unable to move.

Lastly, and this is the role you are all familiar with and the role you know is played by civil preparedness, is the most horrible of extraordinary disasters to occur. I'm referring to the nuclear explosion, accidental or in time of war. All of our preparation, whether for natural disaster or for a non-military man-made disaster, is geared so we can be better prepared to face the nuclear holocaust if it should come.

We have had a review of one major disaster which occurred in the recent past, plus a review of all types of disasters we might anticipate as leaders of industry and security personnel. I think the time has now come for each of us to ask, "Just how well prepared am I to meet an emergency if it should occur in my plant?"

Following are twenty questions which I would like you to review and come up with an answer as to how ready you really are. This isn't the kind of an examination that you can take and come up with a score that says satisfactory, tolerable, superior, excellent, because if you get just one wrong, that means there is an intolerable loophole in your program. It might result in a heavy loss

of lives or damage to your utility or your plant.

Have your facility and operation been subjected to a hazard analysis to determine what emergencies are most likely to occur, when, and where?

Are you and all management aware of the impact of disasters on employees, stockholders, the community, and the nation?

Have you assigned responsibility for developing a plan and program for people and plant protection, survival, and recovery to a highly responsible staff member and vested him with authority to act? If so, does the plan cover all types of emergencies?

Does a competent line of succession exist in your plant? If so, does it work?

Are emergency manpower needs identified, provided for and trained? (Floor captains or area wardens, fire forces, rescue, medical and first aid, engineering, chemical, radiological, and electrical.)

Is there an adequate, well-equipped, survivable, accessible, and clearly-defined Disaster Operations Center in your plant?

Does your plant have external and internal communications? If so, are they reliable and backed up by emergency sources?

Have mutual aid agreements been negotiated with other plants and with community emergency services? (Are you on a first-name basis with the municipal Civil Defense Director?)

Are vital records stored in protected areas?

Has an employees' alert warning and emergency information service been established?

Is there emergency power for essential service and command control purposes?

Is there a plan for emergency shutdown or startup? If so, can you be sure it will work?

Have provisions been made for accounting for employees, feeding, sheltering, and sanitation needs?

Are employees encouraged and assisted in developing individual on-and-off-job survival plans?

Is your disaster preparedness officer consulted on new construction and plant modifications?

Do you have evacuation plans keyed to specific types of emergencies? If so, do you

know if they will work?

Are all employees aware of what they must do in time of crisis? Is their knowledge tested and are their crisis reactions exercised periodically?

Have you prepared a catalogue of essential emergency resources? If so, does it include resources under control of other industries, the municipality, and private sources?

Is an emergency transportation plan in existence? If so, will it work?

Do you really feel confident of your own competence? Can all of the people employed in your plant safely put their lives in your hands?

If you had even one "no" in your score, then I'd like to recommend you join us in helping to develop better disaster plans for your plant. We have a Staff College which is located in Battle Creek, Michigan. Three times a year we conduct an Industry Business Emergency Planning course, designed to

help you to develop disaster plans. The course covers all aspects of civil preparedness, natural disaster, and nuclear disaster. Above all, it shows that we in civil preparedness are concerned about what happens to industry, because there is a partnership between civil preparedness and industry.

We have a responsibility, first of all, for protecting as many people as we possibly can from any effects of any type of disaster that might occur. Secondly, we have a heavy responsibility in helping communities, states, and our nation to recover from disasters, including recovery of our economy and our manufacturing capabilities. We can do this only if our industries survive. In the event they do not survive entirely, it is our responsibility to help them readjust and react in the shortest time possible. We invite you to attend the Industry Business Emergency Planning conference.

VALID REPRESENTATIVE AIR SAMPLES—LOCATION, TIME, DURATION, WORK CYCLES, PEAKS AND TIME WEIGHTED AVERAGE CONCENTRATIONS

By JEREMIAH LYNCH

Deputy Dir., Div. of Laboratories & Criteria Development, National Institute for Occupational Safety and Health, Cincinnati, Ohio

The preface of the Threshold Limit Values of Airborne Contaminants, the document from which most of the standards for airborne contaminants promulgated by OSHA under Title 29, Code of Federal Regulations, Part 1910, were drawn, states that "They (the TLV's) should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations." Certain exceptions are noted.

A recent statement by a committee of the American Industrial Hygiene Association proposed that the AIHA Journal publish the following: "Threshold limit values for airborne particulates which were developed as guidelines for estimating potential hazard to the individual worker are now being used as absolute standards to define safe and unsafe conditions. Frequently this interpretation transforms the eight-hour time weighted concentration (inherent in the TLV definition) into a maximum ceiling level for air sampling purposes. In light of (1) the limited precision of currently used particulate air sampling procedures, (2) the temporal variability in working-environment air concentrations and (3) the statistical extrapolation of air sampling data to estimate risk to the worker, the AIHA-ACGIH Aerosol Hazards Evaluation Committee wishes to re-emphasize the TLV's should not be used as exact dividing lines between safe and unsafe work conditions."

From the preceding statements, it is apparent that industrial hygienists are concerned now, as in the past, with the use of threshold limit values and that they are especially concerned about their use as enforceable stan-

dards. The problem with both of the preceding statements is that they are negative. They tell us what not to do, but they do not tell us what we should do. I am going to discuss some of the positive things we can do to take into account the limitations in the TLV's insofar as we are able and at the same time get on with the work of protecting the health of workers exposed to harmful air contaminants. Specifically, I will examine the reasons why there are objections to the use of the TLV's (or any other number, for that matter) as standards and what we can do to deal with these objections when TLV's are used as standards.

The two basic problems in using TLV's as standards concern the accuracy of the TLV as an index of biological risk and the accuracy of measurements of air concentrations in assessing exposure. These are separate problems and I will consider them each in turn.

The philosophy underlying the use of the TLV has always been that it is better to have a number which is not known to be a perfectly accurate representation of the safe level of exposure than to have no number. Consequently, it has always been the practice of this standard setting group (ACGIH), when it was known that there was a potential hazard, to adopt a number based on the best information available. Sometimes the best was not very good. Only rarely was a detailed dose-response relationship based on human exposure over a sufficiently long period of time available for the purpose of setting standards. We should consider ourselves fortunate that it was not, since in order for data of this kind to occur it is necessary that there be a significantly large number of people ex-

posed to such a degree that a measurable amount of disease is occurring. Fortunately, there are few large populations of workers who are getting frank occupational diseases. In most cases it is necessary to use animal data, and I will not dwell on the difficulties in extrapolating from the results of animal experiments to humans except to say that animals are quantitatively different in a great number of respects, most important of all perhaps in that they do not live as long. It is, therefore, not possible to estimate the effect of life-long exposures lasting 20, 30, or 40 years. Further, some of the TLV's were set by analogy to some other compound of known toxicity. Some of them were set based on such matters as irritation and general plant housekeeping. Smyth analyzed the ACGIH documentation to answer the question of what each TLV attempts to prevent. He found "30 per cent of the values guard against irritation, 7 per cent are simply standards of good practice, and 63 per cent guard against toxic effects." This is not to say that 37 per cent of the substances listed are only irritants or housekeeping problems, but rather these are the effects at TLV concentrations. Other, more serious effects occur at higher concentrations in almost all cases.

The Department of Labor, in developing OSHA program directives for the target health hazard program, considered the basis of each limit and the effect of exposure at that level and at higher levels in determining categories of violations. This classification is in line with the toxicologists' point of view as expressed by Smyth that "De Minimus should apply to concentrations which may have objectionable odor, a trivial irritation of eye, nose, or throat, or which may simply represent poor housekeeping."

It is true that the TLV's are not fine lines and in fact that fine lines do not exist. It isn't even correct to talk about a safety factor because the response of a population of individuals to an air contaminant can be expressed in either of two ways. In the first, we can say that there is a level at which no significant effect occurs and then beyond that there is a range over which a greater and greater proportion of people become affected until a level is reached at which virtually everyone is

adversely affected. This is the traditional concept of the threshold.

However, a continuous range of doses from those at which very few people are affected to doses at which a great number of people are affected, is more likely. In this situation, the limit is set at a point where some acceptable percentage of individuals is affected. (I use that word acceptably reluctantly since I feel, as probably you all do, that no occupational disease is acceptable. For example, 90 dbA does not prevent all acoustic trauma. The same is true with the limit for cotton and probably also with beryllium.)

It is evident, therefore, that any limit is arbitrary to a degree. The real question then is what dose levels can be permitted with an acceptable risk and are the present TLV's based on these dose levels. The answer is that certainly not all of them are. Some may be too low, as in the case of nuisance or irritant materials. Some are too high as, for example, the asbestos TLV of two years ago. I think that it is probable that future evidence will show most of them to be too high. I base this supposition on the very limited and preliminary information that we have on the non-specific diseases often referred to by Professor Hatch, the very limited data on long-term effects, and the very limited data on the combined effects of several hazards which coexist.

In NIOSH, as authorized under the Occupational Safety and Health Act, we are proceeding via the criteria document mechanism to propose to the Department of Labor new standards which will eliminate some of the objections I have described. These new standards should insure that no employee will suffer diminished health, functional capacity, or life expectancy when standards are enforced in conjunction with a program of medical surveillance to detect the hyper-susceptible. Such standards, which are based on health effects rather than discomfort, may properly be considered fixed enforceable requirements rather than discretionary guides.

My own operating conclusions with regard to the question of the accuracy of standards as estimates of biological risk are as follows:

1. Limits must be set for hazardous air contaminants using the best information available.

2. The TLV's and ANSI limits are, on the whole, derived from the best estimates of acceptable dose levels.

3. These estimates are being continuously refined by epidemiological and toxicological research which will lead to periodic revision of the limits.

4. For practical control purposes the accuracy of the limits is adequate.

In the practice of industrial hygiene, although we may be unable in the decision making process to consider the accuracy of the limit, especially when the limit has been adopted into a legally enforceable standard, we can and must consider a number of factors having to do with the accuracy of the measurement. It is in this respect that the dictum that we should not consider the standards to be fine lines has the greatest meaning.

The difficulty in measuring the biologically significant dose to the worker based on some number of measurements made with instrumentation of limited accuracy over a period of time whose extent is not identical with the period of exposure involves four basic problems.

1. The TLV and the standard derived from it are based on a dose-response relationship. From that dose-response relationship we establish a standard for exposure and then we go into the workplace and make a measurement of concentration. The bridges or connections between dose and exposure and between exposure and concentration each involve a potential error. It has long been recognized that there is considerable variability among individuals in terms of their response to a dose that was assumed to be the same. What may be happening in this case is an actual difference in dose even during the same exposure. For example, the dose will vary for the same exposure if the breathing rate varies. It will also vary with the effectiveness of the lung clearance mechanisms, which in turn are affected by such things as cigarette smoking. This problem partly relates to the earlier discussion on the validity of the limit since the limit is in terms of exposure.

However, our estimate of exposure based on measurement of concentration is also sub-

ject to errors. When respirators are provided, it is necessary to consider whether they are really being used. Are they being used continuously when an exposure situation exists or are they only being used at the time that the inspector or industrial hygienist is present? Even when they are being used, how much protection is being provided? Has the proper type been selected and does it fit the worker? When a respirator is used and if it fits, then it is appropriate to divide the concentration by the respirator protection factor, if it is known, to determine the exposure. (You may be interested to know that among the goals of NIOSH is the assignment of protection factors to the various classes of respirators.)

The basic factor in the relationship between concentration and exposure does is where the sample is taken. If a fixed, general air sample is collected, it will of course measure the concentration where the sampler is located, but that may not be where the worker is located. The obvious solution is to hang the sampler on the worker so that it travels around with him. It has become easier to do this with the advent of long-period personal samplers, charcoal tubes, and other solid sorbent methods for such things as solvent vapors, and the development of new low flow rate (50-200 cc/min) and intermediate flow rate (20-25 lpm) personal samplers that will accommodate a variety of sampling situations. Even when the sampler is hung on the worker, there is the possibility that the concentration at the location of the sampler inlet on the lapel is somewhat different from that in the inhaled air of the worker.

2. The second source of error in our estimate of exposure based on some set of measurements is caused by what the AIHA Committee referred to as "the temporal variability in the working environment air concentration." There are two aspects to this problem.

The first is that the dose of importance may be that received over some long period of perhaps years, whereas the standard is for an eight-hour average. In employer monitoring, some consideration should be given to whether the day on which the sample was selected was representative of all other days.

Thus, for the purpose of monitoring worker exposure to determine the real risk to health, it is necessary to devise a sampling scheme where measurements are made on different days throughout the year to insure that an accurate estimate is made in view of this environmental variability. However, the inspector is in the position that if he finds that the concentration truly exceeded the standard for the appropriate period of time, it does not matter what concentrations existed at other times.

The second aspect of the effect of temporal variability on measurement accuracy is the relation of the sampling period to the period of exposure to which the standard applies. Before considering this source of error, it is first necessary to discuss the various limit internal concepts which are being used:

Ceiling Limit. This is the simplest type limit in that there is only one time interval, 15 minutes, in the case of a TLV. For example, if a 17-minute sample for TDI yields a concentration of 0.03 ppm, the limit of 0.02 ppm is exceeded.

Eight-Hour Average with Excursion. Most TLV's are for eight-hour average exposures except that an excursion factor is also given. This means that the TLV times the excursion factor should not be exceeded for a short period, usually considered 15 minutes. Thus, a 25-minute sample of acetone yielding a result of 1,500 ppm would exceed the excursion limit of 1,250 ppm obtained by multiplying the eight-hour limit of 1,000 ppm by the excursion factor of 1.25.

Eight-Hour Average with Short-Term Limit. Several recent criteria documents, such as those for beryllium and asbestos, have included limits for short periods in addition to the eight-hour average. For example, the eight-hour average for beryllium shall not exceed 2 µgm/m³ and peak exposure based on a 30-minute or longer sample shall not exceed 25 µgm/m³.

Eight-Hour Average with Ceiling and Peak Limits. The ANSI-Z37 standards frequently provide for a peak limit not to be exceeded for any time, over a ceiling which may be exceeded up to the peak, once a day for a short period, in addition to the eight-hour average. A 15-minute sample of toluene at

400 ppm would exceed the ceiling limit of 300 ppm for 10 minutes.

The reasoning behind these various concepts is beyond the scope of this discussion. The important point, with respect to measurement accuracy is that, with the exception of the ANSI peak, which I do not understand, there is a time period appropriate to every limit. The ideal sampling period would be equal to the period which applies to the limit. Even in the case of the 5, 15, and 30-minute limit periods this may be difficult, and given the constraints imposed by our limited sampling methods we are frequently unable to sample for a full eight hours. While much work is being done on the development of samplers that will permit full shift sampling, in many cases at the present time it is necessary to use grab samples and to statistically infer what conditions would have existed and what results would have been found had we sampled for the full eight hours. Such statistical inference has a well defined and calculable error. We must insure then that when inferential measurements are made this error is considered, whether in the compliance decision or in the decision of the employer as to whether or not control is warranted.

To digress for a moment, the concept of the time-weighted average should be considered. When an industrial process has a cyclical nature and when it is known that the concentration varies with these cycles and exhibits only random variation within cycles and when only short period sampling methods are available, then it may be appropriate to use the time-weighted method of calculation to determine the eight-hour average. If we are not able to sample for the full duration of each cycle, then a number of samples should be collected in each cycle and the cycle average inferred statistically. Given these cycle averages, and assuming the assumptions mentioned above are valid, the eight-hour average may be calculated from the formula:

$$C_1 T_1 + C_2 T_2 + \dots + C_n T_n \text{ hrs}$$

Considering the assumptions which need to be made and the number of samples that need to be collected, both within and between cycles, in most cases the statistical

method of random sampling over the eight-hour period will be more convenient and accurate. Of course, a single sample or a combination of samples covering the full eight hours is to be preferred over either the time-weighted average calculation or the random inference method.

The third and most obvious source of error results from sampling and analytical inaccuracies. Due to rotometer reading errors and errors in calibration, the flow rate of the sampling device could be off by as much as five to ten per cent. The analytical method error, when all things are considered, including interlaboratory variations, could be up as high as 60 per cent, as was reported by Bumsted in the case of quartz analysis. Fortunately, analytical errors are frequently lower and the range of combined errors in sampling and analysis generally do not exceed 25 per cent.

All I have been talking about up to now have been problems. It's about time I came up with some solutions. In other words, what can we do about all of this? There are two things we should not do, but which have been done all too frequently in the past. The first is to ignore all of this, to not consider any of the sources of errors that I have discussed, to take a grab sample with a detector tube, eyeball a reading of 51 when the limit is 50 and lower the boom. This is certainly not the way to go. Our credibility as professionals in the field of occupational safety and health cannot withstand behavior of this sort. The second is to recognize all these problems, throw up our hands and say it's all too complicated and that, therefore, we cannot enforce standards which will protect the health of the worker. This argument in all of its various forms has been at the root of the reason why air contaminant standards in industry have not generally been enforced in the past and is, therefore, one of the reasons for the passage of the Occupational Safety and Health Act. This alternative also fails for the obvious reason that if the standards are not enforced the worker is not protected.

There is a more constructive approach. Some suggestions may be offered to those who have the responsibility for determining compliance and for those who would critically evaluate the working environment in their

own establishment:

1. Accept the standards as being based on the best estimate of the dose-response relationships available. And remember, the Act provides for setting standards "dealing with toxic materials or harmful physical agents . . . on the basis of the best available evidence." There are many who argue that standards are too high and many who say they are too low, frequently talking about the same standard. It is clear also that this situation will improve as research develops better and better data. If we wait for the certainty that the standard is perfect and will never again need to be changed and will never be challenged, it goes without saying we will never have a standard and the worker will go unprotected.

2. Measure exposure whenever possible. Personal sampling is the preferred method, with breathing zone sampling as a somewhat less satisfactory alternative. General air sampling for the measurement of exposure should only be used when the relationship between the general air concentrations and the worker exposure are known as a result of some specific studies.

3. Sample over the full period appropriate to the standard, whether it be 15 minutes in the case of the ceiling or eight hours in the case of a full shift standard. If this is not possible, then grab samples may be used to estimate the most likely measurement that would have been made if an eight-hour sample had been collected. Appropriate statistical techniques should be used to define the confidence limits of this estimate. As a last alternative, the time-weighted average method of estimating an eight-hour average based on a series of grab samples should only be used when sufficient hard data on the cycles and their effect on the concentration in the environment are known and enough samples are collected within each cycle.

4. When the limit is for an eight-hour average, samples should also be collected during periods of peak exposures to evaluate the excursion or short term limit.

5. Consider both the environmental variability and the sampling and analytical error in making the decision. These errors should be considered both in the case of an inspector

determining that the environment is certainly unsafe and therefore a citation is appropriate, and in the case of the employer's determination that the environment is certainly safe and that no control action need be taken.

In conclusion, it has been my intent in these remarks to take a positive view of what can be done in the application of the air contaminant standards adopted under the Occupational Safety and Health Act. All

though these standards have been characterized as *not* fine lines between safe and unsafe conditions, they are the best available at this time and do constitute standards which should be enforced, because not to enforce them would leave the worker unprotected. We should try to enforce them with logic and reason considering the principles that I have discussed and thereby arrive at conclusions that are fair to all concerned.

some acceptable concentrations use a "C" (for ceiling) designation to indicate that this concentration should not be exceeded. Ceiling values are indicated when the exposure to the chemical, for periods up to 15 minutes, may result in intolerable irritation, chronic or irreversible tissue change, or necrosis of sufficient degree to increase accident proneness, impair self-rescue, or materially reduce work efficiency.

The American National Standards Institute (ANSI) has proposed values for many substances. The time-weighted average and ceiling value are as defined previously. The peak level is defined as a one-time permissible excursion, limit during the work day. ANSI standards are consensus standards, and OSHA has given them precedence over TLV's which are formulated only by the American Conference of Governmental Industrial Hygienists (ACGIH). An evaluation of benzene exposures in which the three ANSI limits are simultaneously tested has been described by Jones and Brief.³

In keeping with the earlier discussion of a statistical basis for determining OSHA compliance, the concentrations measured for contaminants with a ceiling (peak) value standard should be considered acceptable below $(1 + \epsilon)$ times the ceiling (peak) value, where ϵ is the instrument error, as before. However, in all applications, other than the testing of OSHA compliance, the conservative approach, in which measured values are compared directly against standards, is preferred.

Direct Reading Colorimetric Indicators¹²

The pitfalls and problems in direct reading colorimetric indicators are basically similar. Each system requires calibration of both the colorimetric reaction and air flow measurement. Since this type of device is destroyed when used, individual units from a lot should be calibrated. NIOSH is developing a detector tube certification program, whereby manufacturers will be required to conduct specified calibration tests on each lot of tubes. Although this will minimize the need for calibration in the future, it by no means will obviate the need for calibration checks.

For the determination of air contaminants,

there are three types of direct reading colorimetric indicators: (1) liquid reagents, (2) chemically treated papers, and (3) glass indicating tubes containing solid chemicals, also known as detector tubes.

Liquid reagents are supplied in sealed ampoules, in concentrates, and in solid form which is subsequently diluted or dissolved prior to use. Unstable reagents are often prepared by breaking an ampoule containing one component inside a container containing another. Besides the calibration aspect, an obvious problem is the reproducibility in the chemical preparation. Interfering chemicals or temperature can also modify the color tone, which will be a problem in interpreting the color intensity, particularly with a field viewer. The quantity of air samples is vital to the proper determination of concentration. If the optical readout is designed for a fixed volume and the flow is incorrect because the flow rate is in error or the sampling time is not correct, then an incorrect concentration will be indicated. Manufacturer's instructions should be carefully followed and calibration checks periodically performed on given lots. Commercial apparatus of this type is available for determining organic lead in air and for measuring nitrogen dioxide. Chemical indicators can also be used for determining acid or alkaline gases by measuring the volume of air needed to produce a color change. This more skillful procedure, sometimes called air titration, can be easily learned.

Chemically treated papers are convenient and compact and are easily handled in the field. Arsine is quantitatively measured using a method in which the arsine blackens a paper strip previously impregnated with mercuric bromide. Lead acetate impregnated paper has also been used for measurement of hydrogen sulfide. Chemically treated papers are most effectively used when a known volume of air is drawn over or through them.

Treated papers hanging unattended in a contaminated area can only give an indication of the contamination level, because the volume of air exposed to the paper is unknown and the color change in the paper is influenced by air currents and temperature. A commercial device uses a controlled air

flow for the measurement of hydrogen fluoride.

Particulate contaminants such as chromic acid and lead can also be determined, usually by the addition of liquid reagents to the sample on the filter paper after collection. Evaluation of the stains developed are made visually by comparison with color charts or by photoelectric instruments. Accuracy of the paper detection systems depends on the uniform sensitivity of the paper, the stability of the chemicals employed, and careful calibration.

The third and most popular type of direct reading colorimetric indicator is the glass indicating tubes containing solid chemicals. Presently there are about 100 different types of commercially available detector tubes. Because of their compactness and ready availability, they are convenient for evaluation of exposure to toxic materials in industry. They are also used successfully for air pollution studies and for detection of explosive hazards as well as for process control of gas composition. In proper configuration these tubes may be used for the determination of carbon monoxide in exhaled breath or in gas released from a sample of blood, or for determination of alcohol in breath, or gasoline in soil. Reported use has been applied to the measurement of ions in aqueous solutions. However, for purposes of this paper, the indicator tubes would be primarily applied to measurement of environmental concentrations and for this purpose they are to be commended.

The operating procedure is relatively simple but some finesse is needed in order to obtain repeatable results. After its two sealed ends are opened the tube is fitted into the manufacturer's holder, which is in turn fitted with a calibrated squeeze bulb or piston pump. The recommended air volume is then drawn through the tube by the operator. Here is the first pitfall in sampling. If adequate time is not allowed for each stroke a lesser than expected volume of air will flow through the tube, giving an inaccurate result on the low side. A squeeze bulb, even after it is fully expanded, may still be under a partial vacuum and may not have drawn its full volume of air. Similarly, for a piston pump

the flow rate through the tube is determined by a small orifice which can become clogged. Because ammonia produces particulate with most acidic vapors, sampling in an ammonia environment can create clogged or plugged orifices.

Depending on the flow rate and the sample volume drawn, the pump body may not have reached equilibrium before the next stroke is made or the tube is read. The manufacturer's sampling instructions must be carefully followed. The change in color or stain length of the exposed tube are then compared with manufacturer's calibrations as related to the number of bulb squeezings or piston pump displacement. For change in color, the visual judgment depends on the color vision of the observer and the lighting conditions. Thus, one reader's observation may not be reproduced by another. For length of stain tubes, a fixed volume of air is drawn and the stain length is compared with a calibration chart. Here the stain front may not be sharp, so that the exact length of stain is not known. Rolling the tube in the fingers to make a visual judgment of the condition of the edge will be required then to make the judgment as to the actual concentration. Other observers may come up with different answers, depending on how they read the finished edge of the color change.

In some tubes, such as for arsine and stibine, a variable volume of sample is drawn through the tube until the first visible discoloration is noted. This is a very difficult judgment. It is also important to recognize that some stains bleed or change with time, and thus the readings should be made as promptly as possible or as suggested by the manufacturer.

Because the air volume through the tube is critical to the calibration, it is important to be assured that the pump valves and connections are maintained leak-proof. Typically, a test can be made by inserting an unopened detector tube into the prescribed holder and determining at the end of two minutes, using the normal sampling stroke, if any appreciable leakage is evident. For a piston pump, if after two minutes the piston will pull back only 5 per cent of its original distance, the leakage would be considered acceptable. If

leakage is found, check valves should be replaced or connecting points should be resolved and moving surfaces should be properly greased.

At periodic intervals the flow rate of the apparatus should be measured and maintained within the specifications of the tube calibrations. In the field this can be done by noting the time for the bulb or piston pump to draw a sample through a used open tube and comparing this with the manufacturer's design. A more accurate method is to connect the open end of a used detector tube to a burette in an inverted vertical position. The interior surface of the burette should be wetted with soap solution and a film of soap extended across the large open end. As the pump draws air through the detector tube, the soap film moves up the burette across calibrated positions and its rate of movement and total volume displaced are easily read. An incorrect flow rate would probably mean added resistance in the system, which could be created by a clogged strainer or orifice. For a squeeze bulb, suction at the initial collapse of the bulb is greater than at the end, when the bulb is fully distended. Although this is claimed as an advantage by some manufacturers (they indicate that the initial high rate gives a long stain and the final low rate sharpens the stain front), accurate use of such bulbs requires a close reproduction of the flow rate pattern. It is, therefore, essential that the squeeze bulb be depressed with the same force each time it is used. One operator may only get as much as 75 per cent of the total volume of air which can be delivered by a squeeze bulb, compared to another individual.

For sampling in remote locations, the detector tube can be located remotely from the sample pump using connecting tubing with the same inside diameter as the indicator tube. Lengths as great as 60 feet have been successfully used without appreciable error. However, in such instances more time is needed between successive strokes in order to compensate for the inertia effect.

Since the detector tubes have a maximum and minimum range of operating temperatures, it is necessary to keep the tube at the preferred recommended conditions if sam-

pling results are to be reliable. For example, when sampling a hot gas, a cooling line prior to the detector tubes can be used. As little as six inches of metal line outside a furnace may be sufficient to cool the gas to near ambient. The possibility of absorption in the cooling line as well as the volumetric changes caused by the cooling of the gas must be considered for such a sampling application. Alternately, in cold areas detector tubes are often carried on the person, as opposed to a separate container, in order to keep them near body temperature for immediate use.

The detector tubes can be calibrated to operate at much lower flow rates in order to get long term samples. In such applications, a small battery-operated pump is attached to the detector tube and the entire configuration can be placed on the worker to indicate his exposure over an extended period. At least one manufacturer provides calibrations for such a configuration for a variety of its detector tubes. The flow rate and the considerations described above must be carefully reproduced in order to have assurance that the results obtained in the field relate to the calibration.

In terms of health hazard surveys, an integrated sample obtained at the breathing zone of the worker is probably the preferred method for determining average exposure conditions. Peak concentrations are not indicated by this long term sampling approach.

In some instances where low concentrations are obtained at one end of the detector tube and a major portion of the tube is still unreacted, the tube can be reversed to give a second test. Unfortunately, some manufacturers pack the tubes to give a reading in one direction only; the starting point at the other end of the tube is not evenly packed, so the beginning point, if the tube was reversed, is not clearly known. It is also possible to connect tubes in series, utilizing an interconnect tube as a positive control for the other. For example, a hydrogen sulfide tube preceding a phosphene tube can give both concentrations, whereas the phosphene tube would not be suitable by itself, because hydrogen sulfide interferes with its detection. The lack of specificity of several tubes can be used for similar materials. Although the lack of specificity

is a disadvantage when specific materials are being determined in the presence of other similar materials, it can be advantageous to measure materials not even indicated by the manufacturer, as long as they are similar in structure. For example, a trichloroethylene tube is usually applicable to other chlorinated hydrocarbons including chloroform, dichloroethylene, methylene chloride, perchlorethylene, and methylene chloride. A methyl bromide tube can usually be used for chlorobromomethane and methyl chloroform. A chlorine dioxide tube may be used for bromine and chlorine dioxide. A toluene tube may usually be used for xylene. Such use obviously requires specific knowledge of the feasibility and of the proper corrections for the calibration scales.

In some brands of indicator tubes, the calibration scales are given in terms of milligrams per liter. Conversions from milligrams per liter to parts per million can be done simply by the use of Equation (2).

$$\text{ppm} = \frac{(\text{milligrams per liter}) \times 24,470}{\text{molecular weight}} \quad (2)$$

The National Institute for Occupational Safety and Health (NIOSH) and its predecessor organizations have been evaluating the accuracy of detector tubes. Their criterion for the performance is that detector tube readings, after all correction factors have been applied, should be accurate to within ± 25 per cent of the actual concentration at the 95 per cent confidence limit. The sulfur dioxide tubes⁶ and perchlorethylene tubes⁷ met this requirement. Carbon monoxide tubes⁸ tested in the range 25 to 100 ppm met an alternate performance level of ± 50 per cent accuracy, as did benzene tubes.⁹ Carbon tetrachloride tubes¹⁰ did not meet this accuracy.

Detector tubes vary in construction details. The supporting material may be silica gel, alumina, ground glass, pumice, or resin. The indicating chemicals are impregnated on the supporting material and, depending on the construction, there may be alternate layers of chemicals to eliminate interferences or aid in the analysis scheme. For example, in the carbon disulfide tubes, hydrogen sulfide is first

removed. In some cases the entrance layer provides a preliminary reaction essential to the indicating reaction. Thus, in some trichloroethylene tubes the first oxidation layer liberates the halogen, which is indicated in the subsequent layer. In some tubes for nitrogen oxide gases a mixture of chromium trioxide in concentrated sulfuric acid is used to oxidize nitric oxide to nitrogen dioxide, which is the form to which the sensitive indicating layer responds. Although these multiple layer tubes are advantageous when properly made, they frequently have a shorter shelf life because of diffusion of the chemicals between layers.

The shelf life is a critical consideration, because tubes may not be used with sufficient frequency so that they are all used by the manufacturer's indicated expiration date. In our laboratory we have found that detector tubes stored in a refrigerator usually will have a two year life or more. Tubes from a lot beyond the expiration date, if chosen, will be selectively tested to see if they are still performing prior to use in the field.

The U. S. Bureau of Mines, Division of Education and Training, has issued detailed instructions on the operation of the MSA Nitrogen Dioxide Detector (April, 1972) and the MSA Hydrogen Sulfide Detector (April, 1972). These guides give the correct use of these squeeze bulb operated detector tube systems. Additional instruction guides are anticipated for typical sampling devices used in mines.

Other Direct Reading Instruments

Besides the detector tube systems for direct measurement of airborne gases and vapors, there are a variety of other instruments which are portable, battery operated (some require no external power), and measure concentrations at or near the acceptable OSHA limits. Such instruments are available to measure combustible vapors, oxygen, mercury, carbon monoxide, and hydrogen sulfide. Because these devices are hand carried, the measurements must be made with relation to the worker's exposure pattern.

For combustible vapors, the principle of operation consists of igniting the combustible gas sample over a heated filament. Resultant heat of combustion changes the resistance of

the filament which is detected by an electrical bridge measurement technique. This is related to the gas concentration on the basis of calibration standards. The calibration may be done with any combustible vapor or gas, and the response then is related to its equivalent value for the sample gas. If the sample gas is sufficiently different from the calibration material, the results would be only approximately correct. It is, therefore, advisable to have the units checked on gas composition which is similar to the anticipated sample. Some units are adversely affected by moisture in the incoming sample, and a drier is placed in line. When the drying agent becomes saturated, the unit will respond with a different calibration. It is, therefore, essential to not only assure that the batteries and unit are operating as indicated, but to be sure that pretreatment equipment is in operating condition. In addition, some materials like hydrogen, methane, alcohols, and other oxygenated hydrocarbons give unusual response in the combustible gas indicator. Thus, the specific calibration should be performed whenever a special mixture is being evaluated. Brief and Confer¹¹ pointed out that nominally six to eight per cent oxygen is needed to create the recognized meter response for the combustible gas meter. Thus, when sampling in oxygen deficient atmospheres, prior to entry into a closed vessel, for example, tests for both oxygen and combustible gas vapors are necessary.

Carbon monoxide concentration can be determined directly with a portable instrument containing hopcalite. Hopcalite is a mixture of metallic oxides which catalyzes the oxidation of carbon monoxide at ordinary temperatures to form carbon dioxide. The heat generated is used as a measure of the carbon monoxide present in the sample. Moisture in the sample must be quantitatively removed because water will quickly poison the hopcalite.

There are electrochemical sensors in which a gas permeable membrane selectively passes a gas of interest, such as oxygen or carbon monoxide, into a cell in which its presence is detected. These devices provide simplified measurement methods for these two gases and for others not yet developed for

industrial hygiene use (viz., nitrogen oxides and SO₂). Some of these devices do not require any external power. In order to prolong the life of the electrochemical sensors, they should be stored in an atmosphere free of the agent to which they normally respond. Thus, these detectors should be stored in a nitrogen-filled container to prolong their life.

The principle of ultraviolet absorption by mercury vapor has been applied to portable mercury detectors. In caustic chlorine plants, where prodigious amounts of mercury are used, high current flows create electromagnetic fields which can influence the meter movement on the mercury vapor indicator. A magnetic shield made of stainless steel screening placed totally around the unit minimizes the effect. Some aromatic organic compounds also absorb in the ultraviolet region and can interfere with the measurements of mercury vapor.

Direct measurement of airborne dust has just become possible with a new portable, battery operated instrument. The device impacts suspended particles on a polyester disc. The mass collected is determined directly by absorption of beta-radiation from a carbon-14 source located in the instrument. A cyclone can be used ahead of the impactor to collect only the respirable particles. Since the penetration of low energy beta-radiation depends almost exclusively on the mass per unit area of the absorber and the maximum beta energy of the impinging electrons, the result can be directly read as mg/m³.

Although this instrument has not been thoroughly tested in the field, it could prove to be a very useful industrial hygiene sampling instrument in areas where dust measurement is important. Obviously, it will require periodic calibration in terms of both collection efficiency (compared with filtration) and volumetric air flow.

Summary

The problems and pitfalls of using direct reading indicators are most easily overcome by initially understanding the nature of work and the chemicals involved. This requires a preliminary survey to ascertain all the factors involved in the work environment and gives guidance as to the numbers and types of samples needed. Direct reading indicators are a

2. Lynch, J. R.; "Valid Representative Air Samples—Location, Time, Duration, Work Cycles and Peaks and Time Weighted Average Concentrations," *Transactions, 1972 National Safety Congress*.
3. Determination of Compliance, National Institute of Occupational Safety and Health, Cincinnati, Ohio, April 1, 1972.
4. Nardella, M. G.; *Experimental Statistics*, National Bureau of Standards Handbook 91.
5. Jones A. R. and R. S. Brief; "Evaluating Benzene Exposures," *Amer. Indus. Hygiene Assoc. J.*, 32:610-613 (September, 1971).
6. Ash, R. M. and J. R. Lynch; "The Evaluation of Gas Detector Tube Systems Sulfur Dioxide," *Amer. Indus. Hygiene Assoc. J.*, 32:490 (July, 1971).
7. Roper, C. E.; "An Evaluation of Perchloroethylene Detector Tubes," *Amer. Indus. Hygiene Assoc. J.*, 32:847 (December, 1971).
8. Morgenstern, A. S.; "The Evaluation of Gas Detector Tube Systems: I. Carbon Monoxide," *Amer. Indus. Hygiene Assoc. J.*, 31:450 (September-October, 1970).
9. Ash, R. M. and J. R. Lynch; "The Evaluation of Gas Detector Tube Systems: Benzene," *Amer. Indus. Hygiene Assoc. J.*, 32:410 (June, 1971).
10. Ash, R. M. and J. R. Lynch; "The Evaluation of Gas Detector Tube Systems: Carbon Tetrachloride," *Amer. Indus. Hygiene Assoc. J.*, 32:552 (August, 1971).
11. Brief, R. S. and R. G. Confer; "Combustible Meter Response in Low Oxygen Atmospheres," *Amer. Indus. Hygiene Assoc. J.*, 30:576-581 (November-December, 1969).
12. ACGIH Air Sampling Instruments Committee. Air Sampling Instruments for Evaluation of Atmospheric Contaminants. 4th ed. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.

REFERENCES

1. *Compliance Operations Manual* OSHA 2006.

type of sampling device which can be applied to the assessment of chemical exposures; their limitations are primarily those of calibration and understanding the inherent deficiencies in such devices. Interfering materials can adversely affect the results as well as variations in temperature and pressure. Air sample flow is critical to the maintenance of their calibration. No device is foolproof, and so the operator of such units must be aware of the limitations in order to understand the results that are obtained. With such knowledge and the operator's ability to apply the sampling results to acceptable concentrations, assessment of workers' occupational exposure can be obtained with reasonable accuracy. Interpretation of the data for OSHA compliance should account for instrumental error and sampling variability. The more conservative direct comparisons between sample results and accepted ambient standards is preferred in other environmental assessments.

SAMPLE COLLECTION FOR LABORATORY ANALYSIS USING CHARCOAL TUBES, IMPINGERS, AND OTHER INERTIAL COLLECTORS AND COLLECTION EFFICIENCIES

By ROBERT G. KEENAN
G. I. Clayton & Associates, Southfield, Mich.

The implementation of the Occupational Safety and Health Act of 1970 has resulted in a great increase in the valuation of workers' exposure to atmospheric contaminants by means of samples collected at the breathing zone. Many of these are submitted to remotely located chemistry laboratories for such chemical determinations as total mass of particulate (gravimetric analysis), asbestos fiber count (using 400X phase contrast microscopy), a carbon monoxide (by converting the carbon monoxide present in an air sample to methane over nickel catalyst and measuring the methane with gas chromatograph), beryllium, lead, free silica, and other toxic particulate contaminants (using atomic absorption, x-ray diffraction and other physical or chemical methods) and organic solvents vapors (by gas chromatographic procedures). The purpose of this paper is to focus your attention on the practical aspects of collecting in-plant samples of atmospheric contaminants for subsequent analysis in the laboratory.

Sampling of Gases and Vapors

For industrial hygiene purposes, a substance is considered to be a gas if this is its normal physical state at room temperature and atmospheric pressure; it is called a vapor if, under the environmental conditions, a conversion of its liquid or solid form to the gaseous state results from its vapor pressure affecting its volatilization or sublimation into the atmosphere of the container, the process equipment, or the workroom. In this discussion the term "gaseous" is used in a general sense in discussing gases or vapors.

Basic Sampling Techniques. There are two basic methods for the collection of gaseous samples. The first involves the use of a gas collecting device, such as an evacuated flask or bottle, to obtain a definite volume of an air-gas mixture at a known temperature and pressure. This type of sample is called a "grab" or "instantaneous" sample as it is collected almost instantaneously, i.e., usually within a few seconds to one to two minutes maximum, and is thus representative of the atmospheric conditions at the sampling site at a given point in time. This method is used when the atmospheric analyses are limited to such gross contaminants as mine gases, sewer gases, carbon dioxide and carbon monoxide (above 0.2 per cent), and other situations where the concentrations of contaminants are in the percentage range. However, with the increased sensitivity of modern gas chromatographic, infrared, and other analytical techniques, instantaneous sampling of ever lower concentrations of atmospheric contaminants is becoming more feasible. The collectors are resealed immediately after sampling to prevent any losses of the sample by diffusion.

The second method of gas and vapor sampling involves the passage of a known volume of air through an absorbing or adsorbing medium to remove the desired contaminants from the sampled atmosphere. This technique provides a sample of the atmosphere over a recorded time period and is termed "integrated sampling." The contaminant which is removed from the air stream becomes concentrated in/on the collecting medium; the sampling period is chosen to per-

mit the collection of a sufficient quantity of the contaminant for the subsequent analyses.

Sampling Criteria. Whereas airborne particulate substances are readily scrubbed or filtered from sampled air streams due to their larger physical dimensions and to the operation of agglomerative, gravitational or inertial effects, gases and vapors form true solutions in the atmosphere and thus require either sampling of the total atmosphere using a gas collector or the use of a more vigorous scrubbing technique to separate the gas or vapor from the surrounding air molecules. Selected sampling reagents which react chemically with contaminants in the air stream can improve the collection efficiencies of the sampling procedures. In devising an integrated sampling scheme, it is essential to consider the following basic requirements:

1. Provide an acceptable efficiency of collection for the contaminant involved.
2. Maintain this efficiency at a rate of air flow which can provide sufficient sample for the intended analytical procedure in a reasonable and acceptable period of time.
3. Retain the collected gas or vapor in a chemical form which is stable during transport to the laboratory or other analytical site.
4. Provide the sample in a form which is suitable for the analytical procedure.
5. Require minimal manipulation in the field.
6. Avoid the use of corrosive or otherwise hazardous sampling media if possible.

Whereas most of these criteria are self-explanatory, some elaboration on the first and second is desirable. It is extremely important that the collection efficiency of a sampling system be known, either from published, well-documented data, or as a result of an independent evaluation as an essential part of planning a future survey. In making such an evaluation, known concentrations of gases and vapors must be prepared and used in a dynamic or static test system to determine the efficiency of the proposed sampling device. The efficiency must be defined in terms of such variables as the type of scrubber; porosity of frits used in the scrubber; size of scrubber; the height, volume, nature, and temperature of the collecting medium; rate of air flow; stability of the sample during

collection; losses by adsorption on the walls of the probe, connecting tubing, or collecting device which may necessitate a rinsing with a special reagent to remove the adsorbate which must then be added to the collected portion in the sampling device.

Instantaneous or Grab Sampling. Numerous types of devices are used in instantaneous or grab sampling to obtain a definite volume of air within a gas collector. These include vacuum flasks, vacuum bottles, gas- or liquid-displacement type collectors, metallic collectors, glass bottles, syringes, and plastic bags. Air samples must be collected with these devices at a known temperature and pressure to permit the reporting of the analyzed components in terms of standard conditions, normally 25°C and 760 mm of mercury for industrial hygiene purposes. In areas where the atmosphere remains constant, the grab sample will be representative of the average as well as the momentary concentration of the components and thus it may truly represent an integrated equivalent. Where the atmospheric composition varies, peaks and valleys of contamination will be observed, and numerous samples must be taken to determine the average concentration of a specific component. The chief advantage of grab sampling methods is that their collection efficiency is normally considered to be 100 per cent; there must, of course, be no losses due to leakage or chemical reaction preceding analysis.

Evacuated flasks are heavy-walled glass containers, usually of 250 or 300 but frequently of 500 or 1,000 milliliter capacity from which 99.97 per cent or more of the air has been removed by a heavy duty vacuum pump. The internal pressure after the evacuation is practically zero. The neck is sealed by heating and drawing during the final stages of evacuation. These units are simple to use since no metering devices or pressure measurements are required. The pressure of the sample is taken as the barometric pressure reading at the site. After the sample has been collected by breaking the heat-sealed end, the flask is resealed with a ball of wax and transported to the laboratory for analysis.

A variation of this procedure with evacu-

ated flasks is to add a liquid absorbent to the flask before it is evacuated and sealed to preserve the sample in a desirable form following collection.

Partially evacuated containers or vacuum bottles are prepared with a suction pump just before sampling is performed, although frequently they are evacuated in the laboratory the day before a field visit. No attempt is made to bring the internal pressure to zero, but temperature readings and pressure measurements with a manometer are recorded after the evacuation and again after the sample has been collected. This type of collector may be heavy-walled glass bottles, metal or heavy plastic containers with tubing connectors which are closed with screw clamps or stopcocks. The volume of air or gas taken into the bottle may be computed as described later in this chapter.

Gas or liquid displacement collectors include 250-300 ml glass bulbs fitted with end tubes which can be closed with greased stopcocks or with rubber tubing and screw clamps. They are used widely in collecting samples containing O_2 , CO_2 , CO , N_2 , and H_2 or other combustible gases for analysis by an Orsat or similar analyzer. Other devices operating on the liquid displacement principle include aspirator bottles of various sizes which have exit openings at the bottom of the bottles through which the liquid is drained during sampling.

In applying the gas displacement technique, the samplers are purged conveniently with a bulb aspirator, hand pump, small vacuum pump, or other suitable source of suction. Satisfactory purging is achieved by drawing a minimum of ten air changes of the test atmosphere through the gas collector.

The collectors mentioned in the gas displacement section can also be filled by liquid displacement. The most frequently employed liquid is water. In sampling, liquid in the container is drained or poured out slowly in the test area and replaced by air to be sampled. Application of this method is limited to those gases which are insoluble in and non-reactive with the displaced liquid. The solubility problem can be minimized by using mercury or water conditioned with the gas to be collected. Mercury, however, must be

used with caution since it may create an exposure problem if handled carelessly.

Flexible plastic bags are used to collect air and breath samples containing organic and inorganic vapors and gases in concentrations ranging from parts per billion to more than 10 per cent by volume in air and also to prepare known concentrations of gases and vapors for equipment calibration. The bags are easily inflated without stretching to their full volume using rubber squeeze bulbs or small hand pumps. They are available commercially in a variety of sizes, up to nine cubic feet, but they may also be made in the laboratory. They are manufactured from several plastic materials including Saran, Scotchpak, aluminized Scotchpak, Mylar, aluminized Mylar, Teflon, Kel-F, polyethylene and polyester. The bag materials are from one to five mils in thickness and may be purchased as 100-foot or longer rolls of large sheets which may be cut to the desired size. Some, such as Mylar, may be sealed with a hot iron, using a Mylar tape around the edges. Others, such as FEP Teflon, require high temperature and controlled pressure in sealing. Certain plastics, including Mylar and Scotchpak, may be laminated with aluminum which seals the pores and reduces the permeability of the inner walls to sample gases and the outer walls to moisture. Sampling ports may consist of a sampling tube molded into the fabricated bag and provided with a closing device or a clamp-on air valve. The 6- and 12-liter sizes are suitable for many industrial hygiene samples to be analyzed by infrared spectrophotometry using a 10-meter gas cell. Plastic bags have the advantages of being light, nonbreakable, and inexpensive, and they permit the entire sample to be withdrawn without the difficulty associated with dilution by replacement air as is the case with rigid containers.

Plastic bags, however, must be used with caution since generalization of recovery characteristics of a given plastic cannot be extended to a broad range of gases and vapors. Important factors to be considered in using these collectors are: absorption and diffusion characteristics of the plastic material, concentration of the gas or vapor, and re-active characteristics of the gas or vapor with

moisture and with other constituents in the sample. A valuable summary of information sources on the storage properties of gases and vapors in plastic containers has been provided by F. J. Schuette and G. O. Nelson.

The bags must be leak tested and preconditioned for 24 hours to the chemical vapors to be tested before they are used for sampling. Preconditioning consists of flushing the bag three to six times with the test gas, the number of refills depending on the nature of the bag material and the gas. In some cases it is recommended that the final refill remain in the bag overnight prior to the use of the bag for sampling. Such preconditioning is usually helpful in minimizing the rate of decay of a collected gas except for nitrogen dioxide. At the sampling site the air to be sampled is allowed to stand in the bag for several minutes, if possible, before removal and subsequent refilling of the bag with a sample. Once collected, the interval between sampling and analysis should be minimal.

Hypodermic syringes of 10- to 50-milliliter volume have also been used successfully for air sampling. These units are available usually in glass, but the disposable plastic type have also been used successfully. Ten milliliter Plastipak syringes have been shown by Lang and Freedman to have excellent retention properties for methane, hydrogen, and other gases in normal mine air, but some loss of carbon dioxide was observed over a storage period of a week. The advantages of these units are cost, convenience, and ease of use.

Integrated Sampling. Integrated (or "continuous") sampling of the workroom atmosphere must be performed when the composition of the air is not uniform, when the sensitivity requirements of the method of analysis necessitates sampling over a minimal (10-30 minutes) finite period, or when compliance or non-compliance with an eight-hour time-weighted average air standard must be established. Thus, the professional observations and judgment of the industrial hygienist are called upon in devising the strategy for the procurement of representative samples to meet the requirements of an environmental survey of the workplace.

Sampling Pumps. An integrated air sampling method requires a relatively constant

source of suction as an air moving device. A vacuum line, if available, may be satisfactory. The most practical source, however, is an electrically powered pump or blower for prolonged periods of sampling. These come in various sizes and types and must be chosen for the sampling devices with which they will be used.

If electricity is not available or if flammable vapors present a fire hazard, aspirator bulbs, hand pumps, a portable unit operated by means of compressed gas (reton, Unijet Sampler) or battery-operated pumps (activate outside the area to avoid a spark) are suitable for sampling at rates up to 2.3 liters per minute. For higher sampling requirements, ejectors using compressed air or a water aspirator may be employed.

An air aspirator is usable where the pressure is constant. When compressed air or batteries are to be used as the driving force for a pump, the length of the sampling period is important in relation to the supply of compressed air or the life of the rechargeable battery. These units must not be allowed to run unattended and periodic checks on the air flow must be made.

Measurement of Air Flow. Air volume may be measured directly by means of an aspirator bottle or by dry or wet test meters, but these units are used primarily in the laboratory for calibration purposes.

The common practice in the field is to sample for a measured period of time at a constant, known rate of air flow. Direct measurements are made with rate meters such as rotameters and orifice or capillary flowmeters. These units are small and convenient to use, but at very low rates of flow their accuracy decreases. The sampling period must be timed carefully with a stop watch.

Many pumps have inlet vacuum gauges or outlet pressure gauges attached. These gauges, upon proper calibration with a calibrated wet or dry gas meter, can be used to determine the flow rate through the pump. The gauge may be calibrated in terms of cubic feet per minute or liters per minute. If the sample absorber does not have enough resistance to produce a pressure drop, a simple procedure is to introduce a capillary tube or other resistance into the train behind the

sampling unit.

Sampling Trains. Samplers are always used in assembly with an air moving device (source of suction) and an air metering unit. These are the basic essentials. Frequently, however, the sampling train may consist of a filter, probe, absorber (or adsorber), flow-meter, flow regulator, and air mover. The filter is included to remove any particulate matter that may interfere in the analysis. It should be ascertained that it does not also remove the gaseous contaminant of interest. The probe or sampling line is extended beyond the sampler to reach a desired location. It also must be checked to determine that it does not collect a portion of the sample. The meter which follows the sampler indicates the flow-rate of air passing through the system. The flow regulator controls the air flow. Finally, at the end of the train the air mover provides the driving force.

Collection Efficiency of Samplers. Several methods of testing the efficiency of an absorbing or adsorbing device are available. One or more of these methods should be employed for periodic evaluations of individual units, in particular fritted bubblers whose porosities are subject to change from the effects of sampling corrosive atmospheric contaminants.

A recommended test system is a gas tight chamber or tank in which known concentrations of a given contaminant can be prepared. Absorbers are attached to sampling ports and operated under simulated field conditions to determine their collection efficiencies.

Frequently the relative efficiency of a single absorber can be estimated by placing another in series with it. Any leakage is carried over into the second collector. The absence of any carryover is not in itself an absolute indication of the efficiency of the test absorber since it may be possible that the contaminant is not stopped effectively by either absorber. Analysis of the two legs of a U-tube containing silica gel used in sampling a contaminant is a useful check on the collection efficiency of the first leg of the tube.

Another valuable technique is the operation of the test absorber in parallel or in series with a different type of collector having a

known high collection efficiency (an absolute collector if one is available) for the contaminant of interest. By running the test absorber at different rates of flow the maximum permissible rate of flow for the device can be ascertained.

Variable Factors Influencing Efficiency. A high collection efficiency is achieved when a chemically reactive sampling medium is used at a sufficiently slow rate to collect a contaminant with which it reacts to form a nonvolatile product. Such is the case in neutralization reactions of caustic scrubbing solutions with acid gases such as HF, HCl, SO₂, and nitrous fumes and the hydrolysis of toluene diisocyanate in Marcali solution. Collection efficiencies of 95 per cent are reported generally for this type of sampling system. Long-term sampling may thus be conducted provided an excess of the collecting reagent is maintained.

Gases and vapors can also be collected satisfactorily in liquids that are not reactive if the contaminant is readily soluble in the medium. Thus, methanol and formaldehyde may be absorbed readily in water and esters in alcohol. The vapor pressure of these contaminants is lowered by the solvent effect of the absorbing liquid.

A discussion of the theoretical and practical aspects of absorbing vapors in non-reacting liquids is given by H. B. Elkins. It is emphasized that the variable which determines the efficiency of collection in a given system is the ratio of the volume of sampled air to the volume of the collecting liquid. The concentration of vapor in the air actually has no effect on the collection efficiency of non-reacting absorbing media. Other factors to be considered are: the degree of contact between the gas or vapor being sampled and the absorbent; duration of contact of the contaminant with the absorbent; rates of diffusion of gas and liquid phases; degree of solubility of the contaminant in the absorbent; and volatility of the contaminant.

The collection efficiency (the ratio of the amount of contaminant retained by the absorbing medium to that entering it) need not be 100 per cent as long as it is known, constant, and reproducible. The minimal acceptable collection performance in a sam-

pling system is usually 90 per cent, but higher efficiency is certainly desirable. When the efficiency falls below the acceptable minimum, sampling may be carried out at a lower rate, or at a reduced temperature by immersing the absorber in a cold bath to reduce the volatility of both the solute and solvent. It is often necessary to use two or more absorbers in series. Two bubblers in series have been shown to maintain a 95 per cent efficiency of collection using water or isopropyl alcohol solvents with a sevenfold increase in the volume of sampled air (Elkins). A fivefold bubbler system was proposed for the collection of organic chlorides (Elkins et al).

There are four basic types of absorbers employed for the collection of gases and vapors, classified as follows: simple gas washing bottles, spiral and helical absorbers, fritted bubblers, and glass-bead columns. The function of these absorbers is to provide sufficient contact between the sampled air and the liquid surface to provide complete absorption of the gaseous contaminant. In general, the lower the sampling rate, the more complete is the absorption.

Simple gas washing bottles include Drechsel types and standard Greenburg-Smith and midgett impingers. In these devices the air is bubbled through the liquid absorber without special effort to secure intimate mixing of air and liquid. The length of travel of the gas through the collecting medium is equivalent to the height of the absorbing liquid. These scrubbers are suitable for gases and vapors that are readily soluble in or react with the absorbing liquid. One or two units may be enough for efficient collection, but in some cases several in series may be required to attain the efficiency of a single fritted glass bubbler. Advantages of these devices are their simplicity in construction, ease of rinsing (for removing particulates), and the small volume of liquid required (with the exception of the Greenburg-Smith impinger).

The chief advantage of spiral and helical absorbers over simple gas washing bottles is that they provide a longer contact path between the sampled air and the absorbing solution. The sample is forced to travel a spiral or helical path through the liquid five to ten

times that in the simpler units. Friedrichs and Milligan gas washing bottles are examples of this type of device.

In fritted glass bubblers the air passes through porous glass plates, and enters the liquid in the form of small bubbles. The size of the air bubbles depends on the nature of the liquid and the diameter of the orifices from which they emerge. Frits are classified as fine, coarse, or extra coarse, depending on the number of openings per unit area. The extra coarse frit is used when a more rapid flow is desired. The heavier froth generated by some liquids increases the time of contact of gas and liquid. These devices are more efficient collectors than the simple gas washing bottles and can be used for the majority of gases and vapors which are soluble in or react rapidly with the reagent. Rates of flow between 0.5 and 1.0 liter per minute are used. These absorbers are relatively sturdy, but the fritted glass is difficult to rinse out when used for contaminants which form a precipitate with the reagent, e.g., H₂S with CdCl₂. In these cases a simple gas washing bottle should be used.

Packed glass-bead columns are used for special situations where a concentrated solution is needed. Glass pearl beads are wetted with the absorbing solution and provide a large surface area for the collection of a sample. It is of historical interest to note that the absorption of benzene and other aromatic hydrocarbon vapors in nitric acid has been performed with this type of absorber (H. H. Schrenk et al). It is especially useful when a viscous liquid is required. The rate of sampling is low, 0.25 to 0.5 liter of air per minute.

When it is desired to collect insoluble or non-reactive vapors, an adsorption technique is frequently the method of choice. Activated charcoal and silica gel, six to 20 mesh, are common adsorbents. Esters, acetates, and other soluble compounds are sampled regularly on these adsorbents. Solid adsorbents require less manipulative care than do liquid adsorbents, can provide high collection efficiencies and, with improved absorption tube design and a better definition of desorption requirements, these reagents are becoming increasingly popular in industrial hygiene

surveys.

Activated charcoal is an excellent adsorbent for most vapors boiling above 0°C, moderately effective for low-boiling gaseous substances between -100°C and 0°C, such as ammonia, formaldehyde, and hydrogen sulfide, particularly if the carbon bed is refrigerated, but a poor collector of hydrogen, nitrogen, and gases having boiling points below -150°C. Its retentivity for sorbed vapor is twice that of alumina and several times that of silica gel. Because of its non-polar characteristics, organic gases and vapors are adsorbed in preference to atmospheric moisture, and sampling can be performed for long periods of time.

Fraust and Hermann found that the times required for breakthrough and for the collection efficiency to drop to 50 per cent are nearly inversely proportional to the mass flow rate expressed on a molar basis, but that the adsorption process is not affected significantly by differences in the molecular weight. Other investigators have reported on the optimal conditions for sampling organic vapors in the atmosphere with activated charcoal followed by desorption with carbon disulfide and gas chromatographic analysis of the sample components. Their procedures are based upon the method of Otterson and Guy.

Reid and Halpin obtained average recoveries of mostly 90-100 per cent in sampling a test chamber containing known concentrations of halogenated and aromatic hydrocarbons using Darco 12-20 mesh activated charcoal in 0.6 gm quantities in a five inch, six mm i.d. tube, followed by desorption with three ml carbon disulfide and gas chromatographic analysis of an aliquot portion of the resulting solution. The method was applied to concentrations of the separately vaporized compounds equivalent to one-half, one, and two times the respective threshold limit values. The sampling rate was two liters/min in tubes packed to a prescribed pressure drop.

White et al have shown that the first two of four one inch sections of 180 mg each of activated charcoal supported in a six inch., 4 mm i.d. tube adsorbed vapor concentrations of fourteen organic solvents completely at

two times the TLV levels and that the overall recoveries were equivalent to those obtained by desorption of the corresponding liquid state of each compound with one ml of carbon disulfide. These investigators conducted experimental desorption studies with the single compounds and with multiple combinations of halogenated hydrocarbons, aromatic hydrocarbons, pyridine, ethanol, isooctane, 2-butanone, and ethyl ether. They concluded that a mixture of seven or 14 of the compounds evaluated did not affect significantly the desorption efficiency for any one of the substances. The sampling rates ranged 0.5-2 liters/min with no apparent effect on overall efficiency. The one inch sections of charcoal reportedly have a saturation limit of 28-30 mg of a single solvent and 28-45 mg of the total group of 14 solvents. In the case of butyl acetate, for example, a saturation limit of 30 mg/10 liters of air sampled (3000. mg/m³) is more than four times the 1970 threshold limit value of 710 mg/m³ for this ester, thus providing a comfortable margin of active adsorption sites when sampling at the TLV level.

Sampling for Particulates

Airborne particulates are termed "aerosols," which include any system of solid particles or liquid droplets dispersed in the air as a result of nature's or man's activities. We are concerned primarily with the latter source of aerosols in determining occupational exposures to the dusts, fumes, smokes, and mists which may be sampled in the work place. The particle sizes of dusts range from one to 150 micrometers (µm) in diameter, fumes from 0.2 to one µm. Mists (and fogs) cover a wide range of particle sizes and are considered to be primarily liquid, although they may consist of liquids such as water vapor condensed on the surfaces of submicroscopic (<0.2µ) particles of dust or gaseous ions.

Sampling may be conducted with somewhat varied techniques dependent upon the type of intended analysis of the sample. It is performed by drawing a known volume of air through a filter, impinger, electrostatic or thermal precipitator, cyclone, or other instrument used in collecting particulates. It is intended to provide three types of informa-

tion, viz., the aerosol concentration, chemical composition, and particle size distribution. The total concentration of aerosol is determined by weighing the collected material on an analytical balance. The composition is established by chemical analysis of the constituents; in many cases, this may consist of a single type of analysis, especially when the investigator is concerned with one particular contaminant in the sampled atmosphere. The number of particles and particle size distribution are determined using a microscope equipped with a traveling stage and an eyepiece graticule, or by automatic particle counters and aerosol spectrometers.

Filters. Filtration is currently the most common method used in sampling airborne particulates due to its high collection efficiency, which approaches 100 per cent for the popular molecular membrane filters. There are numerous types of filter matrices used to collect aerosols; these include cellulose fiber (Whatman 41); polyvinylchloride, acrylonitrile or cellulose ester polymers; glass; ceramic; carbon; and polystyrene. The cellulose fiber filters are relatively inexpensive, but their hygroscopicity may pose weighing problems. Certain filters, such as fibrous glass (Gelman Type A), ceramic, carbon and polystyrene, offer advantages in the relative ease of determining the blank filter weight and are preferred when gravimetric analysis is the sole type of determination to be performed in the laboratory. The molecular membrane filters (cellulose esters, such as Millipore Type AA) are preferred when microscopic analysis of the particulate is required, as these filters are rendered transparent readily with a clearing fluid. This latter type is commonly used, therefore, in collecting samples for particle counts (including asbestos and glass fibers) and size distribution. In addition, they are preferred in collecting samples for inorganic analyses, especially those requiring metallic element and free silica determinations. Molecular membrane filters may also be used in the determination of total mass concentration of aerosols where it is feasible to employ a low sampling flow rate over a long sampling period (the air flow resistance of these filters is very high).

Filters are used as the final stage of collec-

tion in many types of size selective samplers which remove the coarser particulates in a pre-selector, and permit the respirable fraction to be trapped on the filter. This type of sampling has gained wide popularity with the recent emphasis on personal samples. For this purpose two-stage collectors have been designed to divide the aerosol into those fractions which deposit in the upper and lower respiratory passages, respectively. Horizontal elutriators and cyclones have been widely used as first stage collectors.

The Hexhlet is a high-volume sampling instrument which combines a horizontal plate elutriator as the first stage with a Soxhlet filter as the second stage. The elutriator consists of two banks of horizontal aluminum plates 0.05 cm thick and 0.8 mm apart, separated by a vertical partition; this provides 120 ducts. The plates measure 3.55 cm by 25.1 cm; the total deposit area is approximately 11,000 cm². A tapered critical orifice, positioned just beyond the elutriator, opens through a partition into a Soxhlet filter. An ejector, operated by compressed air, maintains airflow at a constant rate. This instrument weighs only 10 pounds and was designed for continuous operation at 100 liters per minute to collect gram quantities of respirable dust over an eight-hour period in atmospheres containing 25,000,000 particles per cubic foot (850 particles per ml) of air.

The two-stage sampler of perhaps greatest interest to this group is that which incorporates a miniature cyclone as the first stage separator. These instruments have been designed for sampling at flow rates of one to three liters per minute and are being used in battery-operated personal samplers with fibrous glass, molecular membrane, or other type of filter as the second stage collector. The air flow rate meter must be calibrated in the laboratory for use with each type of filter matrix, using a wet or dry test meter which has been calibrated previously against a spirometer or other primary reference.

Impinger. The impinger is the instrument used in the series of Public Health Service studies of the dusty trades starting in 1925 and on which the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists were largely based. For

this reason it has been used traditionally as the standard sampling instrument for particulates in the United States. Air is sampled at a high velocity and impinged from a jet onto a plate which is immersed in a liquid medium. The particles lose their high velocity and become wetted by the liquid. The standard rate of the Greenburg-Smith impinger for sampling mineral dusts is one cubic foot per minute. Fine fume particles, in the sub-micron range, may be collected at efficiencies exceeding 95 per cent by increasing the flow rate to the maximum of 1.59 cfm, corrected

for pressure drop. Samples collected with the impinger may be subjected to chemical analysis, dust counting, or gravimetric analysis (after evaporation of the distilled water collecting medium).

A more extended treatment of the operating characteristics of air sampling instruments should be sought in the appropriate texts on this subject. The present paper has been limited to a necessarily brief discussion of those aspects of this subject considered to be of greatest interest.

THE NECESSITY FOR A PRODUCT SAFETY PROGRAM

By D. E. JAMES
General Foods Corporate Quality Assurance,
General Foods Technical Center,
White Plains, N. Y.

The statistical facts are that 41,500 workers died from off-the-job accidents in 1971. 14,200 workers were killed while at work. In 1971 we had to focus on the impact of the Occupational Safety and Health Act (OSHA). We may have neglected the priority of dealing with a situation killing three times the number of people off the job.

I believe industry has great talent in setting goals and priorities. We should seriously consider the importance of the many elements causing off-the-job problems of safety. My own company experience indicates that we have 10 times as many off-the-job injuries and disability days as from on the job. The leading off-the-job cause in my company is motor vehicle accidents. This is followed by sports activity, falls and slips, and improper lifting.

Another area of concern is product safety. The June, 1970, Final Report of the National Commission on Product Safety reported an estimate of some 30,000 deaths and 20 million injuries each year connected with consumer products. The investigations covered over 350 categories of household products. There is a dearth of satisfactory information to connect incidents with actual causes. I do not question that many hazards exist in the products themselves, but raise a question as to the number of home injuries that occur as a result of poor behavioral patterns.

There is a need for employee education as a part of improving off-the-job safety. For example, the rotary lawn mower designer can incorporate many safety features into his product. The educational effort to keep the operator from driving over loose objects that can be thrown with penetrating force and cause injuries to bystanders is a real problem.

Recent and dramatic developments in the

lawn which govern product liability and the rapid growth of consumer awareness have reversed the old warning, "Let the buyer beware." In this new atmosphere it is the seller who must be wary. All companies — including service firms — now have a conspicuous responsibility to provide customers with safe, reliable products. When personal injury or property damage has resulted from use of products or services, courts have allowed recovery for damage even in the absence of negligence or a direct contractual relationship between the manufacturer and complainant. These trends, combined with the growth of business and the vast multiplicity of product lines, expose a company to greatly expanded risk of product liability losses. Now, in the interest of economic survival, it is an absolute necessity for companies to be aware of these risks and of the importance of product liability loss prevention.

The President has signed into law a Product Safety bill. (S.3419) which provides for a new nationwide system of safety controls. This includes mandatory performance and other standards when the government decrees. Covered consumer products will be monitored and subjected to inspections, testing, reporting, and other control devices by a five-member Product Safety Commission. The Federal government has the authority to order market bans, seizures, recalls, replacements, repairs, and other remedies for those not meeting the standards. Both civil and criminal penalties are provided for non-compliance with the commission's orders. Food, Drugs, and Cosmetics are not included and remain under FDA jurisdiction. Other prior laws, such as the Federal Motor Vehicle Safety Act, continue in force.

I want to share with you a set of practical

guidelines based upon a functioning program which was organized and implemented by a major manufacturer. Since business profiles and potential exposure will vary widely, these guidelines are deliberately broad so as to provide direction rather than specific answers. The Product Liability audio-visual presentation has been arranged in loose outline form to allow a maximum of flexibility in adapting these principles to a variety of needs. However, specific plans appropriate to your company's needs can be developed from this framework given a proper organization and assignment of capable people. It is mandatory that companies embarking on a loss prevention program not underestimate the time and effort required to make this type of activity successful.

(There followed a 30-minute slide presentation with taped comments.-Ed.)

Safety is everybody's job! Product safety is a joint responsibility of private industry, the consumer, and government agencies.

Product-related injuries resulting from defects of design, material, workmanship, or instructions are a small fraction of the total and are the only injuries over which the manufacturer has control.

Product safety is of vital concern to industry, not only for humanitarian reasons, but because it is essential to retention of consumer confidence and long-term business survival. Industry accepts its responsibility to protect consumers of articles of manufacture against hazards.

PRO AND CON—SAFETY BELTS AND AIR BAGS

By EDWARD R. KLAMM

Accident Prevention Manager, Allstate Insurance Companies

We have been deluged by advertising campaigns for the last 10 years urging us to use seat belts. The various campaigns have run the gamut from "Buckle Up" to "What's Your Excuse" to "Scared Face" disasters. Unfortunately, they haven't been effective.

Let's take a look at some hard facts of life: The Insurance Institute for Highway Safety has conducted a study of safety belt usage. They found that the level of lap belt usage varied from a level of 16 per cent of late model car drivers in large metropolitan areas to 9 per cent of such drivers in small cities. Combination lap and shoulder belt usage was found to vary from a level of 6 per cent to 1 per cent between the same types of areas.

As the Institute concludes, "It is clear from (their) studies that actual use of safety belts, as distinguished from claimed use, is low."

It is not realistic though to rely on questionnaires that ask people whether they wear safety belts. We must rely on observations.

Allstate Insurance Co.'s Chairman of the Board, Archie R. Roe, said: "Any advocate of a belt system bears the burden of demonstrating how the combined belt usage can be increased from less than 5 per cent to some figure over 70 per cent within a reasonable period of time."

National Highway Traffic Safety (NHTS) administrator, Doug Toms, has stressed the goal of getting 85 per cent of drivers to use their belts, while we await the required passive restraint installation on 1976 model cars.

Realistically, this seat belt neglect amounts to a clear rejection of personal safety by tens of millions of people. By ignoring their seat belts, some 15,000 people will directly contribute to their own deaths this year, and many thousands of motorists will sustain needless injuries.

In the face of these hard, cold facts, the Insurance Institute for Highway Safety announced—after the completion of selective research—that "Safety belt ads have no ef-

fect. In spite of the number of campaigns urging safety belt use, the proportion of vehicle occupants using them is so low that much of the reduction in death and injury that should be achieved by their use is not being realized."

Here's another hard fact that requires consideration. *Advertising Age*, in a rebuttal to IIHS findings, commented editorially that "confining and uncomfortable safety belt designs are discouraging belt use." They state, "part of the disappointing results of the IIHS test of seat belt use ads may rest with the product."

I ask you: Shouldn't the auto manufacturers, more than the involved drivers, give heed to the message of a Washington editor? That message—"Give the adman a break: Take a look at the product."

The automotive engineers, in initiating technological improvements of the automobile, must give primary consideration to "humanistics," or the human element involved in driving. This fact, as it relates to the safety and welfare of Americans and the anti-pollution activities of the environmentalists, must be a cardinal point for the auto manufacturers.

Do safety belts reduce the severity of injuries?

The answer, of course, is yes.

Early research in the 1950's by Cornell Crash Injury Research, followed by other studies, demonstrated the value of safety belts.

Nevertheless, the facts are—we just have been unable to convince Americans to use the available belts.

Who's to blame—the auto manufacturers, the advertisers, government, the public information experts or the driving public?

Europeans face a similar dilemma

A. B. Volvo conducted a study of 28,000

auto crashes and reported that not one fatality had occurred where the vehicle occupants had used both lap and shoulder belts.

Recently, Captain Herbert Maritz, Director of Traffic, Basle, Switzerland, visited my office. I asked him, "Do European drivers wear their safety belts?" He stated that their studies revealed that 80 per cent of their drivers do not wear the belts. He further mentioned that "perhaps the improved safety belts will result in better usage."

I could cite other research if time permitted, but the evidence is clear, combined lap and shoulder belts do save lives, if given an opportunity. But, the vast majority of people do not use them.

How do safety belts reduce the severity of injury?

There are four basic reasons:

First, by keeping you in your seat.—A simple enough statement, but a very important one in terms of your driving. Think about all the times you have hit a pothole, bump or other obstruction and had to fight to keep control of your car. This one function could be the reason for your being able to avoid hitting that second obstruction.

Second, by reducing the force of impact.—Sadly, not all crashes can be avoided. Safety belts will help, but air bags would give you even more protection.

Third, by preventing ejection from the vehicle.—In reality, you are five times more likely to become the late Mr. Doe if you are ejected from your car. Let's face it, when you are flying through the air at 30 or 40 mph, any environment other than a soft mattress is going to be hostile. Considering that the four thousand pound car you recently occupied might also be flying around the same vicinity, the prospects are dismal—particularly if it should come to rest on top of you.

The fourth reason could well be the most significant:

By allowing (or encouraging) more effective driving.—We could take a cue from race track drivers. They wear a lap-shoulder harness combination. Concentration is extremely important in motor racing. While the professional racing driver intuitively remembers this, the average motorist does not.

When you wear your safety belts, you are

always in the best position to effectively operate your car's controls. You can apply brakes hard, make sharp evasive maneuvers and still stay firmly in your seat.

Man reacts instinctively to the awareness of possible danger. When you put on your safety belts, you are acknowledging that driving does place you into a demanding and sometimes hostile environment. Having this realization keeps the driver alert to hazards and increases his concentration.

Allstate requires belt usage by fleet drivers

We at Allstate have done more than merely expound on the virtue of seat belts. In our company car fleet safety program we require all operators and occupants to use all available safety belts, and there are reminders in the car that repeat the command, "Fasten Seat Belt."

We recommend that you all spell out this requirement for your own company car operators. There will be a good habit carry-over into off-the-job driving, and the operator will be setting a perfect example for his family and acquaintances.

We are delighted to note the publicity by other companies—telephone and auto—that declare "it is compulsory that our company car drivers use the provided safety belts."

Company safety standards were assisted when the Bureau of Motor Carrier Safety issued its regulation that "requires drivers of trucks and buses to use the installed safety belts."

Industrial safety shows the way

Company car drivers, however, make up only a small percentage of American drivers. What about the millions of drivers who display a gross neglect for personal safety?

Not surprisingly, industry and modern technology have shown the way. During the Industrial Revolution, the advent of the "birdcage" stage was noted. That is, management began to place guards over and around hazardous parts of machinery. Technological improvements included the feature of "no start" or "an automatic shut off" if the safety equipment guards were not in place. Later, the equipment designers began to

build-in safety, thus furnishing greater personal protection to employees.

The concept of personal safety emphasized by industry is also evident today in traffic safety.

Initially, safety belts were designed to protect the occupant in a car. However, as I have pointed out, the majority of motorists do not use them. The main imperfection, then, of safety belts is that they were designed for manual operation. It just hasn't worked.

Limited effectiveness of warning and inter-lock systems

To overcome this non-use, the Department of Transportation announced that all cars built after January 1, 1972, must be equipped with improved safety belt systems.

When the driver's seat is occupied, the system provides a warning that reminds the driver and the front seat passenger if they have not buckled their lap belts. The warning includes a buzzer and an airplane-type "Fasten Seat Belt" signal light.

Many of you own 1972 cars and know what this means. A spot-check of 11 new car dealers in the Washington, D.C., metropolitan area by the Insurance Institute for Highway Safety revealed that salesmen at nine of the dealerships were willing to suggest or demonstrate how federally-required seat belt warning devices could be either circumvented or disconnected. Experience shows this system is too easily defeated.

A later study by the Institute concluded: "Belt-buzzer-light approach a failure." The federally-required buzzer-light warning device, intended to induce car owners to wear their safety belts, is a public health failure. Comparing drivers of 1972 buzzer-light equipped cars with drivers of 1972 cars without the system, the Institute researchers found safety belt use levels identical (low) for both groups. Of drivers in the vehicles equipped with the device, 18 per cent were using belts, while of drivers in the vehicles not equipped with the device, 16 per cent were using belts.

The Department of Transportation (DOT) has also proposed that 1974-1975 automobiles be equipped with an ignition-interlock system that would prevent the engine

from starting unless the belt systems were fastened in all occupied front seating positions. But the ignition-interlock system has two main imperfections: It still requires manual operation, and it, too, as the "improved-warning system," can be disconnected or circumvented.

The next technological step for development, as in the industrial revolution, is the automatic restraint. At present this is best illustrated by the air bag, even though there are other systems such as air belts, air nets, etc. Passive restraints have been recognized as a way to cut highway deaths substantially.

Advantages of air bags

The passive air bag system has a number of inherent advantages. It is automatic so "those who never buckle-up" will now be protected. The system will provide crash protection at much higher collision speeds than is possible with current safety belts. The system is more versatile since it will provide automatic protection for youngsters, pregnant women, unusual-sized citizens, the handicapped and others who may have difficulty in fastening existing belts. The passive protection system will also be more durable than present safety belts.

We have thoroughly investigated the merits of the passive restraint issue. We concluded that there is a great potential in saving lives (several thousand annually) and preventing disabling injuries (several hundred thousand) through an effective passive restraint system in the front seat positions only.

It appears that 87 per cent of the occupants of vehicles involved in crashes are found in the front seats. Furthermore, 61 per cent of all fatalities are front seat occupants of vehicles involved in frontal impacts of the type that could be expected to trigger air bags.

Corporate advertising tells a success story

In 1970, when we undertook our campaign to get better bumpers on cars to reduce the skyrocketing cost of auto repairs and auto insurance, we got the same kind of irrelevant attacks we now find surfacing around us on the air bag issue. We were right on the bumper issue, and we believe we are also correct on

the air bag issue.

In our corporate public service advertising, Allstate:

1. Is supporting DOT Safety Standard #208 that requires the installation of passive restraints as of August 15th, 1975, and
2. Is helping to educate the public as to the lifesaving needs and benefits of workable passive restraint systems.

Allstate field testing of air bag system

At Allstate, we firmly believe that the air cushion system offers the greatest protection of any vehicle system yet developed.

Consequently, in March of 1972, we acquired 200 Mercury cars with an air bag for the right front seat occupant to field test the safety principle we support. We aim to show the way both to proponents and opponents of the passive restraint system. After all, the real world experience is the real clincher, and we are willing to "put up the funds and provide the means" to attain adequate testing. We endorse this field-testing to other corporations and governmental agencies.

Later, we will show a film that highlights the air bag tests conducted for Allstate by Dynamic Science and that demonstrates the great reliability of production-built air bag equipped cars.

Our test Mercurys were run over the roughest roads, involved in panic stops from 65 mph, run into a test barrier at 5 mph and jumped 45 feet off a ramp just to give demonstration evidence of the reliability of this air bag system against inadvertent firing.

Yes, the demonstrations were very successful:

1. There was no inadvertent firing under all sorts of adverse conditions, and
2. The air bag did activate when it was supposed to.

Your own industrial experience does confirm the positive value for passive safety devices—especially those that cannot be bypassed by the human element. Industrial machines have automatic safety devices, why shouldn't cars?

As mentioned previously, Allstate recommends field testing of the air bag now. Allstate vice-president Donald Schaffer asserts,

"The air bag is ready, and the installation in front seat positions is essential at the earliest possible date. The air bag's present potential for saving thousands of lives and preventing serious injuries is so great that mandatory front seat installation should proceed without unnecessary delay."

Again, it is a shocking fact that it now appears that no more than 1,000 new model cars with air bags will be available for fleet testing this year—a figure that NHTS administrator Douglas Toms says is "totally inadequate from a statistical standpoint" to meet even minimum field test needs.

Wouldn't it be fitting and appropriate for those who strongly endorse the need of field testing, to equip some of their fleet vehicles with the latest air bag equipment for front seat passengers? This is the real-world experience that can show the way in gaining the ultimate safety of man while behind the wheel of his car.

Why seat belts and air bags

Why, if we believe in air bags, do we advocate the use of lap belts with air bags?

There is a two-fold answer:

1. The present air bags are effective only in frontal crashes. The system is not effective in roll-overs, non-frontal impacts and low-speed collisions. So, even when all cars are equipped with air bags, it will still be advantageous to use the lap belt to attain maximum protection in a crash.
2. Only one-tenth of the nation's cars are replaced each year. If we start with air bag equipped cars in 1976 models as required by DOT #208 standard, this means that 100 per cent replacement will not occur until well into the 1980's. Until everyone has the lifesaving air bag device, many will still have to rely on safety belts.

Mandatory use of seat belts

The worsening auto fatality trend this year and the extreme disregard of motorists to use the provided belts, influenced the National Highway Traffic Safety Administration to take another look at the situation. The federal government announced, in their proposed

highway safety standards revisions, that motorists and passengers be required by law to buckle up their seat belts. Incidentally, this proposed legislation is merely an interim measure.

The aim of such legislation is to convince the majority of average, law-abiding citizens to use the belt out of the habit of compliance and not from any fear of the enforcement consequences of failing to do so. Nevertheless, the mandatory safety belt usage legislation is not a substitute for air bags, and realistically, this legislation has little chance of passage.

As in a jigsaw puzzle, we must analyze each separate item of the total restraint system.

There is no single advertising answer. There is no panacea publicity cure. There is no silver bullet legislation. Telling the American public to "Buckle-Up" just isn't enough.

We do have a successful passive restraint story to tell. We want to emphasize the plus factors. We cannot, nor should we, generalize that one failure or two should impede progress. We need to be open-minded and avoid over-simplification or over-generalization. The auto industry as well as the federal government should share responsibility and action.

Change is inevitable. The new dimensions in our lives today require us to accept this change. I am convinced that man must control his destiny. The automatic crash cushion is one of those controls.

How can you get involved in providing for your personal protection in our wheel society? How can you motivate others to take full advantage of lifesaving restraint devices? How can you participate in auto safety?

I would like to call your attention to this reaction to our film from a researcher in Pennsylvania:

"You recently loaned us a print of your film, 'A Pioneer Look at Air Bag Reliability.' Everyone here who saw the film thought that it was excellent. The film did much to convince us that an air bag would save our lives someday. Allstate is certainly to be commended for its interest in automotive safety. We appreciate you loaning us this film."

We will be glad to make available our air bag test film for any group showing that you may wish. Just drop us a letter of request, and we will schedule the film as desired.

We believe every company should make an independent study of the air bag situation and not take at face value the criticisms many parties are issuing to the public.

As stressed by our Chairman of the Board, Archie R. Boc:

"We are convinced that the installation of air bags is not being delayed because the technology is not ready or because the cost outweighs the benefits. Rather their installation is resisted for reasons unrelated to their ability to save lives and prevent injuries. In the face of this knowledge, Allstate believes that silence on the air bag issue would be a form of corporate cowardice."

Seat belts will be with us for a while. It is also crystal clear that automatic restraints are an essential safety device for vehicles today and tomorrow. With them both, thousands of lives can be saved, and numerous injuries prevented each year.

the air bag issue.

In our corporate public service advertising, Allstate:

1. Is supporting DOT Safety Standard #208 that requires the installation of passive restraints as of August 15th, 1975, and
2. Is helping to educate the public as to the lifesaving needs and benefits of workable passive restraint systems.

Allstate field testing of air bag system

At Allstate, we firmly believe that the air cushion system offers the greatest protection of any vehicle system yet developed.

Consequently, in March of 1972, we acquired 200 Mercury cars with an air bag for the right front seat occupant to field test the safety principle we support. We aim to show the way both to proponents and opponents of the passive restraint system. After all, the real world experience is the real clincher, and we are willing to "put up the funds and provide the means" to attain adequate testing. We endorse this field-testing to other corporations and governmental agencies.

Later, we will show a film that highlights the air bag tests conducted for Allstate by Dynamic Science and that demonstrates the great reliability of production-built air bag equipped cars.

Our test Mercurys were run over the roughest roads, involved in panic stops from 65 mph, run into a test barrier at 5 mph and jumped 45 feet off a ramp just to give demonstration evidence of the reliability of this air bag system against inadvertent firing.

Yes, the demonstrations were very successful:

1. There was no inadvertent firing under all sorts of adverse conditions, and
2. The air bag did activate when it was supposed to.

Your own industrial experience does confirm the positive value for passive safety devices—especially those that cannot be bypassed by the human element. Industrial machines have automatic safety devices, why shouldn't cars?

As mentioned previously, Allstate recommends field testing of the air bag now. Allstate vice-president Donald Schaffer asserts,

"The air bag is ready, and the installation in front seat positions is essential at the earliest possible date. The air bag's present potential for saving thousands of lives and preventing serious injuries is so great that mandatory front seat installation should proceed without unnecessary delay."

Again, it is a shocking fact that it now appears that no more than 1,000 new model cars with air bags will be available for fleet testing this year—a figure that NHTS administrator Douglas Toms says is "totally inadequate from a statistical standpoint" to meet even minimum field test needs.

Wouldn't it be fitting and appropriate for those who strongly endorse the need of field testing, to equip some of their fleet vehicles with the latest air bag equipment for front seat passengers? This is the real-world experience that can show the way in gaining the ultimate safety of man while behind the wheel of his car.

Why seat belts and air bags

Why, if we believe in air bags, do we advocate the use of lap belts with air bags?

There is a two-fold answer:

1. The present air bags are effective only in frontal crashes. The system is not effective in roll-overs, non-frontal impacts and low-speed collisions. So, even when all cars are equipped with air bags, it will still be advantageous to use the lap belt to attain maximum protection in a crash.
2. Only one-tenth of the nation's cars are replaced each year. If we start with air bag equipped cars in 1976 models as required by DOT #208 standard, this means that 100 per cent replacement will not occur until well into the 1980's. Until everyone has the lifesaving air bag device, many will still have to rely on safety belts.

Mandatory use of seat belts

The worsening auto fatality trend this year and the extreme disregard of motorists to use the provided belts, influenced the National Highway Traffic Safety Administration to take another look at the situation. The federal government announced, in their proposed

highway safety standards revisions, that motorists and passengers be required by law to buckle up their seat belts. Incidentally, this proposed legislation is merely an interim measure.

The aim of such legislation is to convince the majority of average, law-abiding citizens to use the belt out of the habit of compliance and not from any fear of the enforcement consequences of failing to do so. Nevertheless, the mandatory safety belt usage legislation is not a substitute for air bags, and realistically, this legislation has little chance of passage.

As in a jigsaw puzzle, we must analyze each separate item of the total restraint system.

There is no single advertising answer. There is no panacea publicity cure. There is no silver bullet legislation. Telling the American public to "Buckle-Up" just isn't enough.

We do have a successful passive restraint story to tell. We want to emphasize the plus factors. We cannot, nor should we, generalize that one failure or two should impede progress. We need to be open-minded and avoid over-simplification or over-generalization. The auto industry as well as the federal government should share responsibility and action.

Change is inevitable. The new dimensions in our lives today require us to accept this change. I am convinced that man must control his destiny. The automatic crash cushion is one of those controls.

How can you get involved in providing for your personal protection in our wheel society? How can you motivate others to take full advantage of lifesaving restraint devices? How can you participate in auto safety?

I would like to call your attention to this reaction to our film from a researcher in Pennsylvania:

"You recently loaned us a print of your film, 'A Pioneer Look at Air Bag Reliability.' Everyone here who saw the film thought that it was excellent. The film did much to convince us that an air bag would save our lives someday. Allstate is certainly to be commended for its interest in automotive safety. We appreciate you loaning us this film."

We will be glad to make available our air bag test film for any group showing that you may wish. Just drop us a letter of request, and we will schedule the film as desired.

We believe every company should make an independent study of the air bag situation and not take at face value the criticisms many parties are issuing to the public.

As stressed by our Chairman of the Board, Archie R. Boci:

"We are convinced that the installation of air bags is not being delayed because the technology is not ready or because the cost outweighs the benefits. Rather their installation is resisted for reasons unrelated to their ability to save lives and prevent injuries. In the face of this knowledge, Allstate believes that silence on the air bag issue would be a form of corporate cowardice."

Seat belts will be with us for a while. It is also crystal clear that automatic restraints are an essential safety device for vehicles today and tomorrow. With them both, thousands of lives can be saved, and numerous injuries prevented each year.

DEVELOPING AN OFF-THE-JOB SAFETY PROGRAM AT UNIROYAL

By D. E. DUDROW

Corporate Manager, Safety & Plant Protection, UniRoyal, Inc.,
Middletown, Conn.

For over a half century occupational injuries have been under serious attack at UniRoyal, and although we have not achieved perfection in our plant safety we are encouraged with the progress that has been made. For a much shorter time, eleven years to be exact, we have been just as seriously trying to exert some corrective influence in the area of off-the-job accident prevention. We find this a much harder nut to crack.

Recognition of the need for an off-the-job safety effort was not hard to come by. As far back as 1961 we had collected figures to show that our employees were having ten times as many accidents away from work as we experienced on the job, and many more of these accidents were fatal. Conservative cost estimates convinced us that the company was, at the time, absorbing an annual loss approaching a million dollars.

While insurance programs covered much of the economic loss that accrued to the injured employees, many of them suffered damage that permanently changed the life plans of an entire family. As in the case of occupational injuries, it is the *personal* tragedies we witness that make us so determined in our efforts to find ways to eliminate accidents. From a harshly practical point of view it was quite evident that the great efforts we made to prevent *work* accidents were often totally negated when our employees became injury victims away from the job.

The decision to do something about off-the-job (OTJ) accidents initiated a system for *corporate-wide* reporting of this type of injury. In 1962 we adopted the use of forms and procedures worked out at that time in cooperation with the National Safety Council. At this stage, our entire program consisted of the collection and reporting of these statistics.

These quarterly summaries were distributed to all factory managers, industrial relations managers, safety supervisors and members of division and corporate management. The letter accompanying the summaries pointed out what was happening to us and admonished every safety supervisor and industrial relations manager to get an OTJ safety program started in his plant. The resulting action throughout the company was spotty, and the nature of the initiated programs varied widely. We continued in this fashion through 1964. By that time all plants were reporting, and we had collected enough data to show, at least on a preliminary basis, that those plants which had started OTJ programs on their own initiative were showing a steadily improving trend in accident experience. The trend continued and it became evident to us that a coordinated, company-wide, uniform plan would pay off.

Dr. Earl Hannaford, safety engineer of the Long Lines Department, AT&T, in a paper delivered at the 1960 National Safety Congress, listed four steps to get action when the "captive group" controls of occupational safety are not completely available to us. First on the list was the "plentiful and continuing use of mass media, such as slogans, posters, movies, mailed-to-the-home items, etc." We decided, as a first stage approach in our own program, that we would exploit Dr. Hannaford's first step—the use of mass media.

From our knowledge of some of the early programs developed at the plant level, we concluded that most plant safety supervisors had neither the time nor the means for reading and evaluating the many leaflets, booklets, posters, films and other aids available for a given program. Since most of this material

was received at corporate headquarters or was readily available to us, we decided to screen out the best material for our use and assemble it in kits. Included was a sample or description of each piece, and the local safety man was to order the materials he could use to best advantage. Suggested contests or other programs were also included. Kits were scheduled for bimonthly mailing during the ensuing months. In announcing the new, coordinated program, it was emphasized that it was designed to *supplement* and not in any way to replace local *on-the-job* safety activities.

Kit materials were aimed at the accidents to which we humans seem to be naturally vulnerable; namely, driving, falls, vacation accidents, and fires.

We continued with the program for two years. In the third year our program consisted of re-runs, so to speak, of earlier mailings, but we became more specific in what we considered the best programs and materials.

Response to this type of program by many of our plants was enthusiastic. For many it meant an *improved* effort, while for some it meant *some* effort where, before, there had been nothing.

As in any promotional project there always comes the time when a new look and a new approach is needed to maintain momentum. In our case it was easy to detect from our statistics a particular phase of off-the-job accident prevention that was crying for attention.

We could see that vehicular accidents and falls were literally "killing" us, so we pointed our thinking caps in their direction. At about this time, some problems in our leased car passenger fleet began to attract attention. The carrier of our collision and liability insurance on these cars called for help in getting damages under better control.

After a series of meetings with our fleet managers and the insurance carrier, we set to work to design and implement a program aimed at reducing vehicle accidents in this group. As this effort was directed largely at sales personnel, many of whom were away from an office or headquarters most of the time, it was decided that the written word was the media most likely to get the safe driving job done for us. With this in mind, a

main feature of our program design was a series of bulletins promoting driving safety, put in the hands of our fleet users on a regular basis. This program had its counterpart in a similar one aimed at the reduction of accidents among our "in-plant" and over-the-road drivers, whose numbers were steadily increasing.

Designing a company-wide plan for the systematic promotion of safety among company drivers was a new experience for us. Following some research and thought on the matter, we decided, after a preliminary reference to our basic fleet accident statistics, it would be wise to pitch our material for an appeal to the individual's pride at being good at the business of driving. This decision led us to the use of the "Be a Pro" concept that has been a feature of much of our material used to date.

Having arrived at this point in our vehicle safety program, it was evident that much of the same material applied to all driving safety, whether the driver was in the course of his employment or involved in off-duty driving activities. Thus, the traffic safety portion of our off-the-job accident prevention program soon became a natural part of our program aimed at preventing vehicular accidents on the job.

In reviewing our off-the-job statistics for the first nine months under our vehicle safety promotion, we found that increases in accidents and days lost due to falls had offset the results of our driver improvement program. Let's briefly review our findings:

1. Twenty-nine plants had signed up for our 1971 *Zero-In* program.
2. Over 16,000 employees and plants in each UniRoyal region were represented, validating the results of the first program.
3. These plants *reduced* frequency of vehicle accidents by 33 percent—from 3.32 to 2.23—while non-participating plants *increased* 16 percent—from 9.32 to 11.06 accidents per million exposure hours.
4. Participating plants also reduced the days lost due to these accidents by 23 percent while other plants were increasing these losses by 6 percent.
5. Falls at home and in public needed at least equal attention because, during 1971,

they grew to represent more than one-third of absenteeism due to off-the-job accidents (32 percent of off-the-job accidents and 35 percent of days lost).

Accidents resulting from falls also accounted for about 10 percent of our *on-the-job* accidents, and this ratio had been a rather steady figure over recent years. Many of the causes of falling accidents were included in both on-the-job and off-the-job accidents, and the seriousness of the results were the same no matter where the accident occurred.

We at once decided to include our attacks on falling accidents in the same plan that had emerged for our war on driving accidents. We would combine, as best we could, the material to be used both on the job and off.

At the same time we felt it necessary to maintain and extend the driver improvement program by alternating it with the new programs to reduce falls. The resulting six programs for 1972 were completed and submitted to the plants for their participation.

Our new program had one other feature significantly different from our earlier kits of available materials. In that program we pointed out what was good, and each location decided what, if any, materials to use. The materials for our vehicle safety and falls prevention was designed, written and produced by our corporate safety staff. Production costs had to be absorbed by the using plants. Use of the material was at the plant's option. There was no "shotgun" coverage by material, whether or not it was wanted. We felt that plants electing to put the program into effect would make best use of it. Not every plant uses the prepared program. Some still prefer to develop their own and use materials available from other sources, but we now know that each plant has an ongoing activity in behalf of safety off-the-job.

Started in 1971, and continued in 1972, our program incorporated the NSC *Zero-In on Safety* theme and made good use of many of the materials developed for the campaign. It may be helpful if I outline a few of the mechanics of our material preparation.

From our slipping file we selected illustrations to paste into our photo-ready copy. From this, an offset printer reproduced and

folded the employee handouts in greeting card form at 1-1/4 cents each.

In a few instances we used a single illustration by a free lance artist, in various reductions for posters, pocket protector inserts, bulletins and employee handout illustrations.

The pocket protectors, costing 12 cents each, had a 2-1/2" by 2-3/4-inch transparent pocket. Inserts were printed 15 to a sheet with an assortment of two-color messages at 4 cents per insert. Some left room for addition of supervisor's name or a timely message.

Both the 1971 and 1972 programs were introduced by a teaser contest to stimulate interest. Standard format for each program included:

1. Descriptive list of materials being supplied.
2. Sequence schedule of activities with actual dates to be filled in by plant.
3. Contest pre-planning checklist and sometimes specific rules and entry forms.
4. Visual aid guide covering movies, posters, pocket protector inserts, etc.
5. Advance copies of *Supervisory Bulletin* and employee handout.

Thirty-four plants have elected to use the special mailings and handouts in conjunction with their 1972 programs for occupational accident prevention.

We are expecting that statistics for 1972 will show the same favorable results previously given for 1971.

We know what results like these mean to our employees who may have been spared injury, pain and extreme hardship. What do they mean to the employer? They mean, of course, that a significant waste in manpower has been avoided. To express these savings in terms of dollars is difficult to do with accuracy that meets the test of general acceptance. But when expressed in terms of man-days, such savings become very meaningful, especially in to-day's struggle with the problem of absenteeism.

Plants participating in our 1971 off-the-job campaign lost 9,000 man days less than those who did not participate in the program. This means that 9,000 man-days were not wasted, either to our employees or to our enterprise. This, to us, is a very satisfactory payoff for the time, energy and ingenuity invest-

ed in our program. We will continue to look for investments with such opportunities in improved manpower conservation.

While we cannot produce substantiating evidence in great abundance, we have a strong conviction that some of the techniques devised for our off-the-job program can be used effectively in our occupational accident prevention. We believe that a continuing ap-

peal to the pride of sound achievement and good sense of people, as individuals, may offer an opportunity to influence their behavior toward increased safety that has not been fully exploited. We plan to pursue this idea further in the development of materials for future programs, we have learned well the lesson that the pursuit of continuing success in safety is an endless one.

OVERVIEW OF POTENTIAL IMPACT OF RECENT LEGISLATION

By JOSEPH P. LAMB

Vice President, Personnel & Industrial Relations, Tenneco Chemicals Inc.,
Saddle Brook, N. J.

An area of particular interest and activity for me is that of school board affairs. Earlier this year I was one of four delegates representing the State of New Jersey at the National School Boards Association Convention in San Francisco. I had an interesting experience at that meeting which, in one way, illustrates what may perhaps be the major defect of the Occupational Safety and Health Act, or at least a major problem with people's optimistic expectations from it, especially those of unions.

During that convention two of my fellow delegates had some free time and, wanting to do a little sightseeing across the Bay in Sausalito and Muir Woods, they borrowed a rented car I was using. That night when I went to use the car I was amazed to find that both front seat safety belts had been buckled together and placed beneath the cushions so as to eliminate the buzzing sound which the 1972 models have as a warning that the safety belts are not buckled.

The point may be obvious. Here we have two community leaders, both well-educated men (Ph.D.'s, in fact) who, because they did not believe in the need of seat belts or understand the value of them or want the inconvenience of them, whatever their reasons might have been, had found a way to "beat" the safety protection which is required by law.

A recent article in the *New York Times* reports that this is a common occurrence. According to the Insurance Institute for Highway Safety, which checked 5,000 separate 1972 model cars, only 18 per cent of the drivers were using the belts. About 82 per cent deactivated them by simply buckling the belts behind them on the seat. The same article pointed out that some federal officials and

auto executives believe that people should be required by law to wear the safety belts. They refer to such a law in Australia, which is credited with reducing fatalities by 20 per cent since it was adopted two years ago in the State of Victoria. I guess we must view this as one strong vote for the enforcement point of view!

My point, however, should be obvious. The mere passage of a law does not mean that human conduct will change or that we can have "instant" safety.

As President Nixon said in his recent report on the Occupational Safety and Health Act, "Like many problems that we face today, the improvement of job safety and health cannot be accomplished by simply pressing a button."

The President emphasized that to accomplish our goals, we must not only develop effective standards and enforce them, but we must also have many more safety and health professionals. We must develop knowledge of the causes of occupational accidents and illnesses, and we must see that all employers and employees receive adequate instruction in these matters.

We as professionals have had enough experience in the field to realize that this is correct. As safety professionals we may know what should be done from an engineering point of view, or from a safe operating point of view, but we must transmit our knowledge and our convictions to those who are responsible for the managing of our operations and to those who actually carry out the many phases of our operations—the men and women in our plants, shops, and offices.

This, as always, is the major challenge we face, whether we be operating managers, safety professionals, labor leaders, or any other

er person concerned about and responsible for the safety and health of our work force.

There is no doubt that the Occupational Safety and Health Act can be a very valuable tool to all of us in achieving these goals. While there may not be as much reference to them as in the past, I believe the three E's of safety are still valid today. Certainly the management, with some push for the other E of engineering. The question of education is barely spoken of. The time will come when those responsible for the administration of the law must recognize the area of education—call it training and program, if you will—as the major effective area for maximum safety achievement.

I do not believe that fear is the best of motivators, and would rather see business complying with the requirements of OSHA because of the personal beliefs and convictions of its managers. However, if we are unable to achieve this personal commitment in all cases, we as safety professionals are at least better off with this concern about penalties, or bad publicity, or whatever other negative influence OSHA may motivate in our managers, than we are with no motivation or interest at all, and so are our employees.

Our company's view, and my personal view, is that OSHA is not a challenge or threat, but is as indicated, a tool. A tool which, when it is properly refined, can be helpful to us in our already existing commitment to provide a safe and healthy work environment. There are, of course, points in OSHA's procedures which we think should be modified.

For example, standards having little or no direct effect on the occupational safety and health of workers should be rescinded so that the large number of citations for trivial violations can be eliminated.

All these minor citations tend to emphasize the mere meeting of minimum standards dealing with physical conditions, rather than the real need for organized safety programs in working places. I would interpret as supportive of this point of view the testimony, at the Oversight Hearings, of Jacob Clayman, Administrative Director of the Industrial Union Department of AFL-CIO, when he

spoke of the need for the standards to "emphasize objectives for performance rather than precise and inflexible specifications." I would hope my interpretation of the IUD's view is correct, and that the safety professionals in the labor movement are also working in this direction.

Originally, concerned elements of the American business scene and other interested organizations had meaningful differences (for the most part with organized labor) over certain aspects of the proposed legislation. The differences were not over the concept of the law but over specific facets of the legislation, such as the question of the right to some protection from possibly arbitrary or unwarranted shutdown of facilities. I believe the ultimate compromise is proper. It does provide a means of shutting down an unsafe operation, but with some safeguard and "due process" in the event of a disagreement as to the degree of, or even the existence of, the hazard involved.

For example, in the chemical industry I can see the possibility of sincere differences between governmental safety inspectors and our operating people over this question of hazard or degree of hazard. Many operations are based on specialized training and understanding of specialized technology, background which an outside inspector well may not possess nor even have adequate specialized training to understand.

I do believe we, as the responsible and knowledgeable management of the operation, are entitled to protection against error in judgment on his part. I know the obvious emotional rebuttal that can be made on that, but I further argue that if indeed there is a real hazard present, no manager or owner is going to risk the serious employee relations problem that would result from his incorrect judgment, nor risk the potential loss of life, limb, or property.

I believe that, in the main, responsible industry—and that does not merely mean the big companies—has been doing its job in providing a safe and healthful working environment, at least attempting to do so to the best of its knowledge.

No one would deny that many companies and businesses have not been doing so, and I

share the opinion that there is no basis for exception from the law on the grounds of small size alone. We all know the statistics in that regard.

In our larger companies our further-re-moved top management is faced with tremendous business, sociological, and governmental pressures as never before. The extra motivation provided by the need to comply with this law has pushed forth again in front of them the need for continued emphasis in the field of safety and health. I believe the human values of American business leaders are basically high. All of our discussions and concerns about OSHA have re-emphasized these values, to our advantage as professional managers and to our employees' benefit.

Certainly within the professional field of industrial safety and health, the law has had a very beneficial impact, not merely in terms of career development, personal growth, and functional expansion. I agree completely with the sentiments of George Taylor, Executive Secretary of the AFL-CIO Standing Committee on Safety and Occupational Health, who stated that the Act will require the best brains, the best training, enormous outlays of money both in the public and private sectors, and the best thinking of scores and scores of people like yourselves.

The president of our company brought up a point worth including when we speak about this matter of "opportunity." To use his words, "Now, more than ever before, the safety man has the key to the front office. If he uses it wisely, he will provide a great service to his employer as well as to his fellow employees—safer jobs in more profitable plants." Certainly the safety professional in industry has this two-way responsibility.

Today there is more truth to the slogan about "safety pays" or "production and safety go together" than in the past. That's why we now refer more often to the safety function as the loss prevention department, because you can make a contribution to profits by knocking out wasteful drains on your company's operating costs. There is no reason for a company or you to blush over recognizing the fact that good safety and good profits go together. There may be high costs to operating safely or keeping your plant in

good shape, but in time the high insurance costs, compensation costs, lost-time inefficiencies, or outright shutdown via fire or explosion will cost a lot more.

A great opportunity exists at this time and into the near future for loss prevention professionals to make their marks as business men and managers instead of just as "safety men" alone.

This added recognition and opportunity for our safety and health professionals is very pleasing to me, as I consider this to be one of the major functional areas of any well-managed company. I have always believed that good labor relations men and good safety professionals were people from the same "bolt of cloth." I believe that the two functions are indelibly, and in some cases delicately, intertwined. In many respects the impact of OSHA on the safety profession parallels the impact of the Wagner Act and the National Labor Relations Act on the labor relations profession.

Years back, the major personnel functions were those of employment and payroll records. The legal obligations imposed by those earlier laws and the strength which they gave to union organization certainly led to very expanded responsibility and a high level of professionalism in the personnel management/industrial relations area. The old idea of "liking people" as the qualification for a personnel man is long obsolete, as is the idea that if you do not know how to use some long-service person elsewhere, make him a "safety man."

The increasing demands imposed on our various fields in the past years have led to continued professional development and growth of us all, even well before OSHA was on the scene. Thinking about the parallel of the historical impact of the labor laws and the possible similar implications of OSHA, I looked back into one of our classical text books on personnel management (Scott's).

I found his description on the personal characteristics needed by management's representative at the collective bargaining table to be startlingly similar to those characteristics which I consider necessary for today's competent safety professional, be he employed in industry, labor, government, or any

other sector. Think of them as they would apply today in a "conflict" situation at some plant. These characteristics were listed primarily as:

1. An open mind with regard to union-management relationships.
2. Understanding of group psychology, particularly as it applies to the union leaders with whom you must deal.
3. Absolute personal honesty, and the expectation that others will be likewise with you.
4. Not the type to seek temporary advantage.
5. Able to say "no" when the facts of a situation require it, and "yes" when it is in order.
6. Able to appraise a situation quickly and clearly.
7. Thoroughly informed regarding the law and court decisions under the law.

Today we must find these attributes in all safety and health professionals, no matter what their particular background or orientation may be.

I say this especially since there is just one area of major concern to me about OSHA and its application or, more properly stated, OSHA and its misapplication. That is the potential misuse of the law for the harassment of local management and perhaps even local labor, either by disgruntled employees or disgruntled union officials. This happens particularly when there may be political infighting taking place within a union or between unions.

As an example of this, one OSHA inspection we had on the West Coast was precipitated by an individual employee complaint, not the local union's complaint, about four alleged "imminent" hazards. Not one of these complaints were found to be valid or even considered minor in nature (we did pick up seven other minor citations with a total of \$63 in penalties).

It was not too difficult to guess that the complaints were initiated by a particular employee who was dissatisfied with his job assignment and not on the best personal terms with his foreman or the union leaders.

On another occasion, on the East Coast, when certain job realignments and elimina-

tions were being made, the threat of an OSHA complaint was made across the table by an international union representative. When the talking was done and tempers had cooled, there was no follow-through.

Hopefully, my concern in this area will prove to be unfounded. I have heard of only one major incident that might be characterized as having a heavy labor relations undercurrent to it—the well known inspection at a New Jersey refinery which led to the "walk around" decision.

I hope that in fact this will be the rare exception. I can think of nothing more destructive to the good intent and objectives of OSHA than to cast companies and unions in a bitter adversary role over matters like this. I believe the Department of Labor is aware of this possibility and is sensitive to it. However, more importantly I believe that most major unions recognize the problems that could result.

As a matter of practice, I review the publications of the AFL-CIO, especially those of the international unions with which we deal. I would give most of them high marks for attempting to educate their membership in the facts of the law and in leading their locals in a direction which would not result in abuse and conflict over OSHA's application. Incidentally, I would recommend similar subscriptions and reading for those of you who are responsible for organized plants.

Congressman Steiger, the author of the House version of the bill, recently spoke to this point in the fall issue of *Occupational Hazards*. Speaking of the relatively small number of employee-demand inspections, he characterized them generally as responsible requests and gave credit to "the tremendous effort by management to recognize the implications of the Act and to keep the channels open between the employees and themselves in matters of health and safety." Congressman Steiger also recognized the unions' role, adding, "It also indicates that in general the unions have done a good, responsible job with their membership."

I think the instance I cited of the argument over job changes and the OSHA threat emphasizes the need that you as safety professionals have to be good practicing personnel

types. It is pretty easy in engineering-type matters to get into a black-and-white-situation. The laws of physics and your training and experience clearly will establish for you certain facts, relationships, etc. that are not debatable.

For a less trained person, or one trained differently, it may not be obviously so. You cannot lose sight of these differences in background and attitude. In the past, when we spoke of safety men relying on persuasion to bring about change, most of the time what we really meant was getting the appropriate management authorities to agree to spend the money to accomplish what we thought was necessary. It was only on a rare occasion that we were "persuading" the union or the plant worker.

All members of management certainly must listen more closely to the safety concerns of workers and their representatives. The technique of listening and resolving differences in such situations may have to be different than you are used to. Those "gray" areas may be real, or there may be need for compromise, even though "compromise" is considered a dirty word in safety. What a man believes becomes very real to him, and you must understand that.

You, whether you are a company safety representative or a union safety representative, have to be patient and listen, sometimes over and over, to the employee's point of view. You must have those characteristics mentioned before for the labor relations profession: open mindedness, personal honesty, the ability to give whatever straight answer a situation requires, patience, and sensitivity.

If your company has operating supervisors who cannot handle their jobs this way, the roof is going to fall in on them and you and your company, harder than ever before. If I knew of such problem supervisors, I would fall in on them first. The fact is, that is and

has been part of the job of a professional manager.

I would say in conclusion, thinking both in terms of the safety and labor relations professions, that OSHA can be viewed as follows:

1. The law fills a need and, in filling the void that did exist, has helped all.
2. The administration of the Act has been basically sound and as well managed as should be expected in so short a period of time. There may have been some poor decisions by inspectors, but we are generally off to a sensible beginning.
3. The law is an incentive for those who are not interested in, or concerned about, industrial safety and health. For those who are, it certainly should be viewed as a stimulus.
4. It presents a need and opportunity for professional development and advancement for those who are capable and who wish to do so.

5. It permits no room for mediocrity or for "hacks." There never was such room in the field of safety, but for sure it cannot be tolerated now.

6. OSHA has its potential for labor relations abuse—if the law receives the wise union leadership it deserves, this should be more a theoretical concern rather than a real one. I am optimistic that we in industry can meet its challenge and that for the most part we can find it to be a ground for co-operation between our safety professionals, our labor relations professionals, and our union leaders.

I hope that this is the direction in which management and labor will proceed in their living together with OSHA. There are alternatives, as demonstrated in the "walk-around" case. There is no question they will be used by management if necessary; but, if we go that route, we will lose something.

OSHA IN THE SYSTEM OF SOCIAL TRANSACTION

By SHELDON W. SAMUELS

Director, Health, Safety and Environmental Affairs, Industrial Union
Department, AFL-CIO, Washington, D.C.

The purpose of this presentation is to help the safety engineer develop a sensitivity for some of the social and political forces affecting his relationship with workers.

The Occupational Safety and Health Act is a social transaction. Specifically, the Act is still another decision-making track within the social structure of the workplace. Viewing the Act in this manner often means a perception oriented by polemic and academic traditions choked with some centuries-old concepts that are no longer fruitful explanations of what has happened in the workplace. The concept of class structure/class conflict is one of these.

The crowning achievement of the labor movement in this country may well be the destruction of effective class structure. Not that we have achieved a classless society or even that such a society has been the conscious goal of the American labor movement, but that we can no longer explain what's going on with the concept of "class." Understanding this fact of history is essential to an understanding of the renewed demand by labor for safety in the workplace.

Two hundred years ago—in Great Britain and Europe—the industrial workforce was created by actually incarcerating the laboring classes in work houses or factories. Workers in a very practical sense were without the civil rights of others. By this and other tests it can be said that a class structure existed at that time.

Jeremy Bentham, an economist-philosopher of the day whose views are still widely held, believed that the ideal social structure (for workers) was half-factory, half-prison, with both wings under central surveillance.

In our country this concept found expression in the Pullman experiment. Remnants of this social practice can still be found in

many of our mill towns. Although it may be a disappearing entity, the mill town will linger as long as state industrial development commissions use them as lures for runaway plants. They are essentially fossils of social development. Needless to say, working conditions in these plant-communities have been the most difficult to remedy because of the workers' almost captive state. In such structures progress of any kind is difficult.

The first battle for a safe workplace took place in the courts, when in the 1840's decisions were sent down that gained recognition of a worker's right to a safe workplace, safe tools, safe work rules, and warnings of special danger. This battle was lost. The worker found that he could win a court case, but not necessarily gain a safe workplace or compensation for disease or accident.

It is interesting to note that William Green in 1926, then the president of the American Federation of Labor, saw workers' compensation as the second battleground. He believed that the cost of compensation would bring "industrial accidents to management's attention . . . when accidents become expensive, industry would begin to consider accident prevention." This battle also was lost, essentially because the only conditions that are changed by this route are those related to compensable losses as defined by inadequate state laws.

Secondly, the employer is enabled to place the primary burden of loss control on the worker by providing protective equipment and training in hazard-avoidance. The employer has no incentive to provide a safe work environment or to remove job hazards. This is not to deny the importance of protection and training, only to score our traditional over-reliance on these ineffective, short-term methods.

We still live with the war cry of that lost battle: "Safety Pays!" Safety pays for the potential victim; it doesn't really pay in many work situations for the employer or we would have virtually no accidents or occupational disease. The National Safety Council likes to talk about 14,500 preventable accidental deaths. Labor likes to talk about an estimated 100,000 deaths from occupational disease. Both statistics point to an incalculable subsidy of the cost or production by the worker and our society.

The economics of the situation are very simple. Nearly half of the male blue-collar workforce has largely work-related chronic diseases largely paid for by the worker and the community as a whole. Even if all of the identifiable costs were placed on the employer, we cannot always be sure that it would not be cheaper for the employer to replace dead workers than to keep them alive.

Society has grown accustomed to providing this subsidy with little or no accounting. It may even be profitable (if only dollars and cents are counted). In the case of chronic occupational disease, it may be cheaper for any nation to sacrifice a life that has already achieved peak productivity. The cost of losing the production of a man aged 55 who is about to enter a stage of disease requiring heavy medical expenses is often very low compared to the lost productivity of a man aged 25 in whom occupational cancer, for example, is unlikely to be found. The relative cost of a life lost at 55 is small even after medical care is added.

For example, the prevention of all cancers, only some of which are occupationally-related, would save this country about \$9 billion each year. That really isn't very much money compared to the cost of sending a man to the moon: \$30 billion. We obviously can afford cancer. Further, on a purely economic basis, government may easily decide that occupational cancer is a worthwhile subsidy, providing a bargain for some employers.

In just the last few months we have been informed of four plants in which beta-naphthylamine and benzidine have been used without control by employers well aware of probable death from cancer of a third or more of the workforce. Because of its priori-

ties, determined on a crude cost/benefit basis, the federal government has refused to adopt standards for these and seven other carcinogens as recommended by the American Conference of Governmental Industrial Hygienists and organized labor.

The economic importance of eliminating potable water from showers and perpetuating closed end toilet seats is perceived by the government as greater than the prevention of cancer. Thus procedures have been accelerated for new standards on these issues.

The same narrow formulation of cost/benefit analysis reaches beyond the workplace and encompasses the total environment. Dr. Lee DuBridge, formerly the chief science advisor to the President, opposed the screening of all potentially hazardous substances on the grounds that "industry cannot wait" the time that could elapse to test their value and effect. Government's commitment to life is a secondary consideration because life has not been, and probably cannot be, justified on economic grounds alone. Our travail in pursuit of an acceptable asbestos standard is another case in point.

The dollars and cents of safety are the reason why collective bargaining has been a limited tool of labor in this area. Safety is seldom a demonstrable factor in increased productivity. An exchange of safety for productivity cannot take place. So long as 75 per cent of the workforce is unorganized, unions on an industry-wide basis will not be able to do much more at the bargaining table than in the past.

There are notable exceptions. Strong unions, representing large percentages of workers in an industry, as in rubber, steel and autos, have and will achieve a great deal for all workers by this route. But at best the situation is a standoff without the ability of a union to use the leverage of regulation.

There are three significant responses of the employers to safety regulation which are worth focusing on.

First, let's look at the tactics of some companies, such as the practice of docking the pay of participants in the "walk-around," which are traditional obscenities dominating the climate in which labor and management operate. There is little that industry can or

will do collectively on issues of this kind. Individually, however, much can be done; namely strengthening our professional structures.

I am a firm believer in the potential of professional organizations. They raise the level of professional practice by demanding minimum levels of acceptable knowledge and behavior. But to succeed they must stone the profession's prostitutes, label the ignoramus, and censure unproductive attitudes. When a society fails to do these things, it inevitably fades and is replaced by another.

The American Society of Safety Engineers can become a successful organization. Safety is new as a profession, but already we can glean some accomplishments based on the response of individuals relatively freed of corporate restraint through the semi-anonymity of collective action. ASSE can expect our collaboration if this trend continues.

The third response relates to the behavior of management's political action associations. Most of you work for companies that paradoxically, are at the same time more responsible, yet responsible through membership for the National Association of Manufacturers, U. S. Chamber of Commerce, and similar groups.

Read the record of the recent Senate and House oversight hearings of the committees on small business and labor. The Chamber says that workers face no greater risk than slipping in a bathtub. They are still shrieking the old nonsense about "accident prone" workers.

More serious is the subversion of government for profit. The National Association of Manufacturers has a full-time representative-office, phones, even government expense account—at the very heart of OSHA operations.

The Civil Service has been raped! Political/industry appointments are now made at the lowest levels. An increasing number of essential personnel are being replaced by industry-sponsored or approved hacks without even a pretension of professional qualification.

The Agricultural Advisory Committee is without labor representation. Political/industry clearance was a factor in the appoint-

ment of every member, a policy being applied to even the Standards Advisory Committees.

Industry standard-setting organizations, such as ASTM, are attempting to by-pass the standard-setting mechanisms in the Act. OSHA and industry officials collaboratively participate in this attempt, giving their products preference over the work of the government's own efforts. Industrial consultants dominate the contract route OSHA has taken in lieu of adequate staff in its standard-setting operations. The handful of veterans left over from Walsh-Healey days are overworked, by-passed during key decisions, and compelled to rationalize the reversal of what little progress was made prior to passage of the Act.

The Business Advisory Council, an "advisory" committee of major industry representatives who function through the Office of Management and Budget, has been an important strut of the Labor Department's consistent attempt to reduce the rights of workers to access to records. Yet full access to this information is critical to a fruitful participatory role for workers as mandated and intended in the Act.

Respect for constitutional government is of small concern when profits are at stake. The mandated deadline for federal preemption of unapproved state programs is being altered not by Congress but the administration, with broad trade association support. The strategy of this legally untenable attempt is to gain time, to delay action that would result in dollars spent to save lives. When time runs out, the Chamber and other industrial organizations will sell out the states entirely. Meanwhile, Labor Department propagandists skillfully cast the unions in the role of molesting the phantom called "states rights."

Worse yet is the Labor Department's attempt to gut the Act by playing upon the fears of the little businessmen. We have traced at least part of the hysteria that resulted in thousands of largely phony complaints pouring into Congressional offices during the last six months. It was in part, an issue created by extreme right-wingers, much like the attack on social security in the 30's and the attack on Teddy Roosevelt's workmen's com-

pensation program when he was governor of New York.

The first reaction of a stampeded Congress was to exempt small employers. It nearly succeeded because it had the support of an administration determined to use the exemptions issue as a lever to confuse educational services with enforcement, precisely the approach that destroyed the state programs and resulted in the passage of OSHA.

Fortunately, a significant number of key senators and congressmen knew that the Occupational Safety and Health Act permitted HEW to conduct on-site consultation and other educational services with no possibility of citation. They knew that we supported this role, that a year ago we began to work for a \$1 million education program for small employers on OSHA, that the problems of small businessmen were being criminally exaggerated.

But the Labor Department has not given up. They recently coerced HEW into signing an agreement that limits its educational role (thus consultative role) primarily to the training of professionals and para-professionals through university grants. This step is part of the announced goal of placing both OSHA and NIOSH in an enlarged Commerce Department.

This subversion for profit is having a profound effect on industrial relations. Millions of workers know what the Act was intended to do. Who do you think they blame when they learn what is happening? And how do you think they react? The most immediate route for reaction is at the point of labor-management contact: the plant. Collective bargaining in process already reflects this reaction in hundreds of plants throughout the nation.

The picture is not entirely dismal. We can, in fact, be very optimistic. We spoke earlier of the effect of organized labor on social structure. That was achieved by a protracted struggle for a significant handful of contract items.

A primary effect of the eight-hour workday and better-than-subsistence wages has been the leisure and financial ability to absorb information made available to the worker by mass communications, mass education,

and a broadened sphere of day-to-day personal contacts.

No longer isolated by language or limited by the potential of his ethnic institutions for social and political action (as was his father), the increasingly younger, more sensitive industrial worker is in a position to examine the quality of his life and to effect change directly through his union and by his personal involvement in the decision-making processes of myriad social and political structures.

Not satisfied with creating merely the potential for social change, labor from the very beginning created an educational apparatus to actualize change. Approximately 25 land-grant universities and a number of private institutions maintain labor education programs. There are no less than four university extension labor-education services in the Chicago metropolitan area alone. There are about 200-400 professionally trained labor educators in this country.

In the fall of 1973, the AFL-CIO Labor Studies Center will begin operating a residential advanced training facility near the heart of the nation's capital. There are 400 periodic and an amazing 12,000 sporadic publications in the labor movement.

Each summer hundreds of thousands of workers attend institutes covering everything from pensions to physiology.

Within the labor movement there is continual agitation to improve this apparatus. But improvable or not, the American worker provides fertile ground for the cultivation and growth of ideas and skills that will improve his condition.

The consequence has been that millions of workers have rejected the blind continuation of their subsidy of the environment of the workplace. The result: a bitter two-year battle that culminated in the Occupational Safety and Health Act of 1970. This stringent legislation sets forth new and expanded rights for workers largely reflecting their environmental concerns, their will to participate in its implementation, and their lack of any kind of inhibiting class consciousness or social structure.

What is at stake are rights which, like all human rights, evolve from real needs as they are exhibited in the past. Participatory rights

as a widespread and widely accepted principle of our society developed relatively late in Western political thought, "Liberty," "civil rights," and other issues and overlapping concepts clearly predate "participation." The time lag was caused by the meaningless-ness of the concept under conditions in which the potential participant was restricted intellectually, socially, politically, or legally from direct involvement in decision making.

With the gradual elimination of these restrictions, participatory rights developed in our time in response to broader needs in the community, where the consequent manifested demand to take part in public hearings, be heard at school board meetings, and become involved through similar points of entry in the political system has been overwhelming.

The new set of participatory rights includes those demanded by workers during the hearings held in conjunction with the passage of the Act through Congress. The legislative history of the Act establishes that many of these rights were not preconceived by union or congressional staff. In a heartening demonstration of the "system" at its best, the cry for these rights literally came from rank and file workers.

Specifically, the need to remedy a situation in which no state recognized the demands of workers to participate fully in the discovery and alleviation of hazards on the job led to enunciation in the federal Act of a set of rights enabling the worker to participate in the development of policies, procedures, and standards; the enforcement process; and the review and appeal of enforcement actions.

For example, during an inspection, the Act provides for the right of workers or their representatives to accompany (to "walk around" with) the compliance officer to aid him in the discovery or recognition of the hazards of the workplace.

Conventional safety and health problems will be replaced by new problems that rise from the new situation prescribed by the Act as its impact unfolds. The adequacy of any response will be determined by the extent to which it takes into account the participatory factor we have described. It is a dimension that cannot be neglected. This is clear in the

apparent rejection of the existing system of industrial medical services.

Prior to the passage of the Act, workers bargained, sometimes with success, for separation of the doctor or nurse from management; for better and more comprehensive services; for confidentiality; for access to medical records; and for free choice of physician. (These were issues in the Johns-Manville strike of 1969).

Some of the issues have been decided by the Act and will be assumed under the standard-setting provisions. Access to medical records has been established. Specific medical services will be mandated. Other issues will be in contention for some time. During that time, labor's demands can be expected to be overwhelmingly in favor of greater participation in the decision-making process in the plant as it relates to safety and health, for example, union-supervised environmental and medical monitoring. These are items that already exist in contracts of the rubber and asbestos unions and are being sought by the Oil, Chemical, and Atomic Workers.

The new AFL-CIO Labor Studies Center under construction in Washington will contain a teaching laboratory where we will equip workers with the necessary skills to conduct their own monitoring.

The demand of workers to extend their participation beyond the provisions of the Occupational Safety and Health Act in case finding, environmental/medical monitoring, safety training and safe-practice supervision is inevitable.

Given the increasing will and ability of workers to extend all of their participatory rights, given management's reliance on a Washington lobby successfully subverting the Occupational Safety and Health Administration, given the urgent needs of the workplace, new momentum to this self-reinforcing trend also is inevitable.

The result is a process profoundly-affected by (and a profound effect of), a broad social transaction in which the Occupational Safety and Health Act becomes a critical lever for labor and a new dimension of "industrial relations." The workplace as an extension of the community can never be the same again. Change is inevitable.

PHILOSOPHY AND PRACTICES OF THE NLRB

By JOHN S. IRVING

Deputy General Counsel, National Labor Relations Board, Washington, D. C.

Although I have no claim of experience in technical safety matters, I am struck by the fact that a sound program of industrial safety necessarily depends on some knowledge of a whole host of professional disciplines—law, engineering, medicine, and management, to name but a few.

My profession is law, and my particular specialty is the law of labor-management relations. It is apparent to me that this area of law bears importantly on matters of industrial safety. It is equally apparent to me that various social concerns, including industrial safety, have an impact on the development of labor law in this country. I should like to discuss several facets of this inter-relationship between such social concerns as industrial safety on the one hand and this nation's primary labor relations law, the Labor-Management Relations Act, on the other.

First, let me illustrate how a labor-management relations law like the LMRA takes into consideration legislative provisions and social policies other than those embodied in the Act.

Although the National Labor Relations Board's primary function is to administer the LMRA, the Board is often presented with situations where it must take cognizance of and make accommodations with other Congressional enunciations of public policy as these may affect the administration of the Act.

The landmark case for this principle is *Southern Steamship Co. v. NLRB*.¹ In that case, the Board had to decide whether certain sailors on a vessel had engaged in protected activity under Section 7 of the Act by striking, while the vessel was loading cargo at a dock, to protest their employer's refusal to bargain with the union that had been certified as the sailors' bargaining representative.

If the strike was protected, the company would have violated Section 8(3) of the Act

by discharging the striking sailors. The employer contended that the strike was unprotected. It argued that the sailors had signed "shipping articles" which required them to obey all lawful orders of the vessel's officers and that, accordingly, the sailors' refusal to work constituted not a protected strike, but a mutiny.

The Board, in a decision and order enforced by the Third Circuit Court of Appeals, found that since the vessel was in port the seriousness of the sailors' refusal to follow the orders of the ship's officers did not constitute mutiny; that the strike was protected under the Act; and that the subsequent discharge was, therefore, unlawful. The Board ordered the sailors reinstated.

The Supreme Court disagreed. The Court concluded that under the U.S. Criminal Code, Sections 292, 293 (U.S.C. Title 18, Sections 483, 484), the refusal to follow orders constituted mutiny even if the vessel was in port, that the strike could not be deemed protected activity under the Act, and that the employer's act of discharging the sailors, therefore, did not constitute a violation. In reaching this conclusion, the Court expressed itself forcefully on the inter-relationship between the Act and other legislation. The Court said:

It is sufficient for this case to observe that the Board has not been commissioned to effectuate the policies of the Labor Relations Act so single-mindedly that it may wholly ignore other and equally important congressional objectives. Frequently, the entire scope of congressional purpose calls for careful accommodation of one statutory scheme to another, and it is not too much to demand of an administrative body that it undertake this accommodation without excessive emphasis upon its immediate task.²

Thus, the Supreme Court has expressly directed the Board to consider other congressional legislation in cases where such legislation may have an impact on the case before the Board. This directive of the Supreme Court has, of course, been followed by the Board. For example, a recent case involved a union's fine of one of its members. (Carpenters Local No. 22 v. Graziano Construction Co.)³

The Board found that the union's purpose in fining the member was for his activities in an internal union election in which he sought the ouster of incumbent union officials. The Board concluded that the fine was unlawful. In reaching its conclusion, the Board noted the Supreme Court's ruling in *Sofield v. NLRB*,⁴ where the Court concluded that a union cannot take certain actions against a member where such actions fulfill no legitimate purpose of the union or are against public policy.

Applying this rule, the Board found the union had acted against public policy in that it had "sought to deprive its members of the right, as guaranteed by the Labor Management Reporting and Disclosure Act, to participate fully and freely in the internal affairs of [their] own union."⁵

Thus, the Board found a violation under the Act based on activity that is proscribed under other legislation embodying a part of the total labor policy.

These cases serve to illustrate the general rule that the Act may not be considered in a vacuum and that the Board and the courts will view alleged violations of the Act in the context of other congressional objectives and other public policies.

In particular, safety concerns are sometimes present in Board cases, and the Board and the courts must consider such concerns in deciding whether the Act has been violated. There are two specific sections of the Act, Section 7 and Section 502, under which protests or strikes by employees over allegedly unsafe working conditions might be considered to be protected activities; any employer discipline, therefore, would be considered to be an unfair labor practice. The first of these, Section 7, is a general provision which defines the employees' right, among other

things, to engage in "concerted activities for the purpose of collective bargaining or other mutual aid or protection. . . ."

An example of the operation of Section 7 in this context is *NLRB v. Washington Aluminum Co.*⁶ In that case seven employees, who were not represented by a union, left their jobs and went home to protest the extremely cold working conditions at their plant.

The Board in its decision had found that the employer's plant was not insulated and had a number of frequently opened doors which allowed outside air directly into the employees' work area. In addition, the plant's oil burner had broken down the previous night.

Confronted with temperatures ranging from 11 degrees to 22 degrees that day, the men decided, after some discussion among themselves, to walk out. The employer notified them later that morning that they had been fired for leaving their jobs.

The Board found that the men had acted in concert, although they were not formally represented by a union, and that the employer had, by discharging the employees, violated Section 8(a)(1) which makes it an unfair labor practice "to interfere with, restrain, or coerce employees in the exercise of the rights guaranteed in Section 7." The Board ordered the reinstatement of the employees.

The Court of Appeals for the Fourth Circuit denied the Board's order for reinstatement because, in its view, the men had left their jobs without affording the employer the opportunity to correct the problem. Because of this and the fact that the employees had not received permission to leave, the employer was justified in firing them "for cause."

The Supreme Court agreed with the Board. The Supreme Court found that the employees' walkout to protest the cold place of work would be considered a labor dispute within the meaning of Section 2(9) of the Act, and thus entitled to protection even though no specific request was made to the employer to correct the conditions. The Court distinguished the activities in the cases from those which might, in general, be unprotected: those that are unlawful (citing *Southern Steamship*),⁷ or violent, or in breach of

contract.

With respect to the last mentioned item (breach of contract), a walkout to protest unsafe working conditions might not normally be protected under Section 7 when there is a no-strike clause in the collective-bargaining agreement. If unprotected, the employer could discharge the men for their walkout.

However, an exception to this general proposition is Section 502 of the Act, which states in part that "the quitting of labor by an employee or employees in good faith because of abnormally dangerous conditions for work at the place of employment of such employee or employees [shall not] be deemed a strike under this Act." This section was added to the original Act, virtually without discussion by Congress, in the 1947 amendments.

This clause was construed by the Board in *N.L.R.B. v. Knight Morley Corp.*⁸ In that case, several men who walked out were employed as buffers in the employer's buffing room. The applicable state labor laws required that certain blowers be maintained to expel the dust particles from the buffing operations out of the building. The blowers at the plant had not been functioning properly for about one week when some men finally quit work to protest the conditions, which included dust-particle-filled air and temperatures of 110 degrees.

The employer discharged them for the walkout, claiming that it was in breach of the no-strike clause in the collective agreement. Expert testimony was adduced at the trial to show the extreme dangers to which the employees would have been exposed had they continued working under those conditions.

The issue posed was whether the walkout would be deemed a breach of the contract's no-strike clause, and thus unprotected, or whether it should be considered a protected working conditions under Section 502 and therefore not a strike which would be prohibited by the contract's no-strike clause.

The Board's finding, based in large part on the expert testimony, was that the conditions were in fact abnormally dangerous, and that the men had walked off in a good faith belief that such conditions were abnormally dangerous. Thus, the Board held the employees'

walkout protected under Section 7 and consequently found their discharge by the employer to be a violation of Section 8(a)(1).

The Sixth Circuit Court of Appeals agreed with the Board and enforced the Board's Order; the Supreme Court denied certiorari. The Court of Appeals, in discussing the issue of whether the contract's no-strike clause would render the walkout unprotected, stated that Section 502 expressly limits the right of management to require continuance of work under what the employees in good faith believe to be abnormally dangerous conditions.⁹

As it stood, this statement would be interpreted to stand for the proposition that the employees' good faith subjective beliefs as to the danger of the working conditions would be relevant in making the determination as to whether a given walkout was protected under Section 502.

The Board later clarified the matter in a subsequent decision which held that the proper standard to be used to test whether the employee activity is protected under Section 502 was to be an objective one, i.e., the conditions must, in fact, be abnormally dangerous.

The case is *Redwing Carriers, Inc.*,¹⁰ several drivers of the employer refused to cross a picket line to make deliveries at a customer's place of business because of threats of violence to which they were subjected by the customer's striking employees.

Redwing's drivers, who were fired for refusing to make the deliveries, claimed that their refusal was based on their good faith belief that abnormally dangerous conditions within the meaning of Section 502 existed because of the threats.

The Board, in disagreeing with their contention, stated the following:

It is necessary first to clarify the meaning of the term "abnormally dangerous conditions" as used in Section 502. We are of the opinion that the term contemplates, and is intended to insure, an objective, as opposed to a subjective, test. What controls is not the state of mind of the employee or employees concerned, but whether the actual working conditions shown to exist by competent

evidence might in the circumstances reasonably be considered abnormally dangerous.¹¹

On considering the evidence in this case, and noting that during the course of the strike Redwing's drivers actually crossed the picket line some 3,600 times (in and out of the customer's premises), the Board concluded that the objective evidence failed to sustain the employees' contention that such conditions were abnormally dangerous. Therefore, the Board concluded that the employees' refusal to make the deliveries did not fall within the ambit of Section 502.

Similarly, in *Fruin-Colton Construction Co.*,¹² employees who had been tunneling a mine shaft had refused to continue working because of alleged abnormally dangerous working conditions which included cold weather and hazards caused by excessive water seepage.

The Board found that, in fact, these conditions were abnormally dangerous within the meaning of Section 502 and that the concerted work stoppage was protected activity, despite the contract's no-strike clause, citing *Knight Morley Corp.*¹³

The employer's discipline of these employees was found to have violated Section 8(a)(1) in that it coerced employees in the exercise of their right, under Section 7, to engage in concerted activity, citing *Washington Aluminum Co.*¹⁴

The Eighth Circuit Court of Appeals disagreed and refused to enforce the Board's order of reinstatement. The Court held that the evidence relied upon by the Board was not sufficient to sustain the finding that abnormally dangerous conditions existed, and under the Supreme Court's ruling in *Universal Camera Corp. v. N.L.R.B.*,¹⁵ the Court of Appeals concluded that the weight of the evidence went against the employees' contention; consequently the court found that the employer's decision to fire the employees was privileged under the Act.

The Court noted that in *Knight Morley Corp.*,¹⁶ the Board and the Court of Appeals relied extensively on expert testimony, whereas in the instant case, no such expert testimony was adduced. Further, the Court did not read the Court of Appeals decision in

Knight Morley as propounded a subjective test for abnormally dangerous conditions. Rather, the Court here reasoned that:

The effect of Section 502 in its application to the case at hand is that if employees acting concertedly leave their jobs believing in good faith abnormally dangerous working conditions prevail, they run the risk of discharge for engaging in a "strike" in contravention of a "no-strike" clause in their collective bargaining agreement or for participating in the unprotected activity of dictating to management their own terms and conditions of employment, should proof later of the physical facts fail to support their belief.¹⁷

It may be concluded from the cases¹⁸ in this area that employees to a great extent act at their peril when they walk off the job in the face of a no-strike clause to protest unsafe conditions. They will be forced to justify their actions and prove, to the extent possible, that what they believed to be unsafe conditions were, in fact, abnormally dangerous.

Recently enacted safety legislation has given rise to some interesting cases dealing with the inter-relationship between Section 502 and such legislation. Thus far, the Board has had no such cases. However, such cases have come before the general counsel of the Board, and he has had to consider such legislation in deciding whether to dismiss the charges of a charging party or to issue a complaint based on the charge against the respondent.

In one such case, *Valley Camp Coal Co.*,¹⁹ the general counsel concluded that abnormally dangerous conditions could be properly determined on the basis of an external standard; specifically, one of the interim safety standards set forth in the 1969 Federal Coal Mine Health and Safety Act.

An employee, a miner who was also a safety committeeman, noticed that the telephone in the mine which served as the means for two-way communication with the surface was dead. He called the mine electrician, who stated that he did not know if the telephone could be fixed immediately.

Upon hearing this, the employee complained to the foreman about the unsafe condition and, getting no satisfaction, urged his

fellow employees to leave the mine and refuse to work until effective communication with the surface was restored. When the other employees refused to leave with him, he left on his own at mid-shift. He was discharged for leaving the mine without permission and for urging others to do so. The collective bargaining agreement contained a no-strike clause.

The requirement that mines of the type in question have working two-way communication with the surface is contained in one of the interim safety standards provided by the 1969 Federal Coal Mine Health and Safety Act. The interim safety standards, included in the Act by Congress in an unusual legislative action, were to be effective until the Secretary of the Interior had the opportunity to promulgate permanent safety standards as required by the Act.

Under the Coal Mine Act, a Bureau of Mines inspector can close a mine immediately if he finds a violation of safety standards which results in an imminent danger, defined in Section 802(j) of the Coal Mine Act to be "any condition or practice in a coal mine which could reasonably be expected to cause death or serious physical harm before such condition or practice can be abated."

While not all violations of the safety standards result in situations of imminent danger and, indeed, the Bureau of Mines does not consider failure to maintain working two-way communication as one of the conditions which results in imminent danger, the Bureau has indicated that it does consider the lack of communication so serious as to require issuance of a notice calling for correction of the defect within a matter of hours, failing which the mine operator would be ordered to remove the men from the mine. Thus, the failure to correct promptly the defective communications system would in practice result in action similar to that in an imminent danger situation.

The general counsel concluded that because the lack of mine-to-surface communications may justify ordering the men out of the mine where, as here, repairs might not be immediately possible, this condition constitutes an abnormally dangerous condition within the meaning of Section 502. The fact

that this condition does not constitute an imminent danger under the Coal Mine Act was not considered dispositive because the failure to correct the defect immediately rendered the condition so dangerous as to warrant action similar to that which would be used if the condition constituted an imminent danger.

Furthermore, the test for imminent danger as defined by the Coal Mine Act was deemed to be more stringent than that for abnormally dangerous conditions under Section 502.

It follows that in leaving the mine to protest this abnormally dangerous condition, and in urging other miners to do so, the safety committee was engaged in a concerted activity protected by Sections 7 and 502 of the Act notwithstanding the existence of a no-strike agreement. His discharge, therefore, violated Section 8(a)(1), according to the general counsel.

In a second recent appeals case, *J. F. White Co.*,²⁰ the facts were that the conditions at an employer's excavation site were unsafe because the employer had failed to comply with a state law which required that the sides of an excavation pit be shored or packed at a 45-degree angle to reduce the dangers from landslides.

On several previous occasions the shop steward for the union had urged his fellow employees not to work under such conditions, and on one particular occasion he induced five men to leave work; he then left the job site to file a complaint with the Occupational Safety and Health Administration (OSHA) and returned later with an OSHA safety engineer.

The safety engineer inspected the excavation site and informed the employer that he had determined that a violation did in fact exist and that the employer could expect to receive in the future a citation and monetary penalty. The employer immediately corrected the fault in the presence of the safety engineer. The employer received a citation and fine several weeks later. The employee claimed that he was discharged on the day in question because he had filed the complaint with OSHA without first discussing the problem with the employer.

Although the employer claimed that the discharge was for an unrelated incident, there was sufficient evidence to support the steward's allegation. The collective bargaining agreement contained both a no-strike clause and a clause wherein the employer and union agree to consult with respect to "all aspects of safety, accident prevention, health, and medical treatment, to the end that the health, safety and welfare of the men working on the project may be adequately and properly protected and promoted and the prosecution of the work efficiently carried on; also, the safety regulations of the State of Massachusetts must be complied with in full."

Without more, this employee's discharge would appear to present a triable issue as to whether his walkout was protected under Section 502 of the Act. However, in addition to filing a charge with the NLRB, the employee had also filed a complaint with the Secretary of Labor under OSHA, because under the Act (Sections 11(c)(1) and (2)), an employer may not retaliate against an employee who has filed a complaint with that agency.

Since in this case the employee has the possibility of obtaining a full remedy under OSHA, the general counsel authorized the regional director to defer action on the merits of the employee's unfair labor practice charge until the Department of Labor's district court suit under OSHA is completed.

Since the object of the Act is remedial, to make the employee whole, and not punitive, to punish the employer, it appears that the purposes of our Act may be satisfied if the employee is given a full remedy under OSHA.

If the decision in the OSHA suit goes against the employee, the general counsel may nevertheless proceed on the charge before the NLRB to determine whether the Act was violated.

These cases serve to illustrate the point that the NLRB and the general counsel of the Board will consider the impact of other policies and legislation to determine whether or not our Act has been violated. And, as the latter case shows, the general counsel may actually defer proceeding on a case, pending

the outcome of a related case before a sister agency where the related case may serve to remedy or set at rest the basic dispute.

The NLRB, in addition to being called in to resolve disputes after a walkout over safe conditions has occurred, may be called upon to resolve certain questions pertaining to the prevention of the development of unsafe conditions. Reference here is to the formation of so-called "safety committees," groups of employee representatives involved in the development and administration of plans to promote plant safety.

Even though the safety committee may have been formed for a beneficial purpose, it has been argued that an employer may violate the Act by sponsoring such a group. Thus, if the safety committee as set up by the employer is deemed under the Taft-Hartley Act to be a "labor organization," the employer may have violated Section 8(a)(2) of the Act which makes it an unfair labor practice for the employer "to dominate or interfere with the formation or administration of any labor organization or contribute financial or other support to it. . . ."

The purpose is to keep labor organizations free from employer interference or domination. If a safety committee is a labor organization, the employer must not sponsor, dominate, interfere with, or give improper assistance to the organization. If he does so, he may violate the Act, even though his purpose is benign.

From the foregoing, it is clear that an important issue in such a case is whether a given safety committee is a labor organization. A labor organization is defined in Section 2(5) of the Act as "any organization of any kind, or any agency or employee representation committee or plan, in which employees participate and which exists for the purpose, in whole or in part, of dealing with employers concerning grievances, labor disputes, wages, rates of pay, hours of employment, or conditions of work."

The following are some of the considerations that would be relevant for a determination of the status of an employee committee. In *NLRB v. Cabot Carbon Co.*,²¹ the Supreme Court, in agreement with the Board,²² held that an employee committee was a labor

organization because it existed for the purpose, in part at least, of dealing with an employer concerning matters of mutual interest, including safety, increased efficiency and production, conservation of supplies, materials, and equipment, etc., even though it did not bargain with the employer in the usual sense of collective bargaining.

Here the committees made proposals and requests to management concerning typical collective bargaining subjects—wages, hours, and working conditions—which the employer was free to accept or reject. These circumstances were considered sufficient to make it a labor organization and to make the employer's creation of it violative of the Act.

Other indicia of labor organization status are found in *Clapper's Mfg. Co.*,²³ where the trial examiner, whose opinion was adopted by the Board, ruled that an employee committee was, in fact, an illegally constituted labor organization.

The factors analyzed were: whether the original proposal and impetus for such committee come from the employer or the employees; whether the form and structure of the committee was dictated by the employer; what the stated purpose of the organization was; whether employee representatives were to be selected by the employer or were to be voted on by secret ballot; whether the employer could control the membership by exercising managerial discretion to transfer, promote, and discharge employee representatives; whether the committee had independent financial resources, i.e., dues; whether it had a constitution, bylaws, or charter; whether employees were on a pay status while carrying out the functions of the committee; whether meetings were held on company time and property; and whether the employer furnished materials and controlled distribution of information for the committee.

In *Clapper's*, the trial examiner and the Board concluded that the committee was instituted by the employer, that he dictated its form and structure, controlled its composition, and assisted its members by paying them for time spent in performing the committee's functions, and that viewed as a whole the employer's actions constituted

domination and assistance to a labor organization in violation of Section 8(a)(2).

It should be noted that the Board and the general counsel will look past the name given to the committee and rather consider its actual purposes, structure, and operation. For example, in *Walton Manufacturing Co.*,²⁴ the Board held that an announcement by the employer that he would set up in the future a management-employee committee for "safety, sanitation, and advisory matters" violated Section 8(a)(1) of the Act by interfering with the employees' Section 7 rights of self-organization.

The Board rejected the employer's contention that since his employees were not represented by a labor organization the employer was free to deal directly with the employees. The Board concluded that rather than individual dealing, which would be permissible, the employer was foisting upon his employees the mandatory condition that any collective bargaining must be done through the committee, with the employer deciding who should be the representatives, when and how they should meet, and with the employer paying for their time spent in these activities. By proposing to call it a "safety" committee, but in fact giving it the potential power to represent employees on a broad range of subjects, the employer went too far and violated the Act.

The foregoing case was decided by the Board in 1960. Today, with safety a paramount concern and with the judicious use of safety committees a fruitful source of information from employees, it may be that the Board would reconsider some of the older "safety committee" cases and may permit greater leeway in this area.

One other element which has been found by the Board to be important is the timing of the employer's formation of an alleged "safety" committee. In *Illinois Marble Co.*,²⁵ the Board concluded that the employer had violated Section 8(a)(2) where, one month after a union had filed with the NLRB a petition for an election, the plant's labor relations director created a committee for "safety and other problems" and appointed the employees who were to serve on the committee. The Board noted that the employer had, in fact,

used the committee to resolve some of the underlying problems which had caused the employees to initially seek a union, and thus interfered with the employees' free choice of a representative.

It should be pointed out here that the Senate Committee on Labor and Public Welfare considered in the last session a Senate bill S.3562, which proposed to amend the Occupational Safety and Health Act of 1970 by adding a provision that would permit an employer to establish a safety committee for the purposes of OSHA without violating any provision of Section 8 of the Act. It can be anticipated that should this legislation be enacted there will no doubt be cases arising with the issue of whether a particular committee is a safety committee within the ambit of the legislation.

However, the proposed legislation is just that; it is not the law. Accordingly, employers should proceed with caution with respect to safety committees. In addition, there may be questions of whether an employer infringes on the status of an incumbent union by bargaining with the safety committee. Before setting up or dealing with such a committee, full consultation with labor counsel is strongly recommended.

As you can see from the above, it is clear that the Act cannot be considered in a vacuum. Those who administer the Act must consider other social policies, including the important one of industrial safety. Let me assure you that we will continue to exercise our responsibilities under the Act in such a way that safety policies are brought to bear on cases that come before us. In this way, we can do our part in achieving the twin goals of good labor-management relations and safety in the workplace.

REFERENCES

1. 23 NLRB 26, enfd. 120 F. 2d 505 (C.C.A. 3), reversed 316 U.S. 31 (1942).
2. *Ibid.*, 316 U.S. at page 47.
3. 195 NLRB No. 5.
4. 394 U.S. 423 (1969).
5. Carpenters Local No. 22 (Graziano Construction Co.), 195 NLRB at slip sheet page 5.
6. 126 NLRB 1410, enfd. den. 291 F. 2d 869 (C.A. 4, 1961), reversed 370 U.S. 9 (1962).
7. *Supra.*
8. 116 NLRB 140, enfd. 251 F. 2d 753 (C.A. 6, 1958), cert. den. 357 U.S. 927 (1958), rehearing den. 358 U.S. 858.
9. *Ibid.*, 251 F. 2d at page 759.
10. 130 NLRB 1208.
11. *Ibid.*, at page 1209.
12. 139 NLRB 894, enfd. den. 330 F. 2d 885 (C.A. 8, 1964).
13. *Supra.*
14. *Supra.*
15. 340 U.S. 474 (1951).
16. *Supra.*
17. Fruin-Colton Construction Co., 330 F. 2d at page 892.
18. See also Stop & Shop, Inc., 161 NLRB 75; United Painters Contractors, 184 NLRB No. 19; Anaconda Aluminum Co., 197 NLRB No. 51.
19. Case No. 9-CA-6564.
20. Case No. 1-CA-8343.
21. 360 U.S. 203 (1959).
22. Cabot Carbon Co., 117 NLRB 1633, enfd. den. 256 F. 2d 281 (C.A. 5, 1958).
23. 186 NLRB No. 52.
24. 126 NLRB 697, enfd. 289 F. 2d 117 (C.A. 5, 1961).
25. 167 NLRB 1012.

ADVANCES IN SAFE TRANSPORTATION OF HAZARDOUS MATERIALS

INTRODUCTION

By H. H. FAWCETT

Committee on Hazardous Materials, National Research Council,
Washington, D.C.

This session on *Advances in the Safe Transportation of Hazardous Materials* could not have been arranged a decade ago, since each speaker this morning is discussing a project or viewpoint which is quite new.

Our purpose is to introduce you to persons not normally associated in the context of "safety"—each speaker has his own specialization—but whose concepts and ideas either directly, or by analogy, may have application to all modes—including air, pipelines, truck, rail and marine.

The studies to be reported this morning may appear to differ widely in scope and content, but all are, in fact, closely related in their determination to advance the cause of safety in the transport of hazardous materials—safety to the public, to emergency per-

sonnel, to operating personnel, and to the environment.

Writing in *The House of Seven Gables*, Nathaniel Hawthorne expressed the opinion that the world owes its onward impulses to men ill at ease—who are not satisfied with things as they are. Each person you will hear this morning, including the chairman, is ill at ease at what he considers the less-than-adequate control of hazardous materials in transport, and each will tell you why and what he is doing about it.

We have not scheduled questions or discussions, due to time restraints, but we encourage you to direct questions in writing to the chairman or speakers at the addresses on the program, and a written reply will be mailed to you.

THE NTSB ROLE IN HAZARDOUS MATERIALS CONTROL

By RADM LOUIS M. THAYER, U. S. C. G. (Ret)
Member, National Transportation Safety Board

The National Transportation Safety Board was created by the Transportation Act of 1966. It is an independent agency in the Department of Transportation (DOT). The law states that in the exercise of our powers, functions and duties, we shall be independent of the Secretary and of the other offices and officers of the Department. That is, we do not report to the secretary, nor does he direct or supervise our work. We present our own budget, and manage our own personnel. The Board reports directly to the Congress annually on the conduct of its functions under the Act, and makes such recommendations for legislation as it deems appropriate. It conducts a continuing across-the-board review of safety in all modes of transportation.

In conducting its activities the Board receives logistic support from the DOT. In our investigations we work closely with the Federal Highway Administration, the Federal Railroad Administration, the United States Coast Guard, the Urban Mass Transportation Administration, the Federal Aviation Administration, the St. Lawrence Seaway Development Corporation, and the office of the Assistant Secretary for Safety and Consumer Affairs. However, in our determination of cause, and the issuance of recommendations, we are independent of all those offices or administrators.

One of the Board's primary functions is the investigation of all civil aviation accidents and of selected rail, highway, and pipeline accidents to determine the cause or probable cause. We have conducted intermodal investigations. Please note that we do not investigate accidents in the marine field. The Coast Guard investigates, and in major cases we determine the probable cause, based upon the record they compile. We publicize the causes of accidents and issue recommendations which, in our opinion, will tend to prevent recurrence. The Board's primary goal,

according to President Johnson when he signed the Act, is "the safety of our travelers." In addition, we are concerned for the safety of bystanders who become involuntarily involved in accidents.

The Board is one of the smallest agencies in the Federal Government. We have about 270 employees, including personnel in ten field offices, an aircraft accident investigation school, and our Washington headquarters.

At headquarters we have the Bureau of Aviation Safety and the Bureau of Surface Transportation Safety. Our Office of Hearing Examiners processes aviation and marine license and certificate appeals. Headquarters also houses the Office of the Members, General Manager, General Counsel, and Public Affairs.

The members of the Board are presidential appointees, confirmed by the Senate. One member is designated by the President to serve as chairman. Our Chairman is John H. Reed of Maine. Other members are Isabel A. Burgess of Arizona, Francis H. McAdams of Washington, D. C., William R. Haley of Washington, and myself.

The Board's major products are accident reports, recommendations, special studies and other publications. Our accident reports contain findings, conclusions, cause of accident, and recommendations to the federal administrator concerned, or to industry. Recommendations are included in the reports and studies, but they may have been issued soon after an accident, when rapid dissemination of the safety information could prevent similar accidents. Compliance with the Board's recommendations is not mandatory. We have no authority to regulate nor power to enforce. However, the law requires that we make public all reports, orders, decisions, and recommendations. The public docket contains them, and all correspondence from

any source in relation to them. We believe that the authority to recommend, and the requirement that the recommendations must be made public, combine to become a powerful instrument in safety—assuming of course that our recommendations are sensible and well founded, and we intend them to be.

Most fatalities occur on our highways—about 54,000 deaths per year during the last three years. However, recreational boating, general aviation, bicycling and motor cycling take substantial tolls. Railroad accidents, rail-grade crossing mishaps, pipeline explosions and marine casualties also contribute their share. These accidents don't just "happen." Each mishap includes, in some measure, a contribution from the driver or pilot, the vehicle or vessel, and the highway, airway or waterway. The Safety Board carefully investigates each area and makes safety recommendations to prevent similar accidents; or, if possible, to prevent a whole class of accidents.

We make special studies and publish reports when a series of accidents suggests a significant trend that requires attention or correction. For example, we have studied the inadequacies of schoolbus bodies; midair collisions; pipeline accidents due to flow of liquids or gases after breaks in lines; problems of pedestrian deaths and injuries; the involvement of youthful drivers in accidents; and risk concepts in dangerous goods transportation regulations.

We hold public hearings on specific accidents. Such hearings permit us to develop facts about the accident, and to provide opportunities for participants to question witnesses. Other hearings before the full board are held to develop or exchange ideas on accident prevention. For example, we investigated the midair collision problem in such a hearing and took testimony from the Secretary of the Department, the Honorable John A. Volpe, and from the Administrator of the FAA, the Honorable John H. Shaffer, his top advisers, and many others.

My first example concerns a hazardous materials spill in an intermodal accident. In December, 1966, in Everett, Massachusetts, a fuel tank trailer approached a grade crossing. A loss of air pressure in the tank caused

automatic application of the brakes, which the driver could not release from the cab. He stalled on the crossing and attempted to flag down an approaching self-propelled railroad passenger car. The railroad car could not stop. It struck the trailer and ruptured the fuel tank. No. 2 fuel oil spilled, ignited, and engulfed the car.

Of the 31 occupants of the railroad car, 13 were killed, including two crewmembers. The truckdriver was not injured.

The collision damaged the railroad car. However, if the truck had been carrying nonhazardous cargo, the crash would have been survivable. The spill of fuel oil and the ensuing fire contributed to the casualties in this otherwise survivable crash. The fatalities were due to burns and inhalation of smoke rather than to injuries from the collision. However, total darkness in the train, doors which opened inward, and a lack of emergency exits also contributed.

This accident, and those that follow, illustrate the increased risks when hazardous materials are present in transportation accidents. As a result of our report, AAR changed its design standards for railroad cars, and the Department of Transportation launched a grade crossing safety program. In May, 1969, at La Grange, Missouri, a towing vessel and two barges were moored at the Triangle Oil refining facility on the upper Mississippi River. Personnel from the tug and barges, and from ashore, were discharging gasoline.

A series of explosions sprayed burning gasoline over all three units. Their mooring lines burned and the craft drifted downstream. Burning gasoline spread over the river and ignited a nearby grain elevator. The drifting tow collided with, and broke loose, two other barges which caught fire. One of the original barges drifted, still afire, against the Chicago, Burlington and Quincy Railroad span and caused some damage. Only good fortune prevented the other barges from drifting down on the waterfront facilities of Quincy, Missouri.

Six persons were killed, and one very seriously injured. Only the deckhand of the tug survived. He stated that there was extensive spill on the deck of one of the barges before

the first explosion. He put on a life jacket and jumped over the side.

Although we could not determine the exact source of ignition, it was probably the galley range which set off a gasoline-air mixture.

This accident illustrates the public safety problems associated with hazardous material spills which migrate and may endanger the public at locations far removed from the point of the initiating events.

Now, let's consider what happened at Laurel, Mississippi, in the early morning of January 25, 1969. A Southern Railway train wrecked with 15 tank cars of liquefied petroleum gas derailed. The accident was caused by a broken wheel on the 62nd car.

Car No. 27 contained hydrocyanic acid, a deadly poison. Fortunately, it remained on the track, and was about 20 car lengths away from the nearest burning tank.

Laurel is a town of about 25,000 inhabitants, through which the train was moving at about 30 miles per hour. As a result of the derailment, two persons were killed, 33 hospitalized, and 1,350 homes, businesses, schools and churches were damaged. The explosions were truly violent. Chunks and pieces of cars, ranging in size from small parts to three-quarters of a tank, were hurled up to 1,600 feet from the wreck. Residents were evacuated from an area about ten blocks square.

This accident illustrates threats to bystanders from fire and explosion when, in the carriage of hazardous materials through populated areas, supposedly effective safety controls don't work. Our report contributed to the passage of the Railroad Safety Act of 1970 and to the first industry/supplier joint Railroad Safety Research Program.

On January 1, 1968, a railroad derailment in Dunreith, Indiana, caused fire, explosion, and the destruction of the town's principle business and seven homes, damage to 86 other houses or businesses, and pollution, by cyanide, of the area water supply.

One car in a 98-car westbound Pennsylvania Railroad freight train triggered a general derailment of a 106-car eastbound freight. Spillage of highly flammable and poisonous cargo resulted. Forty-five minutes after de-

railment, an in-car explosion of ethylene/oxide hurled a 1,600 pound car dome about 800 feet into the residential area. The entire town was evacuated, and the water pollution required health protection measures for months after the accident.

The original derailment was caused by a broken rail within the compromise joint, where two different sizes of rail were joined. Inadequate maintenance contributed. As a result of our report, a National Hazardous Materials Advisory Data Center concept was included in the Hazardous Materials Act of 1970. The Department is developing a new hazardous materials information system for emergency personnel.

An accident occurred in Houston, Texas, when a Missouri Pacific Railroad Company freight train derailed. As the result, 16 cars piled up in the general derailment area. Included were six tank carloads of vinyl chloride, three of fuel oil, one each of acetone, butadiene, and formaldehyde. Vinyl chloride, which escaped from a damaged 48,000-gallon tank car, ignited immediately following the initial derailment.

The Houston Fire Department responded to the scene within a few minutes after the derailment occurred and attempted to control the fire according to recommended firefighting guidelines. Forty-five minutes after the initial derailment a second car, containing vinyl chloride, ruptured violently. This abrupt explosion and the subsequent fire resulted in fatal injury to one fireman and burns or injuries to approximately 37 other firemen, reporters, photographers and spectators. Large sections of one of these tank cars were found approximately 400 feet from the derailment site after the explosion.

This accident clearly identifies the dangers in transportation accidents involving hazardous material spills, even to highly trained firefighters of the eighth largest city in the United States. As a result of this accident, we expect that the traditional "advance and extinguish" philosophy of fire departments in transportation accidents may be re-examined.

On December 9, 1970, Phillips Pipe Line Company's eight-inch line ruptured and spilled propane in a rural area of Franklin

County, Missouri. Approximately one hour later, at 10:44 p.m., an explosion of the propane-air mixture destroyed all buildings at the blast origin, extensively damaged 13 homes within a two-mile radius, sheared telephone poles, snapped tree trunks, smashed windows 12 miles away, and registered its impact on a seismograph in St. Louis, 55 miles distant.

A resident living near the pipeline heard the roar of the escaping propane, saw a geys-er, and noted a vaporlike cloud which flowed into the valley behind his house. He evacuated his family, warned neighbors of the danger, and telephoned the sheriff's office. Minutes later, the valley erupted in an explosion which shattered homes and riddled them with glass.

A fire, fed by leaking propane, blazed at the point of rupture until 11 a.m. the next day. The detonation and initial fire consumed 756 barrels of propane, giving rise to an estimated explosive force of 100,000 pounds of TNT. No fatalities resulted, but 10 persons were injured. The prompt, orderly evacuation by families in the area averted a further tragedy.

The Board determined that the probable cause of the accident was the rupture of an insufficiently bonded longitudinal weld that had been further weakened by internal corrosion. The explosion and fire were caused by the ignition of propane released from its confinement in a concrete block building. An explosion inside the building initiated a shock wave which caused detonation of the entire unconfined cloud of propane-and-air mixture.

This explosion was strikingly similar to one which occurred in the A & S yard in East St. Louis, and demonstrates the potential danger from open-air detonation of spilled liquefied petroleum gases.

At 6:30 a.m. on February 18, 1969, at Crete, Nebraska—and in near-zero weather—a Chicago, Burlington & Quincy Railroad train derailed 19 cars. The train was entering the small town—population 3,500—at about 53 miles an hour. On a parallel siding were three cars loaded with anhydrous ammonia. The derailed cars struck and punctured the standing tank cars, one of

which broke in brittle fracture. The accident killed six people and injured 53, by fumes which engulfed much of the town without warning.

This accident illustrates how an extensive area can be threatened in a spill of hazardous materials from a single tank car contaminating the atmosphere in a temperature inversion. The townspeople themselves unwittingly contributed to the extent of the injuries by their own actions. We found that all persons directly exposed to the cloud of ammonia gas were either killed or seriously injured via the respiratory tract. On the other hand, people who remained in their homes, or who had adequate protection, escaped with either no injuries or minor injuries.

Next, is an example of hazardous materials reacting after their involvement in an accident.

On June 21, 1971, at 6:30 a.m., at Crescent City, Illinois, 15 cars including nine loaded with propane, of the Toledo, Peoria and Western Railroad, derailed. During the derailment, one of the tank cars was punctured. The leaking propane immediately ignited and engulfed the other tank cars with fire. A series of explosions of the remaining tank cars occurred, beginning about one hour after the derailment and continuing through four hours. About 70 persons, mostly firefighters, were injured, and the rail system was shut down for three days.

The public safety aspects illustrated by this accident are the danger to small town firefighters with respect to spills of hazardous materials, and particularly the duration of the threat when fire is involved. In this accident, also, firemen without the capability to handle the situation were caught too close to the explosion.

On the afternoon of August 8, 1971, in a quiet rural area near Gretna, Florida, a southbound tractor van—type semi-trailer combination collided with an automobile that turned into its path. The vehicles entangled and skidded off the pavement into a ditch. The truck then struck a ditch embankment and decelerated rapidly. The cargo—steel cylinders filled with methyl bromide and chloropicrine mixture under pressure—

shifted forward in the van. When the truck stopped, some of these cylinders hurtled through the front wall of the van, and several were damaged. The poisonous gas escaped, and although there was no fire, there were four fatalities. Vegetation was damaged by the fumes. During the cleanup operations 14 other persons were injured, both through inhalation and percutaneous absorption.

We are concerned, here, with casualties associated with poisonous spills in otherwise survivable highway accidents, and with the public safety aspects of the post-crash cleanup when hazardous materials are involved.

A hazardous material "spill" of a slightly different nature occurred at about 8 p.m. on June 4, 1971, at Waco, Georgia, when a westbound Volkswagon crossed the centerline of U. S. Highway 78 into the lane of an eastbound tractor semitrailer carrying a partial truckload of about 25,000 pounds of nitroglycerin-based dynamite and other explosives. Both vehicles were moving about 40 miles per hour. The driver of the Volkswagon was killed in the head-on collision.

Immediately after the collision, fire broke out. It was fed by fuel from the vehicles, and burned the tractor and the front end of the trailer. Firefighters and bystanders arrived simultaneously, and the truckdriver attempted to persuade bystanders to stand back from the burning wreckage. The cargo detonated after about 10 to 15 minutes, releasing massive quantities of energy. The explosion killed two firemen, the driver of a wrecker vehicle, and two bystanders. Thirty-three other persons were injured. The estimated

property damage was \$1 million.

We are concerned, as in the Franklin County, Missouri pipeline accident, with the threats to bystanders. Here, also, firemen trying to cope with an unmanageable situation were victims.

I hope I have not left the impression that we attempt to solve our problems through recommendations for new legislation or more regulations. We do not. On the contrary, our philosophy is that all segments of the transportation industry should be as free as possible to conduct their own safety program as long as they keep their house in order.

Perhaps the most effective program to improve the safety of transporting hazardous materials in tank cars is the joint Railway Progress Institute-Association of American Railroads Tank Car Safety Research and Test Project. This project evolved from the efforts of AAR, railroads, tank car builders and various shipper organizations to establish a framework for conducting research in tank car safety. The program is administered by the AAR Research and Test Department under Dr. William J. Harris, Jr., and policy direction is furnished by a Project Review Committee composed of representatives of the tank car-builders, the AAR, and the railroads. Total costs will be well over a million dollars.

At the same time, DOT agencies such as the Federal Railroad Administration and the Office of Hazardous Materials constantly are pursuing answers to the problem. We feel that our recommendations, objectively made, furnish direction to the efforts of all those working on the problem.

STUDIES OF THE NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL COMMITTEE ON HAZARDOUS MATERIALS

By DONALD L. KATZ
Prof., Dept. of Chemical Engineering, University of Michigan,
Ann Arbor, Mich.

The control of hazardous materials, whether in transportation, manufacture, storage, or disposal, is fundamentally a matter of the interaction between the substance and the system in which the substance is handled, moved, and stored. The substance may be any of several hundred thousand materials actually being moved in various quantities in commerce today. The system involves the whole concept of the physical and chemical properties on which control may be based; the container for that material; the physical restraints on accidental release; vibration, acceleration, deceleration, yaw, pitch, roll; other conditions including temperatures and pressures which it may encounter in the course of a movement from point A to point B; and, most importantly of all, the understanding and dedication of trained or at least intelligent personnel in their responsibilities to ensure a safe transit.

Fully aware of the trend of increasing quantity as well as variety of chemicals and petrochemical materials in water-borne commerce, the United States Coast Guard in 1964 requested the National Academy of Sciences-National Research Council to establish an advisory committee to assist the Coast Guard. The committee was asked to define existing problem areas and to predict future conditions which might affect the lives and property of operating personnel and the public, to advise on research needs, to sponsor supervised research where the specific expertise of the committee was deemed essential, and to evaluate research findings. (Specifically excluded from the considerations of the committee were those considerations of economics and law.)

Since 1964, the committee has served as a

technical advisory group and has considered matters which we feel are of significance in assisting the Coast Guard in its responsibilities. Among the specific achievements of the committee to date with broad application might be mentioned the following:

1. We have acquired a stock-pile of information which we believe to be reliable and scientifically defensible and which has proved useful both to the committee and to our sponsor.

2. We have sought out and developed rapport with technical personnel in other countries who share our concern and with whom we exchange information. In particular, the committee met with our scientific counterparts from six nations in Rotterdam, the Netherlands, in 1968 and also in York, England, in 1971. At the last conference of our committee, held in Boston in June 1972, five nations were represented.

3. We have developed a system of evaluation for hazardous materials which generates a hazard profile of that material based not only on the more obvious aspects, such as fire and explosion characteristics, toxicity characteristics, and effect on human skin and eyes, but extending into areas where much interest is expressed but a paucity of data exists in an organized manner, namely, the effect of materials when spilled into a stream or navigable waterway as it relates to toxicity to human beings, toxicity to the aquatic environment, toxicity to the ecological system, as well as considerations of the chemical reactivity of materials shipped in proximity to each other, chemical reactivity with water, and chemical reactivity to self through polymerization reaction. All of these parameters are necessary to define adequately the

hazard profile.

4. We have concluded an extensive review of the status of pressure-relieving devices for bulk transportation purposes in which it is proposed that a slightly different approach and more complete understanding be applied in the calculation of pressure relieving systems. This work, which is an extension of a study we originally conducted at the University of Michigan in 1945-1948 is the most complete documentation to date of use, limitations, and adequacy of pressure relieving devices as they relate to emergency overpressure conditions.

5. In the field of electrical equipment, the committee has studied the possibility of a more direct approach to ignition hazards based on ignition temperatures and molecular structure to permit their ratings by the classes and groups in the National Electrical Code Article 500. The Underwriters' Laboratories has just completed for the committee a series of determinations on 20 substances whose ignition characteristics were incompletely or inadequately documented. It is hoped to utilize this new data along with existing information, into more complete characterization of chemicals based either on the molecular structure or on relatively simple test procedure.

Several specific cargoes have been looked at in considerable depth. For example, the generation of gases from liquid sulfur has been studied. These gases, which may be both flammable and toxic, result from reactions which are now more widely understood and controlled. Liquefied natural gas is an important item in the national energy picture. The committee suggested the Coast Guard authorize exploratory spill tests both on LNG and on liquid chlorine at the Bureau of Mines station in Bruceton, Pennsylvania, which, along with other studies and investigations, have led to a more complete understanding of the potentially hazardous characteristics of these materials if accidentally released during water transportation or handling.

An example of the committee's ability to muster the type of concentration needed to solve a problem is the analysis of data on LNG-water explosions discovered in the Bu-

reau of Mine's work. Experts from industry were called to report their news and studies before the committee. Ad hoc technical discussions were held, with exploration of many possible concepts; a year's such effort yielded what is believed to be a breakthrough in understanding known as the superheat-limit explosion—the findings were documented in a report to the Coast Guard. In order to back up these various studies, the fundamental need for data, as well as prompt data retrieval, has been recognized from the beginning. Recommendations for a more formal technical information system were made not only for the committee's use but also the Coast Guard's. Such studies recognize that packaging of information and the qualifications of personnel who use it are factors to be considered. A dependable and adequate data base is a valuable supplement to our work.

Perhaps the most challenging studies of the committee to date, and with great potential, have been in risk analysis and hazard evaluation. Several attempts have been made in recent years to develop mathematical models of a type which would permit better understanding of hazard control if appropriate information could be supplied and analyzed. It has become increasingly apparent that risk analysis in the context of transportation can be reduced to a better quantification if the material and the system in which it is moved can be more completely understood. Attention is being directed to this subject, not only by the committee but by numerous groups and contractors with whom we have exchanged ideas, in the hope that as the system is defined and more adequately understood a better control will evolve which will apply to all modes of transport.

In conclusion, then, the Committee on Hazardous Materials was formed to serve a specific need, namely, to furnish technical expertise on matters of concern to the Coast Guard. The committee's selection process seeks persons with general knowledge but who are not engaged in regulation or rule making as such. Objectivity can be achieved by drawing on recognized authorities in industry, in academic pursuits, and in governmental circles who focus their attention on technical aspects of hazardous materials.

ESSENTIAL FACTS AND INTELLIGENT ACTION FOR SAFE TRANSPORTATION, HANDLING, AND STORAGE OF HAZARDOUS MATERIALS

By MILES E. WOODWORTH

Specialist, Flammable Liquids Field Service, National Fire Protection Assn., Boston, Mass.

Intelligent action for the safe transportation, handling, and storage of hazardous materials can only be achieved by an understanding of the essential facts or, more specifically, the relative hazards of the materials involved.

Although the relative hazards of most common hazardous materials such as gasoline, fuel oil, and LP gas are quite well known, there are still many variables which are not so well known for the same materials. For example, we know that natural gas is lighter than air and will dissipate relatively quickly when released in the open. However, when it is liquefied at minus 265°F and released to the atmosphere, the vapors are heavier than air and will travel a considerable distance close to the ground. Also, if it is stored in cylinders at highly elevated temperatures, another type of problem is created due to the inherent hazards of a pressure vessel.

Another example of a variable is hydraulic fluid. With a flash point in excess of 300°F, it would normally be considered a low fire hazard. However, if used in a piece of hydraulically operated equipment operating at 1,000 pounds pressure and a line breaks, the oil is released in an atomized form which could and has resulted in severe fires or even explosions when ignited.

In fire fighting, foam is frequently used to extinguish a tank or spill fire. However, it is not too well known that certain water soluble or polar solvents will have a destructive effect on the fire fighting foams commonly used for extinguishing liquid hydrocarbon fires. As a result, special types of commercially available fire fighting foams are needed for the

extinguishing of these types of solvent fires. They are commonly referred to as "alcohol type" foams.

Therefore, even where the relative hazards are reasonably well known, there are many variables which must be considered when evaluating the total fire hazard of a material in a particular environment. In general, these variables are recognized and accepted by most people, including emergency personnel, but this does not mean that there should be any lessening of education and training for all levels of those handling these materials.

The major concern today is with the lack of information and knowledge for those hazardous materials where the potential hazards are not known or cannot be recognized by most people. In the many groups that have studied this problem, it is recognized that hazardous materials can present three basic hazards: health, flammability, and reactivity, with a possible fourth, which is water pollution for some cases. Additionally, it is generally agreed that there should be improved placarding and labeling, which would reflect a better recognition of these problem areas.

There are some materials commonly being used and transported which may be highly toxic, highly flammable, and highly reactive, yet currently they are classified in only one of these categories. There are many more materials which have varying combinations and degrees of hazard in these three major categories of hazard. These multiple hazards of materials are quite well known to chemists and chemical engineers, but they frequently overlook the potential additional hazards under a fire exposure environment. For exam-

ple, there are some chemicals which will polymerize violently when heated; others detonate when heated. Also, there are some chemicals whose products of combustion are considerably more toxic than the original unburned material.

There are many regulations, codes, standards, and recommended practices which cover many of these potentially hazardous materials and more are being developed. As a result, considerable emphasis is and has been placed on the prevention or minimizing the results of an incident. However, a great amount of effort still remains to be given to the prevention area. As an example, many of us are concerned about the violence of a polymerization reaction of materials under temperature and pressure conditions found in storage or transportation containers when exposed to fire. There are many materials which are known to polymerize, but the question remains as to whether the required emergency relief venting devices will be adequate to relieve the reaction or should rupture discs be installed to prevent a possible catastrophic overpressure rupture of the container. It is known for a few materials that the reaction can be handled by the emergency vent, but there are many others where this information is lacking.

Although the prevention of incidents involving hazardous materials is extremely important, the major area of concern today is a recognition of the problem that despite all efforts to prevent incidents there will always be accidents. Therefore, an identification system is needed which will provide an instant recognition of the degree and type of hazard to which the people handling the emergency will be exposed. In most cases these people are members of fire departments although in many cases it is policemen and company employees who will be confronted first with an emergency.

The members of technical committees of our association who have studied this problem for approximately 20 years feel that there are three types of information which are needed for fire departments handling chemical emergencies, for their own protection as well as for the protection of others. First, and most important, is an instant visual

recognition system which would indicate the degree of hazard for each major category of hazard. Second, there should be available information which can be obtained in a matter of minutes. Third, there should be information and assistance available within hours for handling some types of accidents and to assist in the clean-up.

On the last point, there are a number of chemical companies, trade associations, or national emergency response teams which if called upon will send men or teams of men to the scene of an emergency to advise or handle the situation. This type of assistance has proven effective in many types of accidents and emergencies. Certainly, these programs should be encouraged and expanded as needed.

For information that is available within minutes, our second point, there has been a very considerable amount of time spent and considerable information published. For example, the NFPA publishes the *Fire Protection Guide on Hazardous Materials*, and *Fire Officers Guide to Dangerous Chemicals*. The latter book was written by a retired deputy chief of the Los Angeles Fire Department, one who is knowledgeable and experienced in handling chemical accidents. The Chem-Cards published by the Manufacturing Chemists' Association have proven extremely helpful to emergency forces in handling emergencies. Additionally, there are available various other textbooks and other sources of information, including chemists, all of which are available to the fire services in the proper and safe way to handle emergencies.

The Chem-Trec Program of the MCA is the most recent program which is proving helpful in handling emergencies. However, to secure this information one must know the name of the chemical involved. Frequently, this chemical name is not available or at best takes time to secure. There are some who recommend that the chemical name be required on a placard. Although this may be desirable, it does create other problems. One personal example is the development of an NFPA training film for tank vehicle fire fighting in cooperation with the Tulsa, Oklahoma, Fire Department. I discussed with them the fact that we would cover in a brief

way the transportation of chemicals. I had noted that in their city there was a tank vehicle company with six tank vehicles, each one bearing the name of the chemical being transported. This was Anhydrous Unsymmetrical Dimethyl Hydrazine, written out in large letters with UDMH under this on two of them. My question to them was, "How would they handle an accident involving one of these transport vehicles?" The major reaction, I received was, "How do you pronounce it?"

In an actual case, a chemical company received a call from a fire chief of a nearby city requesting information on how to handle a leaking tank car of acetone being shipped by their company. The company knew that they had not shipped acetone, but also knew that they had just shipped a tank car of acetone cyanohydrin which, of course, is extremely toxic. Needless to say, they did not waste any time in sending a crew of men to the scene.

This all points up the problems of securing the names of the chemicals and knowing the pronunciation or spelling of the entire name, since only a slight difference can make a major change in hazard.

As we have discussed, there is general agreement as well as a great amount of time spent in supplying information which can be made available in a matter of minutes or in hours for the assistance of those responsible for handling an emergency.

However, the instant recognition of the degree and type of hazard, our first point on needed information, is still being argued both in the United States and in other countries. To accent this problem, let us for a moment put ourselves in the position of a lieutenant in charge of a pumper responding to the scene of a reported transportation accident. Upon arrival you find smoke coming out of a large van type truck. You are warned that the truck may blow up, and there are "Dangerous" placards on the truck. From previous experience you know that people tend to exaggerate hazard but, more importantly, your entire training is to fight fires, more or less regardless of the hazard to you or your men. You also know that if you don't fight the fire and there is an explosion after the fire has

been burning for some time, that you will be severely criticized by those spectators who are injured or those people whose property is destroyed by the explosion. Additionally, you know that many tragedies have been prevented by the rapid application of water to such types of fires. Even though the fire probably has been burning for approximately ten minutes since it first broke out and the alarm sent in, and you have laid in your hose lines and are ready to start operating, the question is, "Do you or don't you fight the fire?" What would you do?

In one such case, four firemen were killed when the decision was made to fight the fire from behind a low, reinforced concrete wall. It was the resultant widespread fire that killed them, not the explosion of organic peroxides. However, in another similar transportation case involving violently heat reactive chemicals in a congested area, the fire department extinguished the fire, although a number of them suffered from the toxic products of combustion.

The downwind spread of toxic or volatile vapor clouds is not well understood. For example, a given quality of a toxic gas might travel 25 miles under a temperature inversion condition, but only 0.3 of a mile on a sunny day. Again, it is the quick action of emergency forces which can save many lives if they have the instant recognition of the degree of toxicity and a knowledge of vapor travel. The same can be said for liquids that may be poisonous which are released during an accident and enter a river. For example, a mile downstream from the scene of the accident, a town has a water intake for their drinking water. If the hazard is immediately recognized, the town can be alerted to shut off their intakes. Remember that fire and police departments are the only emergency forces trained to quickly handle emergencies on a 24-hour, seven days a week basis. Additionally, they have the communications which are essential for handling emergencies. Therefore, for these reasons a good placarding system can prevent a tragedy.

It is well accepted that the present placarding and labeling requirements for many hazardous chemicals are inadequate for the protection of the public, emergency person-

nel, and plant employees. However, finding a system which will be acceptable to all concerned is proving extremely difficult.

At the present time there are two proposed systems under consideration. The first is the system developed over 10 years ago by the NFPA. This system is a diamond shaped symbol which has three categories of hazard: health, flammability, and reactivity. The degree of hazard in each category is given by numbers from 0 to 4,—with 0 indicating no special hazard and 4 an extreme hazard. A fourth space in the diamond is reserved for additional information, such as a W with a line through it to indicate reactivity with water. This system is easily taught and is being used in laboratories, various industrial plants, and in large chemical plants. A slight modification of this standard has been adopted for labeling in Federal Standard 313. The basic purpose of this system is to give at a glance the inherent hazards of materials on which an action decision can be based in the event of an accident. It also has proven helpful from a prevention viewpoint in that people are alerted to the potential hazards of a material.

The other system which currently is under consideration is the Hazard Information System being developed by the Office of Hazardous Materials of the U. S. Department of Transportation. This proposed system also incorporates a diamond. The upper half of the diamond has the United Nations symbol for the class of product. Under this is the identifying word, such as poison, flammable, corrosive, etc. Under the signal word is a two digit number. This two digit number refers

one to a manual where instructions are given on the handling of spills or fires plus first aid treatment. The first digit identifies the class of material, and the second digit may indicate a secondary hazard. For example, gasoline would be Flammable 30, and acrolein would be Flammable 36. However, the numbers basically refer to a page in the manual which would be very similar to the present MCA Chem-Card Manual. Detailed information on this HI system was published in the *Federal Register* of June 27, 1972.

The U. S. Department of Labor under the Occupational Safety and Health Act is charged with developing a labeling system for hazardous materials for the protection of employees. It is hoped that one system can be developed which can answer the needs of transportation safety as well as plant employee safety.

In summary, many hazardous materials which only involve flammability hazards are being reasonably well handled today due to the years of experience with them. However, continuing education and updating of regulations must continue. There is an urgent need for a simple placarding and labeling system which will provide information on the hazards of chemicals and particularly for those chemicals which present multiple hazards. It is the hope of the NFPA that one system can be adopted for placarding for all modes of transportation and also be used for labeling for the protection of employees. Such a system should give instant visual recognition as to the nature and the degree of the hazard.

THE CHEMICAL TRANSPORTATION EMERGENCY CENTER

By JOHN C. ZERCHER
Manager, Chemical Transportation Emergency Center

Shortly before 2:30 p.m. on November 4 of last year, the Baltimore fire dispatcher's office received word that a tank truck containing arsenic acid had turned over in the industrial area and was leaking. In the few minutes that followed, they—

- dispatched a fire company to the scene;
- notified the department staff captain specializing in chemical incidents, who immediately departed to the scene;
- dialed 800-424-9300 to seek assistance regarding handling of the chemical. Within minutes, and before the captain reached the accident scene, he had been briefed on hazards and handling procedures for the material, and was quite prepared to handle the problem.

The dispatcher's third call was to CHEMTREC, the Chemical Transportation Emergency Center established by Manufacturing Chemists Association. On completion of his discussion with the dispatcher, the CHEMTREC communicator contacted the shipper's home office. They had men and equipment at the scene in a short time to assist in the cleanup.

This facility, which began operation September 5, 1971, provides immediate-action response information to the scene of a chemical transportation accident on receipt of a phone call identifying the product involved. As the next step, the shipper is contacted, who then makes his experts available for additional counsel and/or on-site assistance. The files contain telephone numbers to permit establishing proper contact within the shipper's facilities for reaching someone at any time of the day or night who is knowledgeable about the proper way to handle an emergency situation regarding his product. This is a voluntary program of MCA member companies, aimed at providing timely and accurate information to the emergency services, carrier personnel, general public

and others who might be involved in transportation accident situations.

The assistance of this Center is available to any involved person by calling one phone number from any state in the continental limits. This telephone is manned on a 24-hour a day, seven-day week basis, and the number is publicized throughout the country, including emergency and carrier personnel. We should stress that CHEMTREC is not a depository of general information such as how a shipment should be marked, nor is it a policing agency. Instead, it is a source of help in transportation emergencies involving chemicals, providing immediate guidance on what to do in case of spills or leaks, fire or exposure.

In recent years there was increasing evidence of need for such a service, voiced by emergency services, the National Transportation Safety Board, and others. In September 1969, with encouragement of the Department(s) of Transportation and Health, Education and Welfare, the President of MCA established a study group to consider setting up a system which would be applicable to all producers and shippers of hazardous chemical materials. Subsequently, an Intercommittee Task Group was organized to study what would be feasible and to develop recommendations. MCA technical committees were called on, and other specialists were consulted as the need arose.

By late 1969, after evaluating many alternatives, it was concluded that a national center and a single telephone number had substantial advantages over other possible arrangements. A group of regionally distributed units was considered, but it was felt that a single center would be more accessible to carriers and emergency service personnel, with shortened response time for action and feedback. The proposal contemplated that the Center would be located at MCA head-

quarters in Washington, and that it would have 24-hour-a-day telephone coverage. It was adopted in June, 1970, by the board of directors of MCA, and funds authorized for its implementation.

Interestingly, CHEMTREC's first year ended during the 100th anniversary year of MCA.

The existence of CHEMTREC has been, and continues to be, publicized in the emergency services and in the carrier and chemical industries. In addition, many shippers mark shipping documents with the notation, "In the event of any emergency involving the chemicals in this shipment, call toll-free 800-424-9300, day or night." (Call 483-7616 in Washington, D.C.)

This "800 WATS" system provides direct-dial service from all contiguous states. The number is assigned specifically to CHEMTREC. On receipt of any emergency call, which might be from a policeman, fireman, carrier, or others, certain basic information is obtained. The CHEMTREC communicator on duty determines what happened—where and when. He determines the product name, shipment source, company which made shipment, name of the carrier, the consignee, whether there are injuries, and any hazards which might exist. If there are any unusual conditions, such as weather, or if the accident is in a populated area, this is determined, also. Most important, the communicator established who called, where he is located, and how he can be called back.

The communicator will thereupon provide the caller with response/action information for the product or products involved, giving basic information such as hazards, and what to do in case of spills, leaks, fire and exposure. This informs the caller of the hazards, if any, and provides sufficient information to take immediate first steps in controlling the emergency.

The information provided by member companies and other shippers is stored on cards in visible-index, tub-type files. Once the product is identified, access to the alphabetized cards is only a few seconds. Shipper-contacts information is stored in similar fashion.

Next, the communicator relays details of the accident to the shipper, who has the ex-

pertise needed to deal with the situation. When the shipper has been notified, he becomes responsible for any future action in regard to the emergency. Based on experience to date, the validity of this two-step approach—providing immediate information from file, then utilizing the knowledgeable people of the shipper—has been well confirmed.

For a number of years, various chemical companies have had emergency response systems, each with its own phone number. CHEMTREC simplified this by providing a single phone number throughout the country. However, to properly respond to an emergency, many companies have greatly improved their internal systems.

While statistics tend to be uninteresting, at least a few are pertinent. Specifically, in the first year we had over 4,200 inbound phone calls, excluding another 1,600 associated with the former owner of our WATS number. Of the pertinent calls, 1,798 were related to the 801 reportable emergencies that were handled.

As expected, problems have come in many forms ranging from a chlorine barge stuck on a dam in Louisville to multiple-car derailments or a small can of solvent leaking in a freight van. Some are preventive in nature, such as the railroad man who called wanting to know if it was safe to weld on a tank car which contained vinyl chloride, a flammable compressed gas. A similar situation involved a shop foreman wanting to weld near a car leaking absolute alcohol. In stopping these two actions, it is probable that serious problems were averted.

After an accident such as the one involving a propylene car in East St. Louis last winter, when the car head was punctured and the gas escaped and exploded, our role must be primarily one of notification. In this instance we advised both the shipper, who became involved in post-accident activities, and certain government agencies, who investigated the matter.

In two instances, ships involved in storms in the Pacific have sought CHEMTREC's help via their West Coast operations office. One problem involved an herbicide; the other, a material burning in a hold, with injured

crew members aboard. In both instances we gave them the available file information and shipper personnel provided the remaining needed assistance. In the latter case, it came from the plant manager and the company doctor working together.

When CHEMTREC was being established, we expected that calls would come predominantly from the emergency services. In practice, this is actually reversed. In our first year, some 24 percent of the calls came from fire and police, while over 65 percent came from operations people in the carrier industry. The latter included major problems with overturned trucks and cars, but many others involved only small containers, which can still be troublesome. By handling these before they become major difficulties, it is probable that some calls to the emergency services were averted.

In planning CHEMTREC, we anticipated that calls would be received on hazardous materials other than chemicals, and with products of primary interest to other Associations. Liaison was established with all resources we could develop. The National Agricultural Chemicals Association, with its system of emergency response teams has been activated on numerous occasions, with excellent results. The Chlorine Institute members have responded well to our calls. Their new "CHLOREP" system, when implemented, will work through CHEMTREC.

The National Liquified Petroleum Gas Association and Fertilizer Institute have provided assistance on LPG and ammonia, respectively. We have had three incidents of material reported to be radioactive. In all instances, the Atomic Energy Commission's emergency facilities responded promptly. In one instance they concluded the spill was rain water, although the carrier, seeing liquid beside a damaged container, called in good faith.

The Institute of Makers of Explosives and the Department of Defense, both of whom have been called upon, help round out our sources of specialized assistance. Ability to contact other organizations which can pro-

vide emergency assistance is an essential part of our operation, as we frequently receive calls on materials of prime interest to these groups.

On a recent Saturday morning a call came from a college town. A student entering a chemistry lab reported smelling "arsenic gas" and called the fire department. Our man on duty gave information on arsenic liquid and solid, but had no "arsenic gas" card. While he was looking for further information, a call came back from the fire chief. "Call off your search," he said, "There's a skunk in the lab."

Another man whose prize cat had been exposed to fumes from a commercial furniture wax wanted to know the antidote. "See your local vet", we had to respond.

A grocer reported a load of meat had been "shipped with some chemicals and smelled bad; is it safe to sell?" Again, this is out of our line, so we referred him to his carrier, meat supplier and health department.

We have received over 865 calls from people, mostly fire services, asking if CHEMTREC was really there, and for more information. These are falling off slowly as knowledge of CHEMTREC is becoming more widespread.

In its initial phase, CHEMTREC concentrated on regulated (DOT) commodities from member companies. To maximize its effectiveness, information on all commercial chemicals is being solicited. Information and emergency contacts from non-members is welcomed and encouraged.

After a year's operation and several thousand phone calls, we are, more than ever, convinced—

—of the need for such a system.

—of the validity of the two-step approach: i.e., provide pre-written, immediate-response information, and then get the manufacturer/shipper involved. This is where the real expertise is.

—that many problems have been prevented or reduced in magnitude as a result of guidance provided by CHEMTREC.

OCCUPATIONAL SAFETY AND HEALTH ACT— AN EIGHTEEN MONTH REVIEW OF PROGRESS

Introduction

By HOWARD PYLE
President, National Safety Council

Secretary of Labor, four of whom are designated by the Secretary of Health, Education and Welfare.

The committee is a continuing advisory body of twelve members. Two members represent management, two members represent labor, two members represent the occupational health professions, two members represent the occupational safety professions, and four members represent the public.

The Secretary of Health, Education and Welfare designates the members representing the occupational health professions and two of the members representing the public. All of the members are selected on the basis of their experience and competence in the field of occupational safety and health. All the members are appointed by the Secretary of Labor who designates one of the public members as the chairman.

The functions of the committee are as follows: The committee shall advise, consult with, and make recommendations to the Secretary of Labor, the Assistant Secretary of Labor for Occupational Safety and Health, the Secretary of Health, Education and Welfare and to any of their representatives on matters relating to the administration of the Act. The committee shall hold no fewer than two meetings during each calendar year. Members of the committee may propose items for the agenda to the chairman between meetings; every meeting shall be open to the public.

We make it quite clear as we convene our meetings that they are not public hearings. We are delighted to have guests in the room for the discussions, but questions and comments from the floor cannot be allowed. We have had very orderly audiences and some-

I have been asked to talk briefly about advisory committees, as such. Having been a governor and a part of the White House community, my previous activities were largely confined to the executive department of government, resulting in mixed emotions about advisory committees. Many government administrators are reluctant to accept advisory committees.

The purpose of the advisory committee is to provide additional inputs from sources most likely to have the expertise, interest and sense of responsibility required to enable administration of a particular piece of legislation.

Advisory committees are exactly what that term implies. They do not, by their existence or by their participation, obligate the administrator to accept their advice. The worst mistake advisory committees can make is to become so proprietary as to believe that what they say must become the law of the land.

I am privileged to be the chairman of the current advisory committee to the Department of Labor and HEW. We have an interesting group, not of one opinion certainly, but dedicated to serving the Occupational Safety and Health Act with the best judgment we can possibly offer.

You might be interested in the particulars of the legislation itself.

The Williams-Steiger Occupational Safety and Health Act of 1970 established a National Advisory Committee on Occupational Safety and Health to advise, consult with, and make recommendations to the Secretary of Labor and the Secretary of Health, Education and Welfare on matters relating to the administration of the Act. The Committee consists of twelve members appointed by the

times quite large. This has enabled the press to hear all that transpires, pro and con. For the most part, I think our committee has functioned exceptionally well.

The minutes or transcript of the meeting is available for public inspection, and notice of any committee meeting is published in the *Federal Register*.

Some of the subject items that come up have more than one dimension and, while we don't always agree, the purpose of the committee is to exchange pros and cons thereby enabling George Guenther, Dr. Key and others to draw conclusions from our thinking that will be helpful.

One thing I learned while I was in public life is that whether you are a governor, or the Secretary of Labor, or the Secretary of HEW, or President of the United States, you have to make decisions that are predicated on a broadly based assortment of facts. Four years in the Governor's office taught me that most of the people who disagreed with me disagreed because they simply did not have an opportunity to have all of the facts in perspective.

So it is with those of us who watch the development of decision making in the government process. There are political overtones that can be very partisan, but I think for the most part those activities performed in the name of safety have been remarkably free of purely partisan demonstrations of thought and action.

I have been particularly happy with the recent administrations in the Department of Labor. We pleaded for ten years for some kind of an advisory committee that could ex-

press the judgment of the community at large and specialized interests in that community with respect to safety standards and administration.

Secretary Wirtz very graciously invited a group of us to advise him on an *ad hoc* basis. When Secretary Schultz came into the Department of Labor, he established a formal relationship with the committee that Secretary Wirtz had set up and we continued to function. It was then that we began to get into some decisions about noise levels and dust, among other things—something the professional safety community had been kicking around for years. Finally, Congressman Steiger and Senator Williams put together the Williams-Steiger Act and into this Act was written a requirement for an advisory committee.

I hope I have provided a better understanding of advisory committees and the fact that they are indeed "advisory." We have been sought out on many occasions. Our individual and group opinions have not always prevailed, but we have had the satisfaction of knowing that we had an opportunity to make an input before somebody at the top made the final decision.

We can be hopeful that the decisions that are made are in the public interest, because the men who are administering this program are about as dedicated to their task as any I have ever met.

It is a pleasure to have you here this morning and a delight to have the Department of Labor representatives who are going to be visiting with you in the name of the Occupational Safety and Health Act.

OCCUPATIONAL SAFETY AND HEALTH ACT AN 18-MONTH REVIEW OF PROGRESS Opening Remarks

By CHAIN ROBBINS

Deputy Assistant Secretary of Labor/Administrator,
Occupational Safety and Health Administration, Washington, D.C.

Here we are one year later.

Hopefully, that year has seen a meaningful decrease in occupational injuries and disease.

One thing for sure, the year has seen response of many kinds to OSHA. Today we are going to review several aspects of that response.

During this year we have seen a groundswell of voluntary compliance activity among trade associations and employers. We have also seen employee groups actively involved in orientation programs to participate more fully in accident prevention activities.

We have dealt with many splendorous varieties of rumors regarding our compliance actions—or inactions and we have been overseen by several Congressional committees.

Although we believe we have made some solid achievements, we recognize there is

much left to be done:

Our standards development program is really just getting started.

Our compliance activity coupled with our statistical collection system continues to review areas where significant accidents and disease indicate emphasis for compliance actions.

The State programs effort continues to develop.

Our training efforts have been and are being increased.

Our information program is receiving new emphasis—today's meeting is intended to be the beginning of an expanded program to better assist all who are concerned with the prevention of occupational accidents and disease.

OSHA REVIEW OF PROGRESS

By GEORGE C. GUENTHER
Assistant Secretary of Labor for Occupational Safety and Health

We in OSHA feel that during the 18 months of our existence we have initiated an effective program to implement the Congressional mandate to improve conditions in the American workplace. We have, we feel, come a long way, but we also realize that we have a long way to go.

Our first task was to issue job safety and health standards and to become a viable agency to administer the Act. In so doing, OSHA accomplished the following:

1. We issued, in May 1971, a comprehensive initial package of standards. These standards are only a beginning. OSHA is working closely with the National Institute for Occupational Safety and Health (NIOSH) in HEW to accelerate the development of new standards, especially in the area of occupational health. In addition, cooperative ties with private research groups and consensus organizations are being strengthened to utilize their efforts in designing the most feasible standards for improving workplace safety and health.

2. We made information on the Act's requirements and on specific standards and compliance procedures available to the public. Efforts to disseminate information are being accelerated, including the development of new materials to more clearly explain the specific rights of employees and responsibilities of employers.

3. We encouraged the states to improve their own programs and standards to be at least as effective as the federal. Most states have submitted a formal letter of intent to develop and submit plans, thereby displaying a positive and enthusiastic reaction to occupational safety and health.

4. We developed new and more effective programs of training and education. For example, about 1,700 instructors have been trained to deal with job safety and health problems faced by foremen in the construc-

tion industry. In turn, these instructors have already trained an estimated 65,000 supervisors. This multiplier approach, of which the construction industry training is the forerunner, is necessary if OSHA is to reach a significant portion of the millions of covered employees. While this kind of training is important, our first priority in training has been for the OSHA compliance staff, to ensure that inspections are of the high quality necessary to accomplish the goal of reducing exposure to hazards in the workplace.

5. We focused on the worst situations first. OSHA's highest inspection priority is investigating catastrophes and fatalities. The second is the investigation of valid employee complaints. About 6,000 of these have been received and reflect both employee concern with the workplace environment and awareness of OSHA's ability and willingness to help. Third, two special programs, one for target industries and the other for target health hazards, have been started to attack some of the worst known hazards. The five industries selected are marine cargo handling, roofing and sheet metal work, meat and meat products, miscellaneous transportation equipment (primarily mobile homes), and lumber and wood products. The five health hazards are asbestos, silica, cotton dust, carbon monoxide, and lead. And fourth on the priority list, inspections are made on a random basis of industries of all sizes in all parts of the country.

Our stress is on the quality of the enforcement program and the elimination of hazards rather than on raising revenues through penalties. About 38,000 inspections have been made, with more than 6.6 million employees in the 34,000 workplaces inspected. As a result of inspections, some 26,500 citations have been issued, with penalties proposed in about 45 per cent of the cases. Total penalties proposed to date amount to about

\$2.7 million. Citations and proposed penalties are subject to review, upon appeal, by the independent Occupational Safety and Health Review Commission.

We continue to be impressed and heartened by the efforts of employers to bring their establishments into compliance before an inspection. To date, more than 26 per cent have been found to be in compliance, and in most others violations generally have been of a nonserious nature.

Voluntary compliance is a major key to achieving our goal, and employers, in increasing numbers, are finding that as a result of voluntary improvements, not only is employee safety and health improving, but productivity increases and other benefits are achieved.

Having issued the initial package of standards, OSHA next had to begin revisions. Although we had carefully screened all existing national consensus standards, we found some needed reevaluation. These had little or no direct relationship to safety and health on the job. You'll remember the much publicized ones dealing with split toilet seats, toilet partitions, retiring rooms, and ice water. We are either eliminating or amending them. Such minor violations also are treated as de minimis, and we issue no citations nor propose penalties. By July of this year, more than 100 revisions had been made and many more are in the works.

In agriculture, President Nixon has directed that we develop improved standards for the use of pesticides. Under certain circumstances, some pesticides are hazardous, both for those applying the materials and for those working in the fields that have been sprayed.

A task group of the President's Council on Environmental Quality has been working on this problem, and its findings are expected soon. In anticipation of this important report, we have drafted the outlines of pesticides standards for five crops—apples, oranges, peaches, grapes, and tobacco—and for field applicators.

We are expanding our use of standards advisory committees to assist in developing standards. The Agriculture Advisory Committee is one of the newest. In August, we increased the membership of the Construc-

tion Safety Advisory Committee from nine to 15 because we will be using so many subcommittees for specific standards that it was felt a larger membership would bring more expertise to bear on the many problems in this area. We had an Advisory Committee on the asbestos standard, which was promulgated in early June.

We are in the process of appointing members of four more committees to make recommendations on noise, heat stress, toxic metals, and carbon monoxide. We would welcome nominees for these advisory committees from employees, employers, the states, insurance companies, professional safety and health organizations, and others. Don't hesitate to volunteer your services in the next 10 months we'll be forming 10 to 15 more advisory groups.

On the subject of advisory groups, I would certainly be remiss if I did not mention the key role played by two others. The Act created the National Advisory Committee on Occupational Safety and Health. Under the chairmanship of Howard Pyle, NACOSH has provided invaluable advice and consultation on the developing OSHA program.

We have also benefited greatly from the involvement of the Federal Safety Advisory Council, whose members represent federal agencies and federal employee unions. The Council is helping us to prove that the Federal Government actually practices what it preaches to the private sector.

Now more on standards. We have just published completely updated editions, including detailed subject indexes, of the General Industry and Maritime Standards. These updates include all amendments, insertions, and other changes since the initial package was published. We expect to publish a similar edition of the Construction Standards.

We have developed a new guide to simplify the identification of pertinent standards. We feel that this publication will make it easier for employers, especially small employers, to find those standards which apply to their workplaces. By utilizing this guide, the user can have a ready reference to those standards with which he must be concerned.

In addition, in January the Superintendent-

ent of Documents will make available a Subscription Service on all our standards and regulations. This service will commence with all the basic documents and will be supplemented with regular mailings, in easy-to-insert loose-leaf format, of all changes.

We are also preparing for wide distribution to all employers a new booklet titled "All About OSHA." We have asked trade associations and insurance companies to help us in this massive communications project. With their assistance, combined with an official mailing, we hope to reach all of the nation's covered employers. We expect the booklet to be published early in the new year.

In connection with our efforts to inform the public, during our first fiscal year OSHA handled more than 1,000,000 public inquiries. Our staff made more than 10,000 speeches across the country, and we are conducting orientation seminars for employers and employees at the rate of more than 1,200 a year. This is the beginning of a broad training and education effort at the area office level.

Among criticism we have received has been the charge that we have created unnecessary paperwork for employers, particularly those with small businesses. Let me say that we are aware of the tiresome stream of forms that confront Americans, whether or not they are in business. For our part, OSHA has exempted from our injury and illness record-keeping requirements all employers with fewer than eight employees. This ruling should help reduce the burden on the small employer.

Let me turn now to the public response to OSHA's program activities.

We have been accused, on the one hand, of going too fast too soon, and on the other hand of moving too slowly and with insufficient vigor. Here's a short sampling of comments that reflect the range of views.

One one side, we have statements like these: "Our representatives in Washington have given this agency the authority to accuse, try, judge, and sentence us on the spot. I would wonder if this is constitutional? Are we still in America? After leaving the meeting, I went outside to see if the American flag was still flying. . . ." "This piece of legislation

is so overpowering that I feel in my case the only solution is to discharge my employees and do such work as I myself can do, and operate as an individual."

On the other side, the snail's pace argument, if you will: "The Administration is dragging its feet in enforcement of the new federal job safety and health law . . . there should be a minimum of 8,000 federal inspectors working for the Occupational Safety and Health Administration, and their work should be supplemented by some 4,000 industrial hygienists. . . ." And "The Federal Government is trying to unload the program back on the states, despite the fact it was the glaring failure of the states to act which brought about passage of the law."

I think the correct approach lies midway between these points of view. We are steering what we consider to be a responsible course aimed at accomplishing the objective of the Act. I think we have made a good start, and I am proud of the dedication OSHA's people have shown and of the spirit of cooperation in the private sector.

When I hear some of the more strident criticisms, I console myself with the history of the two other major pieces of labor legislation of our time—the National Labor Relations Act and the Fair Labor Standards Act. Neither of them was immediately accepted.

When the NLRA was passed in 1935, 58 prominent lawyers from around the country publicly joined in an opinion solemnly stating their view that the Act was unconstitutional. Even after the Supreme Court proved the prominent lawyers wrong, controversy continued to rage. But the Board survived, and by 1940 the worst of the controversy was over. Today, the Act is a cornerstone of national labor policy.

The Fair Labor Standards Act was enacted in 1938 after decades of struggle. Its enactment immediately embroiled the Department of Labor in bitter criticism from both labor and management. Like the National Labor Relations Act, the constitutionality of the Act was challenged and legislation was introduced in Congress to amend it. But in 1941, the Supreme Court upheld its constitutionality and major attempts to limit the Act legislatively were defeated.

I think it instructive to recall that both Acts were controversial in their inception, but came to be accepted later. This lesson should be kept in mind. The controversy over OSHA will also subside as the public becomes more familiar with the Act—its benefits to both employers and employees, and to the working environment—and as we become increasingly expert in managing the program.

During the past year, I testified numerous times before committees of the House and Senate. In the Labor-HEW appropriations bill, Congress voted to exempt from inspections firms with three or fewer employees. This would exclude from inspections for this fiscal year 52 per cent of employers and 3.6 million employees. Last week, the President, for fiscal reasons having to do with the HEW appropriation, vetoes this bill. We, therefore, will operate under a continuing resolution until the 93rd Congress takes new action on our appropriation next year.

The Senate passed but the house did not for technical reasons an amendment to permit us to conduct consultative visits to workplaces for advice on specific subjects, without triggering an inspection. This amendment was limited to employers of 25 or fewer employees. The amendment, by Senator Javits and Congressman Steiger, is expected to be re-introduced in the next session, with a better chance of success.

One criticism cited above declared OSHA should not turn back the administration of job safety and health laws to the states. Congress specifically directed us to encourage the states to accept this responsibility where their programs are "at least as effective as" the federal program. In accordance with President Nixon's "New Federalism" concept of placing government programs as close as possible to people affected by them, OSHA itself is a decentralized agency with two-thirds of its staff in the field. Wide-spread state participation is another element of the decentralization concept. The Act provided a two-year period for the States to prepare their own plans.

To date, we have approved more than \$8.5 million in grants for states and territories that have indicated their intention to submit a

plan. As I said earlier, virtually all states and territories have given affirmative notice of their intentions, and we now have in hand 19 plans for review. Before the end of the year, we expect to have 15 or 20 others.

A great majority of the states are expected to begin implementing approved developmental plans during the first half of 1973. Federal enforcement of federal standards will continue in states with developmental plans, to the extent necessary to assure safety and health in the workplace. The intensity of this continued federal effort will be re-appraised and adjusted twice each year.

Most states that will have plans in operation during 1973 have already begun moving toward effective performance in line with Williams-Steiger Act criteria. On October 3, we proposed a rule that would protect this transitional process from interruption by a short period of federal preemption after December 28, (the expiration date for section 18(h) agreements). Under this rule, I would be authorized to issue temporary orders protecting enforcement authority in states that have submitted "good faith" plans before December 28, while we are conducting a thorough pre-approval review.

We are convinced that the states will assume their full share of responsibility for occupational safety and health, and that temporary orders will help them make the transition with maximum efficiency. The number and quality of plans submitted to us will be the key to the future direction of the national job safety and health effort.

While the role of the states is critical, we clearly recognize the need to posture ourselves so as to be able to deal with current and developing program needs. We are therefore going to effect a second reorganization which will enable us to deal better with the expanding role of the states and their relationship to the federal effort; to focus more clearly on our standards-setting responsibilities; and to incorporate our training and educational responsibilities into each of our regional and area offices. The reorganization also will provide for improved dissemination of information about OSHA to employers and employees.

PENALTIES UNDER OSHA

By ROBERT D. MORAN
Chairman, OSHA Review Commissions,
Washington, D.C.

Money speaks in a language all people understand. Suzy Parker once said: "I do everything for a reason. Most of the time the reason is money."

Some say Congress wrote monetary penalties into the Occupational Safety and Health Act to give employers a reason for compliance. Others say it's not the fine that costs money, it's the abatement that costs. No matter how you look at it, the failure to comply hurts employers in the pocketbook. Maybe this is why there is so much interest in the monetary penalty provisions of the Act.

You know, of course, that the Commission can assess monetary penalties of \$1,000 and less for violations found to be serious, as well as those classified as less than serious. \$10,000 can be assessed for willful and repeated violations, and up to \$1,000 a day can be assessed as a penalty against an employer who fails to correct a violation within the abatement period. I'm not forgetting that there is also provision for criminal penalties in this law, but they are not within the jurisdiction of the Review Commission, so I shall confine my remarks today to the civil assessment of the monetary penalties I have just stated.

The penalty provision of the statute is one of the least understood, the most discussed, and at least one of the most important aspects directly affecting the implementation of the will of Congress as expressed in the findings and purpose of the statute.

In order "to assure, so far as possible, every working man and woman in the nation safe and healthful working conditions and to preserve our human resources," Congress in its wisdom determined that employers found in violation of the Act may have money penalties assessed against them.

As I mentioned, penalties are misunderstood. Moreover, many spokesmen for the

business community indicate that they *resent* penalties. When I use the term "resent" I understate the situation by several orders of magnitude. These people seem to overlook the absence of favorable results with the Walsh-Healey Act and some of its related laws. There were no money penalty provisions, and orders for correction of safety hazards by Labor Department inspectors often went unheeded.

But, in addition to those who question the policy of imposing a penalty as soon as it is discovered, there are also those who say that, as a matter of law, the Government cannot levy a fine or assess a monetary penalty in the absence of conviction of a crime after trial before a judge and jury. There critics, some of whom are lawyers, overlook the fact that early in the 20th Century the Supreme Court determined that the administrative imposition of money penalties was within the power of Congress to legislate.² Despite this decision, which was rendered in 1909, Review Commission judges have repeatedly and consistently had the issue of the constitutionality of monetary penalties argued before them.³ Counsel so arguing are apparently unaware that the forum in which they appear in job safety cases is not competent to determine questions concerning constitutionality.

I must confess that the Commission has found it difficult to understand and sympathize with the refusal of counsel appearing before its judges to recognize the principle enunciated by the Supreme Court 40 years ago, when it ruled that "due process of law does not require that the courts, rather than administrative officers, be charged, in any case, with determining the facts upon which the imposition of . . . a fine depends. [And] . . . that Congress may choose the administrative rather than the judicial method of im-

posing them."⁴

Were the imposition of money penalties by an administrative agency a new or novel or even unusual occurrence, the attitudes mentioned above would be more easily understood. However, during fiscal 1971, over 60,000 money penalties were imposed administratively by agencies of the Federal Government. The total sum collected is in excess of \$10 million.⁵

Notwithstanding the fact that over three generations of administrative law have established the utility of civil penalties as a deterrent to violations of public policy as articulated by the legislature, the effective administration of penalties presents a number of serious problems. The Commission had to deal with many of these problems during the initial months of its existence.

Perhaps, the most fundamental problem in this area has to do with the differing responsibilities of OSHA and the Commission. The Secretary of Labor's authority is limited to "proposing" penalties. Only the Commission has the power to "assess" penalties. However, if the action initiated by the Secretary is not contested by the employer, OSHA's penalty proposal automatically becomes the penalty. The Commission cannot interfere in this process, no matter how unjust we may think a penalty decided in this manner may be. I, for one, wouldn't want it otherwise. If the employer does not feel strongly enough about the matter to exercise his right to contest, it should not be a concern of the Commission.

When a contest is filed, though, the Secretary's penalty proposal, in my opinion, should be accorded no more weight than is accorded his evidence and argument on the alleged violation. If the Department of Labor establishes, to the satisfaction of the judge, that the employer has violated the Act as alleged, the next question should *not* be whether or not the Secretary's penalty proposal is appropriate. The issue at that point should be what penalty, if any, is appropriate, based on the evidence that has been introduced during the hearing.

The Commission, as some of you may know, has differed with OSHA on penalties. At the very outset, OSHA, in its Compliance Operations Manual, published a formula to

guide its own people in arriving at an amount to be proposed as a penalty. That formula was challenged in one of the first cases to reach the Commission, *Hodgson v. Macirema Operating Company, Inc.*⁶ In that case, it was the Secretary's method of computing a proposed penalty for a serious violation that was called into question. Among other issues treated, the Commission observed that, although Congress had provided for a range of penalties from a minimum of one cent to a maximum of \$1,000, the Secretary's formula resulted in the administration of a *minimum* of \$500. The Commission declined to accept this, and specifically expressed its dissatisfaction with this method of computation since it presented both the danger of an excessive and burdensome penalty for a violation of minimum gravity and the possibility (for different reasons) of a nearly insignificant penalty for a violation of maximum gravity.

In the *Macirema* case, the Commission found that the Secretary of Labor had based his proposed penalty on calculations which began with the maximum permissible penalty, then applied percentage discounts for three of the four penalty assessment criteria set forth in the Act, to wit: history of previous violations, size of business of the employer, and his "good faith."

The maximum possible reduction from the \$1,000 was 50 per cent. This was not in accord with the Act's requirements.

Section 17(j) provides that in assessing civil penalties, the Commission shall give "due consideration to the appropriateness of the penalty with respect to the size of the business . . . , the gravity of the violation, the good faith of the employer, and the history of previous violations." In the proposal of a penalty in *Macirema*, it was apparent that the Secretary had given no consideration to the gravity of the violation. Without more, the Commission could not, in good conscience, accept a proposed penalty which had not been based upon "due consideration" of the statutory criteria.

For those interested in details, the Commission's review in the *Macirema* case was limited to the facts that were before us. We could only rule on the issues presented. This is the only way we can act. The Secretary has

to accept our ruling in a case of this nature or appeal it. He is not, however, compelled to apply the ruling in this case to other cases. Only when some cited employer contests a penalty proposal and argues that it is based on a formula the Commission has already ruled against, can we force it to be abandoned. And then it will once again be confined to that individual case.

Following *Nacirema*, the Commission reviewed a case involving a trench cave-in, *Hodgson v. Hidden Valley Corporation*.⁸ There, a proposed penalty of \$600 for a serious violation of the general duty clause was affirmed by the Commission's judge as "not unreasonable." The Commission pointed out, in that decision, that considerations involved in one or more of the four statutory criteria may well override all other considerations affecting the assessment of a penalty. It found that one of the four, "the gravity of the violation charged," was "of signal importance." On that basis, the proposed penalty of \$600 was increased to the maximum of \$1,000.

The three Commissioners have not always spoken with one voice. It is appropriate to state that I dissented from the majority in the *Hidden Valley* case. However, my dissent was based upon considerations other than those which impelled my brothers to assess what, to them, appeared to be a more appropriate penalty providing an effective deterrent to conduct which they found to be in violation of the general duty clause of the Act. I agree with the purposes of the majority in its decision on the penalty to be assessed in *Hidden Valley*, once they were convinced that a violation had been established. I dissented because, in my opinion, the record did not show a violation.

Lest I give the impression that the imaginative use of civil penalties to effectuate the purposes of this Act is the one subject upon which all Members of the Commission always agree in principle, I should mention the *American Home Products* case.⁹ In that case, the majority of the Commission determined that the record transmitted by the Commission's judge indicated that the violation for which the respondent was cited, and on which the proposed penalty was based, was possibly of greater gravity than the judge had realized.

Accordingly, the Commission issued an order to show cause, in which they invited the parties to adduce additional evidence bearing upon the appropriateness of the proposed penalty.

Here again, I disagreed with my fellow Commissioners, in issuing the order to show cause, on the theory I advanced earlier: that when the employer does not contest the amount of the penalty proposed against him by the Secretary, the Commission should not interfere. This time I did not believe that it was proper or appropriate for the Commission to review in detail the appropriateness of the penalty because the employer in *American Home Products*, after initially contesting the action, later changed his mind and attempted to withdraw the notice of contest. The amount of the proposed penalty had already been paid and the condition causing the alleged violation had been abated. I felt that the purposes of the Act had been effectuated and that review by the Commission was inappropriate. I am satisfied with the result in this case for, after considering the responses to the order to show cause, the Commission decided to permit the employer to withdraw without any change in the penalty previously proposed.

Thereafter, the Commission decided a number of cases¹⁰ in which the Secretary of Labor, in citations issued shortly after the effective date of the Act, had proposed penalties so small (some amounted to less than a parking ticket) that they clearly lacked deterrent effect. The Commission reviewed these cases and assessed no penalties. It is our opinion that the principal purpose of the Act is to assure safe and healthful workplaces, and that monetary penalties of insignificant amounts do little to effectuate that purpose. As a matter of fact they have the opposite effect, since employers look at them as harassment. I think nearly everyone agrees that cooperation of employers and employees is necessary in order to fully achieve the purposes of this law. That cooperation will not be forthcoming from employers who believe they are being harassed by petty penalty.

Interestingly enough, at the time the Commission was considering these last-mentioned cases, the Secretary of Labor apparently had

reached a similar conclusion and was in the process of issuing instructions to Area Directors of the Department to that effect. I think this is a step in the right direction.

It should be borne in mind that 95 per cent of the OSHA penalty proposals are never contested. There is no escaping the conclusion that they must be doing something right. In spite of all I have said on this subject, I believe that this conclusion is proper.

Mark Twain once said: "Always do right. This will gratify some people and astonish the rest." I hope I have not left you with the impression that I am astonished when 95 per cent of OSHA's alleged victims accept their penalties without complaint. On the other hand, I hope OSHA is not astonished when the Commission does right by the other five per cent. The net result should be gratifying to all interested in success of the Act.

REFERENCES

1. Section 12(b).
2. *Oceanic Steam Navigation Company v. Stranahan*, 214 U.S. 320, 339-340 (1909).
3. E.G., *Lence Roofing v. Hodgson*, — Fed Supp. — (D. Ga. 1972).
4. *Lloyd Schulte-Schleier Anstalt v. Elting*, 287 U.S. 329, 335 (1932).
5. Goldschmid, *An Evaluation of the Present and Potential Use of Civil Money Penalties as a Sanction by Federal Administrative Agencies*, report submitted to Administrative Conference of the United States, July 31, 1972, page 9 and passim. Professor Goldschmid notes that those figures, which are estimated, are conservative. For instance, the Internal Revenue Service assessed 3.2 billion of additional taxes and penalties which could not be separated and, accordingly, is not included. Nor does the above figure include any part of an action initiated by the Secretary of the
6. Treasury in December 1971 against Investors Overseas Service, Ltd. and its former president, Bernard Cornfeld. The penalty used for is approximately \$75 million.
7. Docket Number 4, February 7, 1972.
8. Section 17(k), in pertinent part, provides: "For purposes of this section, a serious violation shall be deemed to exist in a place of employment if there is a substantial probability that death or serious physical harm could result from a condition which exists . . . unless the employer did not, and could not with the exercise of reasonable diligence, know of the presence of the violation."
9. Docket Number 11, February 8, 1972.
10. *Hodgson v. American Home Products Corporation*, docket number 3, February 28, 1972.
11. E.G., *Hodgson v. General Metal Company*, docket number 250; *Hodgson v. Chilton Millwork and Lumber Company*, docket number 123.

OSHA: BULLSEYE OF THE "BIG GOVERNMENT" ISSUE

By THE HON. WILLIAM A. STEIGER
Member of Congress, 6th District of Wisconsin

If one were to examine the period of the 92nd Congress, just passed, it seems to me that, along with busing and tax reform, one of the outcomes of what George Wallace used to call "sending the message" was the emergence of big government as a central issue in the minds of many people of this country.

Some have called it backlash, some call it frontlash, many call it apathy, but I think the central point is clear. The American people in large numbers feel they no longer control the destiny of their government and their individual lives.

Small business and those employed by business large and small are no exception to this phenomenon. Perhaps before the late 1960's the small businessman, other than government contractors, did not have much concern about what his government required of him.

Workmen's compensation and social security, the things that by then had become a matter of some routine, were no longer very irritating to deal with. With the passage of new regulatory legislation, however, be it the Equal Employment Opportunity Act or the Environmental Protection Agency legislation or the Product Safety Act or other examples of consumerism, the small businessman and large business began to feel that they were being deluged with federal red tape with a consequent increase in the cost of doing business. Coupled with this perhaps was the economic turndown in the late 1960's and the recession that took place. With the advent of wage and price controls and other pressures, the small businessman began to feel the cost of doing business had become close to, if it had not exceeded, the amount of profit he could expect from his efforts.

And then along came the Williams-Steiger Occupational Safety and Health Act of 1970. I think it is fair to say that occupational safe-

ty and health is one of the least understood, most complex, most technical, and therefore most exposed of the efforts of "big government."

The reasons for this are several. A primary reason is that in spite of several years of consideration by Congress, OSHA took the business community by surprise. The less-than-enlightened attitude taken by many leaders in the business community, particularly by some organizations during the early development of safety and health legislation, has been described as an ostrich approach. They decided they could ignore OSHA because it would go away. This clearly was not the case.

The alarming increase in on-the-job injuries and deaths between 1960 and 1970 made it imperative that Congress enter this field. We did not do so lightly. But it is fair to say there was a lack of intensive involvement by the business community during the developmental stages of the legislation, when many of the provisions of the Act were being set in concrete. That proved to be a serious error.

I am continually amazed at the versions I hear among both employers and employees about where the standards came from. Many seem to think that somehow the Congress of the United States met in the bowels of the Labor Department and drafted those standards and published them in the *Federal Register* as if they were created by Moses as in the Ten Commandments. (They're a little longer than the Ten Commandments—by how many thousand words?) I think there has been at some point a failure to comprehend fully the consensus standard provision included in occupational safety and health. And when I look back to the hearings that took place in that three-year period between 1968 and 1970, I find all the witnesses except organized labor testified in support of consensus standards.

Another cause of the political controversy

surrounding OSHA is that the Act represents a significant departure from past efforts by the states and the federal government in the field of safety. While most states had inspection efforts in this area, they relied, almost without exception, on consultation and abatement periods as the sole means of attacking the safety problem. Death and injury statistics quite clearly show that approach was not working. Given the size of the inspection force under the old system and the number of places to be inspected, it seemed most likely that an employer would not be inspected in the foreseeable future. Those who were inspected were almost always given grace periods to correct violations. As a consequence there was very little incentive for an employer to attack safety and health problems prior to inspection. With the first-instance citation under OSHA, this is no longer the case, because an employer is now held responsible for compliance with standards before he is inspected.

I suspect it is fairly easy to convince the large employers that considering the cost of workmen's compensation, lost time from injuries, legal fees, hospital bills, and all the other costs of job hazards, to comply with OSHA rules is clearly in their financial interest. It is quite another thing to persuade the small businessman of these facts. This is particularly true when he does not even know what is required of him and by what standards he must abide. The several hundred pages of regulations in the *Federal Register* might just as well have been written in a foreign language insofar as many are concerned. The result is the generation of a tremendous and irrational fear on the part of many.

With all the controversy, with all the fear, with all the effort being made, one significant fact of life stands out above and beyond anything else. That fact is that suddenly safety is important, that safety is an issue with which employees and their employers are now dealing. I don't know precisely what benefit flows from this visibility for safety, but I think it is fair to say that all the work and effort of the National Safety Council over a period of 60 years, and all the work of the American Society of Safety Engineers and

other groups that have been in this field for a heck of a lot longer than Steiger has, have not had that same impact.

For decades, every plant had a poster that said, "Safety Pays," and everybody ignored it. Everybody had something that said, "By golly, yes, safety is important." And then the unions put it at the bottom of the list, below the coffee break. Every employer said, "Of course I want a safe place," "Yes, I will follow what my insurance company says," and then ignored them. Out of the Occupational Safety and Health Act comes that very clear understanding that we can no longer ignore health and safety of those who work in this economy, and that in fact we can make safety pay, that we can reduce our costs, and that we can improve and enhance the environment in which 60 million men and women earn their living at least eight hours a day.

All the fuss, all the furor, all the difficulty with this act pales into insignificance if the result is a reduction in the 14,200 lives lost each year—a reduction in the 2.2 million disabling injuries that take place each year.

The second point I would make is that I don't want to see us getting into the box which I'm sure some are going to try to push us into by the fact that in the early stages of the Act's administration the number of accidents have actually increased, not decreased, simply because of the reporting requirements included in the bill.

The fact that there are over 100 bills introduced in the House of Representatives, all of which seek to amend the basic act, is an indication of the political controversy that will surround any act of this magnitude. To put it frankly, these bills are designed to gut occupational safety and health. All of them ought not to be dismissed lightly, but I think there will continue to be very serious controversy within Congress about the administration and development of occupational safety and health.

One of the most interesting phenomena from my standpoint as a Wisconsinite is that so much of the discontent is coming from the neighboring states of Illinois, Nebraska, Missouri, Montana, Wyoming, and Colorado. Some theorize this is a result of the general distaste of the heartland of America for gov-

environmental regulation. Perhaps a more pragmatic reason is that many of the state programs were relatively nonexistent and that workmen's compensation rates were relatively low. It is also true that many of the government contractors who have had to comply with Walsh-Healy standards happened to be concentrated on the East and West Coast, and few are located in states such as Nebraska.

A concrete example of the "knee-jerk" reaction to OSHA is the exemption of small business in the Labor-HEW appropriations bill. During the debate over the first Labor-HEW bill, Rep. Paul Findley of Illinois introduced an amendment that would have provided, in this fiscal year, no inspections for businesses employing 25 or fewer people. It was adopted by a wide margin, in part because of the frustration reflected in Congress when a new law is implemented by the administrative branch of government. They were, again borrowing from George Wallace, attempting to "send a message." I think that message was received by the Department of Labor and by those who have responsibility for this Act. The Senate passed the figure at 15. The bill was vetoed. It came back again. It ended up at three. The President just vetoed it the other day.

It is clear, however, that similar pressure will come again and will be exerted on subsequent HEW appropriations in the early part of the 93rd Congress.

Given the size, scope, and complexity of the Williams-Steiger Act, some of the problems and some of the opposition are inevitable as new legislation is implemented. This has been true historically following passage of any major piece of social legislation in this century. I should like to borrow from Rep. Maverick in his remarks from the *Congressional Record* on the floor of the House in May 1936 concerning implementation of the Social Security Act. He said: "One set of objectors says the payments are too inadequate. Others complain that the program is too expensive. To this I might say such forms of criticism somewhat offset each other. Some groups are protesting that security programs are being installed too rapidly; others the opposite. Again we must strike a balance be-

tween speed and caution. On the whole it is remarkable how much of the criticism is directed at details and how little at the principles of the Act." It is remarkable how similar his remarks are to today's heated debate concerning not the principles of the Act, but its details and administration. As the most workable solutions are sought to complex problems, controversy is inevitable and healthy. This is as it should be in a democracy.

While many of the problems can be taken care of administratively, the law itself is not without its faults. Through visits to many places, both in the Sixth District of Wisconsin and elsewhere, and through many letters from across the United States, I find the biggest single criticism of OSHA comes from small businessmen who would like to come into compliance but lack the technical staff resources to interpret how the standards apply to their operations. Those who call the OSHA office for assistance are correctly told that the law does not allow OSHA personnel to visit the workplace without the threat of fines and enforcement. Therefore, on August 18, I introduced legislation to provide assistance to small employers.

Weeks of hearings before the House Select Labor and Small Business Subcommittees and the Senate Labor Welfare Committee all focused on consultation rather than exemption as the primary need of the small businessmen as they seek to comply with the often complex and technical standards. The bill in its final form would enable an employer with 25 or fewer employees to request the Department come to his plant and interpret the standards for him. No citations could be issued and, with the limited exceptions of cases of imminent danger and serious violations, no enforcement would be triggered.

The bill received the endorsement of the National Safety Council and Governor Pyle. I am deeply grateful for that. I thank the Administration, and I thank George Guenther, Larry Silberman, the AFL-CIO, the bipartisan co-sponsorship of a number of members of the House, and, most importantly perhaps, the National Small Business Association and the National Federation of Independent Business.

In spite of the efforts to bring the bill to the House floor under suspension, it was not called up because of the log-jam at the end of this session. It was passed as an amendment by Senator Javits to the Public Works and Economic Development bill of 1972 but it was dropped in conference as non-germane, and the President vetoed that legislation.

On-site consultation would be the most beneficial service we could provide for small business. It would deal with the cause of the problems rather than the symptoms. Further hearings will be scheduled by Congress next year, and I hope that our continued efforts will be successful.

One of the problems confronting any legislator is how best to respond to those who have a concern.

One of the difficulties we face is the fact that for lots of reasons, some of which I have talked about, what a member of Congress gets today is essentially criticism. He gets criticism from employers, large and small, who are concerned about the standards. He gets criticism because employers fear the enforcement of the Act, or the first time penalties. He gets criticism from unions who say it is too weakly administered, it's too coddling of business, the fines are too small. That's all any member of the Congress of the United States is receiving at this point: detailed, complex, harsh criticisms. And some of them not very complex—they are straight out statements that "this Act is going to put me out of business." This milieu of fear, of the implementation of an act creates, from a legislator's standpoint, a perspective that is one-sided. Thus if there's any single step that can be taken by the people who work in the field of safety it would be to tell their Congressman, "I think the Act can work, I think the Act is working." And if you don't think it's working, explain what changes you think ought to be made in it.

I think it is about time all of us who have held our heads high on behalf of safety stand up to the Congress of the United States in opposition to exemptions by an arbitrary number of employees. That very serious step backward will continue to be before Congress

unless and until there is some perspective, some expression of sense on the part of people. I am finding this just now from a few employers who are beginning to write letters that say, "I have been inspected. The inspectors were good. They did their job. They pointed out problems. I can make the corrections, and it will not put me out of business."

Industries with predominantly small employers ought to be exceedingly concerned about the possibility of exemption by number. From you can come, not only a better understanding of the Act, but that boldness to stand up and give your legislator a better view of exactly what's happening in the implementation of this Act.

Failing that, I am fearful of what the next Congress may do. I'm pessimistic simply because we continue to get that pressure, we continue to see that concern and that fear expressed. Secondly, there isn't any way, whether it's through advisory committees or enforcement officers and compliance officers, or consultation officers when we get them, that any member of the Congress who has to deal with this Act can gain a real understanding of the problems of the Act unless you say something. So I ask you to accept these two roles: first, be willing to help legislators gain comprehension, understanding, and perception about OSHA; second, be willing to help us by offering what Congress gets far too seldom: constructive comment.

I'm profoundly proud of Bob Moran and the Occupational Safety and Health Review Commission, and of George Guenther and Chain Robbins, and the people in the Department of Labor, and Marcus Key, and the men and women in the Department of Health, Education, and Welfare. I think they have done an extraordinary job in administering and developing this act in a very short time, but they're not perfect, and neither are legislators.

The only way you can correct mistakes, the only way you can help us understand, if in fact changes are necessary, is if you'll give us some guidance and counsel, both about what's right and what's wrong. If you don't do that, then those who complain, be they

unions or employers, will continue to ride high in the effort to break down and weaken what I think can be, over the long haul, one

of the most effective steps taken by you and me to ensure that people in this country live a better life.

WHAT ASSOCIATIONS CAN DO WITH OSHA

By KENNETH L. PATRICK

Director, Safety, Western Wood Products Association, Portland, Ore.

The history of Western Wood Products Association dates back over 70 years. It has served its members primarily in the field of forestry, product promotion, transportation, and the supervision of lumber grading. Up until the past 15 years or so there was little or no Association interest in the field of safety. Individual companies were on their own. The first interest in staff support in safety came around 1956, at which time a staff member was added to conduct in-plant inspections and advise member companies on safety matters. As the Association grew in membership and the geographical regions expanded, that service didn't grow proportionately. However, it did continue as a stop-gap measure to augment similar services offered by state and insurance company conducted in-plant service programs. I am not trying to give you a historical rundown on the safety services program in my association, but I am highlighting the extent to which one of the more progressive associations was involved in safety activity. This is what the members wanted and what they got. Looking at the entire industry and measuring other association programs, ours was a major effort by comparison. I wouldn't be too far wrong if I said that other industry groups as a whole set safety and health priorities low in their programs as well.

Let's talk for a moment about a major failure of trade groups between the later years of the Eisenhower administration and December 1970. During those years, when the Occupational Safety and Health Law was taking form, safety professionals knew well that the effort that was being waged by labor and political counterparts to formulate a safety and health bill would ultimately culminate in some sort of legislation. It was only a question of when. Loud cries from those who foresaw what was happening failed to alert industry management elements to become

involved in the formulation of legislative proposals that would ultimately become law. Our industry, as well as others, chose to disregard the alert signals and consequently sold themselves down the river to somewhat of a lopsided law.

The first ray of hope for unity in our industry came after December 1970 and followed a proposal to the Forest Industries Council, which is our highest level of management representation, that an action group be structured to represent the industry on safety and health matters. It was intended that the group would become a coordinating group to interchange ideas and take action that could be more effectively handled on an industry-wide basis and where impetus was required to get the job done. Twenty-two months later this committee is still active, viable, and a useful tool of our industry. It has been the vehicle by which we in wood products have benefited substantially. Each and every one of the participating associations, which total about 45, have complemented one another's efforts in some form or another. Through this cooperation we kept each other advised so that our members could in turn be kept up to date on what was going on. Therefore, members have been in a much better position to solve individual problems that we knew would be under the sharp scrutiny of the Safety and Health Administration. Because wood products associations have kept their members better advised, I believe the wood products industry has fared far better than most industries. Voluntary compliance took an early lead and has resulted in a relatively better showing on inspections and proposed penalties.

The FIC Committee reviewed each and every wood products manufacturing function and determined if there was a safety and health standard in existence. Then we started the ball rolling to fill the voids. As a result,

at this time, we have three separate standards in development under the ANSI program that when completed will no doubt be accepted and promulgated by the Department of Labor. We also have had an active program underway since May 29, 1971 when the standards package was promulgated, to rectify some of the problems that resulted from issuance of standards that had not been sufficiently reviewed and clarified by the Labor Department prior to promulgation. The Department of Labor has not always been prompt in taking action on our petitions, but we feel that we have developed a level of understanding and confidence that has eased pressures until administrative action was completed.

By associations working closely with regional administrators on regional problems and highlighting problems as they occur, we have assisted OSHA materially in their management of field activities. For example, by watching closely what is going on in the field of inspection activity, associations have been able to identify gross inconsistencies that most likely would not have been identified by regional administrators. Associations, being closer to the receiving end, can keep pace with this sort of thing. It's amazing what you can turn up by a casual review of OSHA inspection reports.

Over the past year, several congressmen have pointed out that they feel that OSHA's information program failed to inform many businesses in the United States. No doubt some were insufficiently informed, but I do not believe that government can be held totally responsible for this. We in association work can't with clear conscience shift the responsibility if we have not done everything possible to help our members to understand the law and to outline responsibilities, etc. There are far too many associations representing American business who failed miserably in this connection, but on the other hand are first in line to breed contempt amongst their members to approve the program. I suppose it is far easier to criticize and play-up problem areas of any program than it is to offer constructive criticism and assistance in working out the problems.

During the days when the OSHA staff was

being formed and many were complaining about being inspected by unqualified inspectors, we assisted the Labor Department in selecting for compliance officer positions people that we knew would serve the program well, for government, labor, and management. We recognized the value in the inspection program but felt that it was of particular importance to have knowledgeable industry-wise people at the inspection level on OSHA's field staff. As a result of our recommendations, highly qualified men were hired for those positions in the Northwest. What developed was a better working relationship and level of understanding. This is one of the bonuses that was made possible through the active effort of a regional trade association.

Now we are on the verge of two more crises in connection with this law. First, with respect to the many changes that have been proposed to amend the safety and health law, most of which would tend to minimize its intended effect. Too few associations are stepping forward to testify before House and Senate committees in behalf of the positive aspects of the safety and health program, while at the same time recognizing deficiencies that seem to be taking a turn for the better due to the positive efforts of the OSHA staff. I personally feel that if the program is kept in the same channel that it is in today, it is headed in the proper direction and will undoubtedly culminate in a good solid long range program in the coming years. I personally don't subscribe to any changes in the law, particularly when the problems that have been cited by some congressmen are being controlled administratively by DOL.

Our second crisis on the horizon is in the area of workmen's compensation. Unless industry supports the development of good state programs that measure up to current-day standards, you can count on a federally regulated and administered program in the next three years. Such a program under federal control can't be anything but a money shuffling program. Rehabilitation and prevention programs such as we have in the more progressive state compensation programs will be a thing of the past and we will be in the middle of another money give away

program that industry will pay for. Just recently, Ralph Nader proposed that 100 per cent pay be the bench mark for compensation. The other day, I heard of a case in New Jersey where a person was on the job full time and at the same time drawing 100 per cent compensation. With this kind of incentive, who wants to work?

Again, far too few associations and businesses appeared before the President's Commission on Workmen's Compensation with any constructive ideas or pledges of effort to do something about existing state programs that need a face lifting.

No matter how you look at the situation, 1972 has been a crucial year in the field of accident prevention; 1973 won't be any different. The OSHA program will go through further critical development, implementation, and direction finding stages.

On the whole, OSHA is a good program. Naturally, industry has viewed it with considerable apprehension because of the potential abuse and probable costs in relation to actual benefits that can be achieved.

People from states such as Oregon, which already had complete, stringent safety conditions, found it difficult to understand the need for federal involvement. Historically, there has been much progress in accident prevention in our state and others. However, as I have traveled around the country, I have learned that this progress is not a benchmark in all the states. Many have lagged in providing accident prevention programs.

Some speculate still as to whether or not the OSHA program was the proper step for Congress to take to remedy the shortcomings in many states. However, the fact is that some kind of stimulus was necessary to improve conditions overall. Safety and accident prevention have not had the constituency that other issues regularly have, such as wages and fringe benefits, that are commonly a part of the labor management negotiation package. Too often there has been a tendency to give priority to the more meaty issues rather than the matter of safety and health.

In any event, we do have a program. It is being implemented with great vigor and challenge to labor, management, and state and federal agencies to make it work.

I mentioned earlier that some employers had the feeling that OSHA might result in abuse because of the opportunity for harassment and unrealistic policy and enforcement procedures. I am most happy that there hasn't been abuse in our industry. This is an ever present danger however, under any kind of a regulatory program, but particularly with one where reasonable minds can differ regarding what is a "safe place to work" and what is a realistic safety device or practice. Obviously, what is safe or even helpful, varies, depending on many circumstances.

Realism is needed because of the stifling and damaging effect that would otherwise be felt on our economic base. Imposing costly or stifling safety and health requirements on a productive enterprise would aggravate an already bad situation. Expending management or labor time and energy meeting frivolous safety or health requirements would further reduce output and therefore increase the price of the product. I am not suggesting that steps not be taken where realistic safety standards should be met, but I believe that it is essential that those who are making the decisions carefully weigh the trade offs.

I have been personally involved in our industry's effort to cope with this new law from the beginning, and I feel strongly that we have merely tapped the potential that is available to us through association effort. Trade associations can assist each of their members in enlarging national and local occupational safety and health committees and represent our industry in proposed rule making procedures. They can work with industry to develop effective safety training programs, conduct seminars and workshops. Associations can improve communications. They can educate members on standards applicable to individual types of operation and where there are no standards, and they can organize standard making committees. They can collect case histories of citations, penalties, and appeals and provide feedback to members. Keep track of these activities can help straighten out difficulties with the Labor Department if there are facts to back up the arguments.

YOUR ASSOCIATION AS AN OSHA INFORMATION CENTER (AND WE ARE SITTING ON A TIME BOMB)

By WILLIAM J. MOSHOFSKY

Vice President, Georgia-Pacific Corp., Portland, Ore.

The National Commission on State Workmen's Compensation Laws was established by Congress in the Act creating OSHA and appointed by the President. The commission was established primarily because many people felt that state workmen's compensation laws are in real bad shape. Some wanted immediate Congressional action, others said let's study first. The studies prevailed, and our commission was tasked on to OSHA as an afterthought. But believe me, the implications could be far greater than the safety aspects of OSHA.

Frankly, we are sitting on a time bomb. The study is now complete and the Commission's recommendations and report are out. Basically our Commission report says that if the states don't improve their laws, Congress should force them to do so. The deadline is set for July 1, 1975, but already Senator Javits has introduced a bill which would set up Federal standards specifying benefit levels, requiring minimum levels of medical and rehabilitation, broadening coverage, requiring broad second injury programs, dabbling in every facet of workmen's compensation (setting up the Labor Department as a policing agency).

I fought, and will continue to fight, federal involvement because I think it would be bad for the workman, bad for the employer, and bad for the public. But federal involvement is inevitable if the states don't act. The Feds are already involved to some extent (social security, permanent total disability and death, LSHW, Federal employees, railroads, Jones Act).

Actually, we heard some credible statements urging scrapping workmen's compensation all together, putting it under social security or creating a new setup and covering both on-the-job and off-the-job injuries. For-

tunately, those on the Commission who believed in state workmen's compensation prevailed. The reasons for this are:

1. To keep the cost of on-the-job injuries tied to employers' costs as pressure for safety and accident prevention. OSHA guard rails and safety devices won't do the job alone. The attitude of management, supervisors, and workers is fundamental.

2. Retain experience rating and self insurance which rewards the safe and punishes the unsafe.

3. Keeps the employer involved—he is the most able to help when an employee is first injured, as well as later in rehabilitation and return to work. It is bad enough to inject a state agency as a regulator, but to involve Uncle Sam will certainly push the employer further out of the picture.

4. Workmen's compensation simultaneously achieves many objectives—recovery, return to work, rehabilitation, safety, and effective delivery of benefits.

We also prevailed in getting recommendation against immediate federal standards. We agreed on a three-year delay, giving the states a chance to move.

We opposed immediate federal action because, first, it would precipitate a wasteful confrontation in Congress over how much federal intervention is necessary and what kind. Second, many essential aspects of state systems are not susceptible to federal mandate, such as administration and rehabilitation. Also, definitions of terms such as disability, second injury, and medical vary from state to state, making application of standards very difficult. Of even greater concern, shifting to a federal approach would move workmen's compensation further away from recovery, restoration, rehabilitation, and return to work, and toward mere "dollar" re-

covery. Too much emphasis on dollar recovery delays recovery, rehabilitation, and return to work, to the detriment of the worker and his family.

Let me hasten to add that the record of performance at the state level is not good—there is certainly need for major reform. For example, maximum benefits are below the poverty level in a majority of the states. Typical maximums are \$250 to \$400 per month. How can you justify such a maximum monthly income replacement for someone earning \$1,000 to \$1,500 a month.

Remember, workmen's compensation is not a welfare program, it is not like unemployment compensation. It was spawned as a tradeoff; the workman gave up his right to unlimited damages for negligence for limited recovery for injury in all instances of job injury. The employer got protection against unlimited recovery in *all* job injury cases. So there is a real obligation to keep wage replacement in reasonable relationship with real wages!

And there are other shortcomings: limits on coverage based on number and types of employment; limited rehabilitation; defective delivery systems resulting in abuses; too much litigation and red tape.

So obviously there is plenty of ammunition to support federal action, and we all know the Federal government is already involved in almost everything else relating to employees and employers.

In the past, basic reform in workmen's compensation has been difficult to bring about. Workmen's compensation tends to be dominated by attorneys, associations, and insurance interests. Litigation is an attorney's bread and butter. Lawyers are a powerful lobby. Frequently the same lawyers who advise labor organizations on labor matters also get referrals of workmen's compensation cases—and influence labor leadership on workmen's compensation issues. Also, there are many lawyers in legislature, and lawyers usually dominate legislative committees dealing with workmen's compensation.

Meanwhile, associations fight off benefit increases; first, because that's what they feel they are hired to do and can prove their worth by doing; second, they resist benefit

increases pending enactment of reforms to reduce abuses and limit costly litigation.

Employers generally have not given workmen's compensation the attention it deserves. They fail to realize that workmen's compensation benefits must be adjusted as regular wage levels are adjusted. Frankly, too much responsibility has been delegated to associations, claims people, and insurance companies.

But I'd rather not dwell on the past—what about the future. How do we get the states to move?

Basically, we've got to make workmen's compensation an issue. Everyone—employers, labor organizations, associations, insurers, administrators—must get concerned and involved. Associations, particularly those not normally involved in workmen's compensation, can help. Get a copy of the report. Get a summary. Put out an alarm to your members to become aware, and urge them to push their state employer associations to get moving on reform efforts.

But you can't stop at sounding the alarm. It's going to take followup and persistence.

From the employer's standpoint, my big worry is that benefit increases will be enacted but that needed reforms in the delivery system will not. The Commission report labelled certain recommendations "essential"; most of these were in benefits and coverage. It did say administration (and the delivery system) are as important but since they are not susceptible to federal mandate they were not labelled essential. Therefore, it is up to employers and their associations to see that administrative changes are incorporated.

I strongly believe employers and labor must take the lead, hopefully working out needed changes together. There are plenty of tradeoffs for both sides. Certainly, cooperation between these two groups could really bring about essential reforms.

Meanwhile, a constant watch on Congress is necessary. Senator Javits' bill, which went far beyond the essential recommendations of our commission and would more than double benefits without eliminating costly abuses, is already in the hopper. Congress just acted on longshore and harborworkers workmen's compensation reform. Congress recently en-

acted OSHA. Those urging federal involvement in state workmen's compensation certainly won't sound radical.

We all have a tough but necessary job to

do—passage of needed reform at the state level while blocking harmful Congressional intervention. It is time to get moving—the time bomb is ticking.

MEMBERS OF THE

INDUSTRIAL CONFERENCE

NATIONAL SAFETY COUNCIL 1972-1973

Vice President for Industry—M. F. BIANCARDI, Asst. Vice Pres. Employers Insurance of Wausau, Wausau, Wisconsin

Chairman of Industrial Conference—W. E. STUFFING, Dir. of Safety, Carrier Corp., Syracuse, N. Y.

Chairman of Committees (Chairman-Elect)—HOWARD RESHOLZ, Safety Dir., The Rath Packing Company, Waterloo, Iowa

Vice Chairmen of Committees—E. B. LOCKE, Vice Pres., Texas Employers Insurance Ass'n., Dallas, Texas; C. E. WILSON, Asst. Mgr. of Safety & Workmen's Comp., Bethlehem Steel Corporation, Bethlehem, Pa.

Chairman of Sections—J. W. TYSSER, Mgr. of Safety, Republic Steel Corporation, Cleveland, Ohio

Vice Chairmen of Sections—J. S. SHERY, Assistant Vice Pres., Engineering, Aetna Life & Casualty Company, Hartford, Conn.; A. H. CHRISTIAN, Division Safety Engineer, American Viscose Division, FMC Corporation, Philadelphia, Pa.; ALAN REED, Manager, Engineering Services, Daniel Woodhead, Inc., Northbrook, Illinois; G. B. LEMKE, Vice Pres., Employers Insurance of Wausau, Wausau, Wis.

Secretary—ROBERT G. BELKNAP, Asst. Mgr., Industrial Department, National Safety Council, Chicago, Illinois

Committee Chairmen—Associations—J. L. HORTON, Asst. Manager, Marine Dept., Cleveland-Cliffs Iron Co., Cleveland, Ohio; Audio Visual Aids—MARIE SCORRI, Div. Safety Coordinator, Maxwell House Division, General Foods Corporation, Hoboken, N. J.; Contests & Awards—G. LUNDG, Dir. of Safety & Plant Protection, Inland Steel Company, East Chicago, Ind.; Executive—W. E. STURRING; Nominating—J. C. RADCLIFFE, Dearborn, Mich.; Occupational Health Hazards—W. E. MCCORMICK, Mgr., Environmental Control, The B. F. Goodrich Company, Akron, Ohio; Occupational Health Nursing—HELEN P. ONVETT, R.N., Employers Insurance of Wausau, Indianapolis, Inc.; Off-the-Job Safety—I. M. DAVIDSON, Div. Engineering Manager, American Mutual Insurance Co., Atlanta, Georgia; Physical Hazards—B. J. CHESLAK, Safety Director, General Motors Corporation, Detroit, Michigan; Research Projects—E. N. DECK, Manager of Safety, Security & Plant Protection, General Electric Company, New York, N. Y.; Standards—N. MCCALLUM, Safety Director, Chrysler Corporation, Detroit, Michigan; Technical Publications—W. S. WOOD, West Chester, Pa.; Training—M. R. FRASER, P. Eng., Safety Director, Mines Accident Prevention Association of Ontario, North Bay, Ont., Canada

MEMBERS OF THE

ASSOCIATIONS COMMITTEE

NATIONAL SAFETY COUNCIL 1972-73

Chairman—JOHN HORTON, Asst. Mgr., Marine Department, The Cleveland Cliffs Iron Co., Cleveland, Ohio; DAN ADAR, Vice Pres., Medical Acoustics, Inc., Portland, Ore.; WM. ATKINSON, JR., Safety Director, Nat. Mach. Tool Builders Assn., McLean, Va.; HARRY BECKER, Safety Director, American Water Works Assn., New York, N. Y.; EARL A. BRATTON, Executive Director, Steel Plate Fabricators Assn., Hinsdale, Ill.; J. P. CARROLL, Dir. Saf. & Loss Prev., The Society of the Plastics Industry, New York, N. Y.; H. LOUIS CUSTER, Dir. Retirement, Safety & Ins., Natl. Rural Elec. Cooperative Assn., Washington, D. C.; H. J. EIERMANN, Mgr. Saf. & Loss Prev., SCM Corp., New York, N. Y.; R. E. HALSTEAD, Safety Director, Allison Div., G. M. Corp., Indianapolis, Ind.; DON G. HAUSER, Vice Pres., Iowa Mfrs. Assn., Des Moines, Iowa; JOHN JANOUS, Dir. Ind. Health & Saf. Serv., Amer. Iron & Steel Inst., Washington, D. C.; A. KOONMAN, Motor Vehicle Mfrs. Assn., Detroit, Mich.; JAMES HICKER, Safety Director, Portland Cement Assn., Skokie, Ill.; MARION E. MARTIN, Hallowell, Maine; R. L. MOORE, Asst. Vice Pres., Safety Services Dept., National Loss Control Services Corp., Long Grove, Ill.; E. L. NEWMAN, Dir., Office of Fed. Agency Programs, U. S. Dept. of Labor, S. W. Wash., D. C.; K. L. PATRICK, Dir. of Safety, Western Wood Products Assn., Portland, Ore.; KENNETH J. PATROW, Dir. Mgmt. Dev., Nat. Foundry Assn., Westchester, Ill.; FRED ROCKERS, Manager, Admin. Services, Gypsum Assn., Chicago, Ill.; A. SPIEGELMAN, American Ins. Assn., New York, N. Y.; ALLEN WALTERS, Sec. Amer. Warehousemen Assn., Chicago, Ill.; FRANK WOOD, Technical Director, The Salt Institute, Alexandria, Va.

Association Consultants—Washington Area—SANTO J. BARCA, Staff Asst. to the Pres., Can. Migra. Institute, Washington, D. C.; GEORGE BURKE, Manager, Tech. Services, Water Pollution Control Fed., Washington, D. C.; JOSEPH H. CORQUITT, Secretary, Natl. Assn. of Refrigerated Wholes., Washington, D. C.; BEN DAY, Mgr. Technical Services, The Fertilizer Institute, Washington, D. C.; WM. E. HUGHES, Exec. Vice Pres., Composite Can & Tube Institute, Washington, D. C.; HARRY E. KORSA, Technical Director, Natl. Soft Drink Assn., Washington, D. C.; HUGH MCCABEY, Manager, Asst. Dept., Chamber of Commerce of the U. S., Washington, D. C.; JOHN MOHAY, Executive Vice Pres., National Ind. Meat Packers Assn., Washington, D. C.; New York Area—RAY C. ELLIS, Jr., Dir. of Safety Services, Hotel Safety Trade Group, New York, N. Y.; L. H. GILLETTE, Assistant Executive Vice-President, Amer. Institute of Steel Construction, New York, N. Y.; W. W. PATRICK, Code Eng., Bldg. Prod., The Aluminum Assn., New York, N. Y.; KENNETH S. ROLSTON, Admin. Asst., American Pulpwood Assn., New York, N. Y.; WILLIAM J. STEVENS, President, Natl. Assn. of Photo-Lithographers, New York, N. Y.; Midwest Area—ROBERT E. COLLINS, Exec. Vice President, Southern Cotton Ginners Assn., Memphis, Tenn.; LEONARD FREED, Mgr. Safety & Member Services, Ohio Contractors Assn., Columbus, Ohio; JEFFERSON KEITH, Managing Dir., American Metal Stamping Assn., Cleveland, Ohio; GEORGE KELLER, Dir., Assn. Saf. Services, Employers Ins. of Wausau, Wausau, Wis.; H. McRAE, Bldg. Const. Emp. Assn. of Chicago, Chicago, Ill.; E. C. MERKLE, Managing Director, Natl. Flexible Packaging Assn., Cleveland, Ohio; HAROLD REGAN, Safety Coordinator, Amer. Paper Inst. Inc., Chicago, Ill.; West Coast Area—L. S. CHAPPELEAR, Jr., Manager, Tech. Services Dept., Western Oil & Gas Assn., Los Angeles, Calif.; RICHARD FENTON, Exec. Vice Pres., Southern Calif. Plywood Assn., Los Angeles, Calif.; J. M. KAPLAN, Exec. Vice President, Greater Los Angeles Chapter, National Safety Council, Los Angeles, Calif.; T. F. KNIGHT, Jr., Exec. Vice Pres., California Manufacturers Assn., Los Angeles, Calif.; PAUL E. SHEPPARD, Director, Associations Division, National Safety Council, 425 N. Michigan Ave., Chicago, Ill. 60611



National Safety Council

A Membership Organization Dedicated to Protecting Life and Promoting Health

March 21, 2001

Baron & Budd, P.C.
The Centrum
3102 Oak Lawn Avenue, Ste. 1100
Dallas, TX 75219-4281

To Whom It May Concern:

The attached records are kept and maintained in the regular course of business of the National Safety Council, and it is the regular course of business of the National Safety Council to keep and maintain the attached records.

The attached photocopied material is an authentic reproduction of an original file copy of :

NATIONAL SAFETY COUNCIL CONGRESS TRANSACTIONS 1972, VOLUMES 1-5, 7-16,
19-22,25.
National Safety Council, Chicago, IL.

Respectfully,

Robert J. Marecek
Manager, Library

