BULLETIN

HOLMES SAFETY ASSOCIATION

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SAFETY EFFICIENCY

MINERAL INDUSTRIES

April 1992

LAST ISSUE?

See form page 1

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last issue!

In December, we requested your assistance in completing a survey form to update the HSA Bulletin mailing list. Just in case you missed the original announcement, we are giving you another opportunity to continue receiving this Bulletin. This will be the FINAL NOTICE appearing in the HSA Bulletin. If you **DO NOT** return this form, the last HSA BULLETIN you will receive will be the OCTOBER 1992 issue.

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April 1992

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KEEP US IN CIRCULATION

The Holmes Safety Association Bulletin contains safety articles on a variety of subjects: fatal accident abstracts, studies, posters and other safety-related topics. This information is provided free of charge and is designed to assist in presentations to groups of mine and plant workers during on-the-job safety meetings.

Welcome new members

NAME	CHAPTER NUMBER	LOCATION
B & W Commercial Contractors	9624	Morenci, AZ
Grefco, Inc.	9625	Basalt, NV
Pen Service Corp.	9626	Dunlow, WV
Larc Inc.	9627	Wharncliffe, WV
Jim Wilkin Trucking	9628	Pioche, NV
Bell County Coal Corp.	9629	Middlesboro, KY
Eagle Delta	9630	Williamson, WV
Gauley	9631	Oakhill, WV
Grand Junction Concrete	9632	Grand Junction, CO
Kiah Creek Processing	9633	Dunlow, WV
Sheridan Whiterock Bag Plant	9634	Sheridan, AR
Reintjes of Geismar	9635	Geismar, LA
J.A. Riggs – Texarkana	9636	Texarkana, AR
F. H. Stickles & Son, Inc.	9637	Livingston, NY
Acme Brick Co. #1	9638	Ft. Smith, AR
Acme Brick Co. #2	9639	Edmond, OK
Acme Brick Co. #3	9640	Malvern, AR
Williams Brothers Coal Co. Inc.	9641	Mouth Card, KY
Empire State No. 1	9642	Schenectady, NY
Brown & Root Inc.	9643	Grand Junction, CO
Pope County Road Dept.	9644	Russellville, AR
J. A. Riggs Store #3	9645	McGhee, AR
White Park Mill	9646	Mesquite, NV
Sheridan Whiterock Pit	9647	Sheridan, AR
Glen Falls Cement – Mill	9648	Glens Falls, NY
Wolf Pit	9649	Lore City, OH
Acadian Chapter	9650	Baton Rouge, LA
Mate Creek Development, Inc.	9651	North Matewan, WV
Ormet Corporation	9652	Burnside, LA
Anco	9653	Baton Rouge, LA
Capital Security	9654	Coushatta, LA
Belle Colony Mine	9655	Belle Fourche, SD
SCL Pit – Bolsa Road	9656	San Jose, CA
Dann & Wendt Inc.	9657	Rio, WI
Treasure Mine	9658	Dillon, MT
Barretts Mill	9659	Dillon, MT
Beaverhead Mine	9660	Alder, MT
Alder Plant	9661	Alder, MT
Antler Mine	9662	Alder, MT
Green Austin Western	9663	Norris, MT
Red Pioneer	9664	Norris, MT
Twin Oaks Mining Inc.	9665	Turkey Creek, KY
Cheyenne Eagle Coal Co Inc. #2	9666	Phyllis, KY
Cheyenne Eagle Coal Co Inc. #3	9667	Phyllis, KY
Childress Construction Co.	9668	Hi Hat, KY
Pepin – Ireco, Inc.	9669	Ishpeming, MI
Big Sandy Terminal, Inc.	9670	Kenova, WV
United Steelworkers of America	9671	Mina, NV
B & B Excavating, Inc.	9672	Vail, CO
Mountain Spring	9673	Lisbon, OH

Holmes Safety Association
Monthly safety topic

Fatal powered haulage accident

GENERAL INFORMATION: A 46-year-old truck driver received fatal crushing injuries when he was run over by an endloader at a strip coal stockpile at a coal preparation plant.

DESCRIPTION OF ACCIDENT: The crew members arrived at the plant and received work assignments. The endloader operator went to the strip coal stockpile area around 7:30 a.m. and began hauling coal from the stockpile to the coal crusher bin.

About 8:30 a.m., two coal trucks arrived at the site—one driven by the victim. At this time, the endloader was moved to the right side of the stockpile and began pushing up coal. The victim and the other driver were to dump at the extreme left side of the stockpile.

The bulldozer operator (the fourth vehicle working in the area) was working on the left side of the strip coal stockpile when the other truck driver positioned his truck to dump. The driver was having difficulty dumping because his load was partially frozen to the trailer bed. The dozer operator notified the driver to move to an area that had just been leveled to try to dump there. The truck driver backed up against the stockpile but was only able to dump a small amount of coal. He then began trying to free the coal by pulling forward and making a sudden stop. This was tried with only minimal success. The victim positioned his truck about 30 feet to the right of the truck with the frozen load and dumped his load. The victim drove his truck away from the stockpile stopping approximately one truck length in front and to the right of the problem vehicle. The victim exited his truck and walked over to assist in freeing the frozen load.

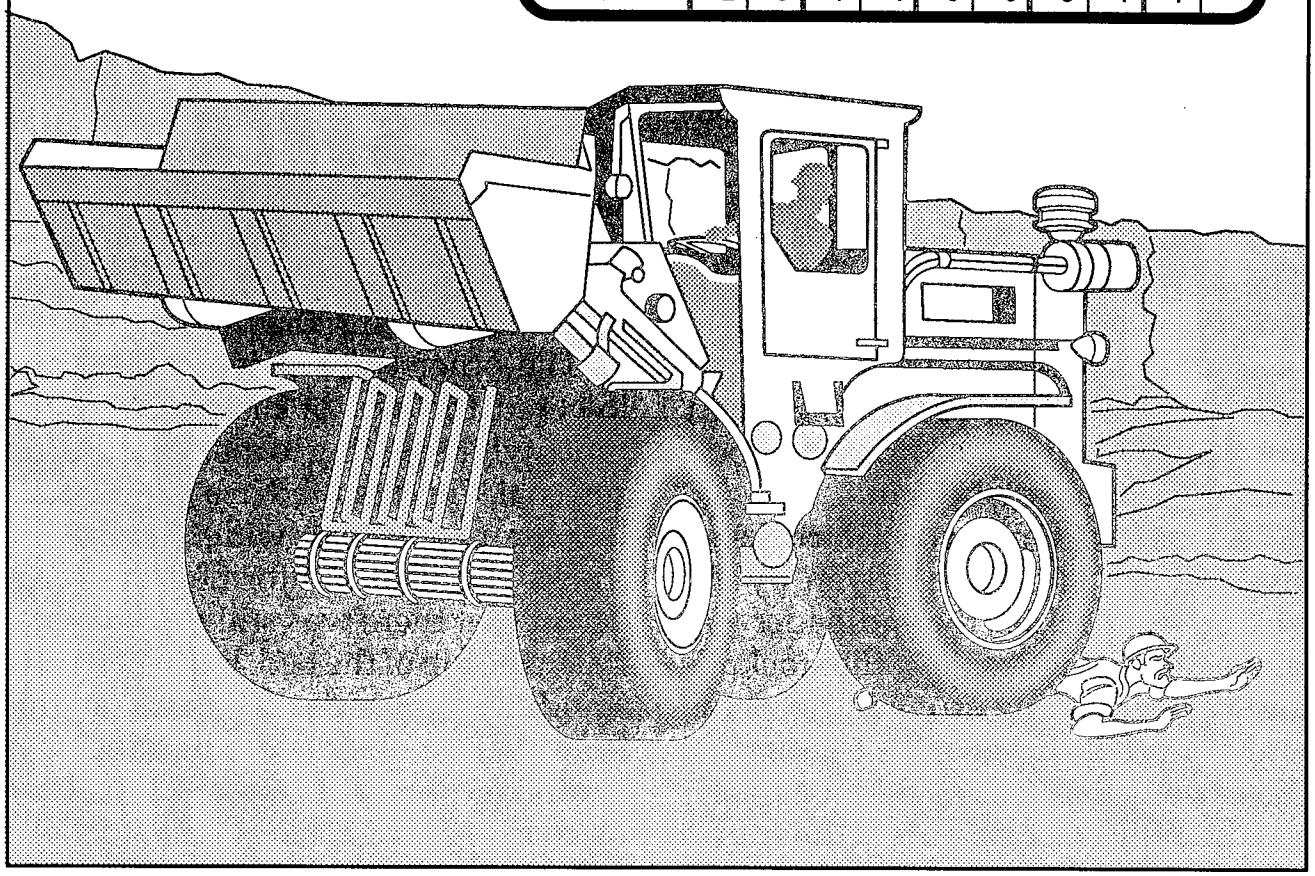
The other truck driver raised and lowered the bed of his truck several times while moving to dislodge the frozen coal. This resulted in a pile, about 5 feet high by 18 feet wide, behind the truck. The victim informed the other driver that there was still frozen material in the top of the bed. Both men were standing alongside the truck at this time. While they were talking, the endloader operator stopped pushing up coal on the right side of the stockpile and crossed behind the problem truck to push up the small piles of coal which had been dumped. While the operator was pushing up the piles of coal, the victim walked back to the rear of the truck to see if the frozen material could be dislodged. The pile of material dumped earlier forced the victim to stand in a position that put him in the path of the endloader.

As the endloader retreated, the victim was knocked to the ground and run over by the rear and front wheels.

The bulldozer operator was pushing up coal and, as he retreated down

Coal mine fatalities to date — thru 02-28-92

Type	1988		1989		1990		1991		1992	
	UG	S	UG	S	UG	S	UG	S	UG	S
Roof fall	—	—	7	—	3	—	5	—	6	—
Haulage	1	3	—	—	2	—	1	1	1	—
Machinery	—	—	—	1	2	—	—	—	—	—
Electrical	—	—	—	—	2	1	—	—	—	—
Other	1	—	—	3	—	5	2	3	—	—
Total	2	3	7	4	9	6	8	4	7	—



the stockpile, he saw the victim lying on the ground and immediately called for assistance.

An ambulance arrived about 9:50 a.m. and transported the victim to the hospital, where he was pronounced dead at 11 a.m.

CONCLUSION: The accident and resultant fatality occurred because the coal company failed to realize the hazards associated with allowing four pieces of equipment to be operated in a very limited area.

Contributing factors to the accident were: the contractor's truck drivers had not received hazard training; the overnight temperature had dropped into the freezing range, causing the load to stick inside the aluminum truck bed; and, the other three pieces of operating equipment (plus the victim's parked truck) were in close proximity, with audible reverse direction warning devices sounding simultaneously, and may have impaired the victim's ability to determine the location of the closest piece of equipment.

Danger! Unsupported roof

Keeping miners out from under unsupported roof requires some new strategies

By Robert F. Peters, Research Psychologist, U.S. Bureau of Mines-Pittsburgh Research Center, Pittsburgh, PA

The number of deaths due to groundfalls has steadily decreased over the past 40 years as a result of improvement in equipment design, increased automation, and better compliance with mine safety laws and company policies. In most years, however, groundfall accidents are still the leading cause of fatalities in underground coal mining. Statistics from the Mine Safety and Health Administration indicate that during the 5-year period from 1984-1988, 106 coal miners were killed by falls of roof and rib, and 4,135 miners were injured.[3]

The Bureau of Mines' (Bureau) Accident Cost Indicator Model was used to estimate the total costs of fatal and lost-time underground coal mining accidents during 1987. Figure 1 shows that fatal groundfall accidents account for a major portion of the total costs of mining accidents. Approximately half (47%) of the victims of these fatal accidents were in an area where the roof was unsupported. These statistics clearly show a great need to identify and to apply techniques that will effectively encourage miners to avoid areas of unsupported roof.

Mining companies try various strategies to convince employees to avoid unsafe acts and to adopt self-protective behaviors. This article evaluates five strategies to discourage miners from going under unsupported roof. These strategies include: incentives and feedback, disciplinary action, fear communication, employee participation, and expression of management concern.

Typical practice

Interviews with many coal miners and mine inspectors throughout the country suggest the following picture of the problem:

- Almost all miners know that going beneath unsupported roof is prohibited by mine safety regulations, and that many people have been killed while under unsupported roof.
- There are no reliable methods for judging whether an area of unsupported roof is about to fall.
- It is usually not difficult to determine where the area of unsupported roof is, and many of those who go beneath unsupported roof are no doubt aware of the fact.

Apparently, from the perspective of those who go beneath unsupported roof, the perceived benefits of this behavior sometimes outweigh the perceived risks.[4] Relatively few miners are going beneath unsupported roof, but those who do repeat the practice rather often.

In a recent study, 143 coal miners from nine different mines were asked to estimate the frequency with which someone in a typical face crew goes beneath unsupported roof.[7] Forty-four

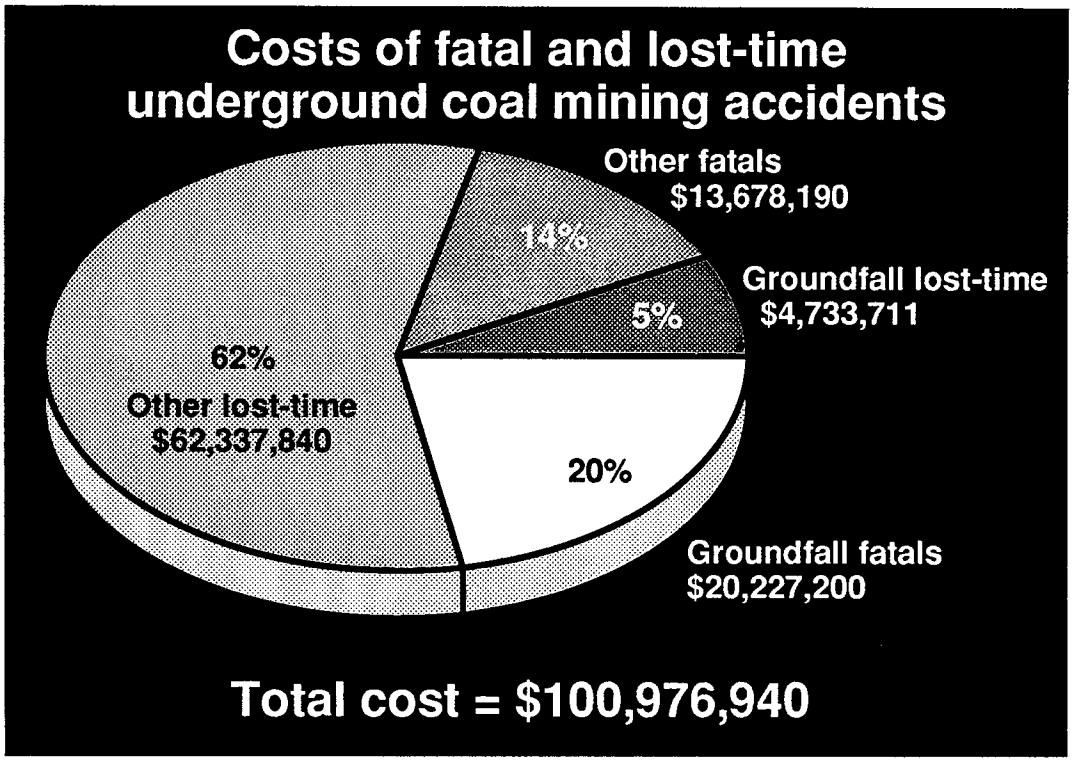


Figure 1.—Groundfall accidents account for 25 percent of lost-time and fatal underground coal mining accidents.

percent estimated that, in a typical crew of face workers, someone goes beneath unsupported roof at least once per shift. Coal miners were also asked to estimate the proportion of face workers who go beneath unsupported roof during a typical month. Most estimates were relatively low—the mid-point of this distribution of estimates was 10 percent.

Much remains to be discovered about the situations and circumstances that prompt miners to go under unsupported roof. The Bureau is currently conducting research to learn more about these situations.

The usual techniques for discouraging miners from this practice appear to be limited to verbal warnings made during safety talks about the danger of going under unsupported roof. In some cases, managers threaten disciplinary action that might be taken.

These techniques, however, have some significant drawbacks. The effects of verbal warnings to avoid dangerous acts or conditions are often of short duration. After employees have heard these warnings a couple of times, further repetition probably has little or no impact. Supervisors are often reluctant to use formal disciplinary actions, because they wish to avoid interpersonal conflicts and various other undesirable responses. Also, due to the layout of a typical underground working section, it is impossible for section foremen to be able to closely monitor what each member of the face crew is doing, and where they are with respect to the last row of roof supports.

As stated earlier, a significant number of miners continue to be killed and injured each year while they are beneath unsupported roof. This suggests that warnings and the creation of regulations or policies which threaten miners with disciplinary actions are not a sufficient answer. Other options, therefore, need to be examined.

Incentive strategies

Incentives have been found effective at improving employee compliance with safety rules in a rather large number of studies.[6] Safety incentive plans are relatively simple to operate. As Sulzer-Azaroff points out, however, there are a number of important decisions to be made in setting them up, and if the wrong choices are made, the plan is apt to be ineffective.[8]

Although incentive plans have been extremely effective in motivating certain types of self-protective employee behavior, there are some difficult problems with using this technique to directly influence miners not to go under unsupported roof. For incentives to affect behavior, it is important that people see a close connection between their actions and the receipt of a positive outcome (or avoidance of a negative outcome) as a result of their action. This means that one must be able to consistently and accurately measure the behavior that one wishes to change. Unfortunately, there is no effective way to assess how often employees go under unsupported roof. Direct observation is not a feasible alternative. Until it is possible to come up with a good way to assess how often miners go under unsupported roof, it will not be possible to set up a system to reward people for doing it less often.

Although it does not appear possible to tie rewards to how often people do not go under unsupported roof, it is feasible to reward people for doing things that make it less likely that miners will go under unsupported roof, that is, the precursors of the undesired behavior. For example, miners might be reluctant to use safety jacks to support the roof, because the jacks are covered with dirt and grit, or because they are often not kept where they should be. In such a situation, a system could be set up to randomly check the location and condition of the jacks to see if they are readily available, clean and easy to use. A reward could be given to crews working in sections when jacks are found to be in their proper place and proper condition. A similar procedure could be used to ensure that warning devices are posted at the edge of areas of unsupported roof.

The following are some things that might be done to maximize the effectiveness of this strategy:

- Find a baseline by looking at data from prior time periods, for example, last month.
- Establish a specific criterion of success for earning the reward.
- Give rewards for small, but significant improvements in performance.
- Rewards should be relatively small, and should be given relatively often, for example, monthly.
- Rewards might include exchangeable tokens (like, trading stamps), ball caps, pocket knives, stickers, promotional items, public commendations, written commendations, certificates, stock in the company, money, a chance to win contests, and work-related privileges.
- Supplement the incentive program with education—why it is important to stay away from unsupported roof, roof fall accident statistics, how to perform various tasks without exposing oneself to unsupported roof, etc.

In summary, there may be situa-

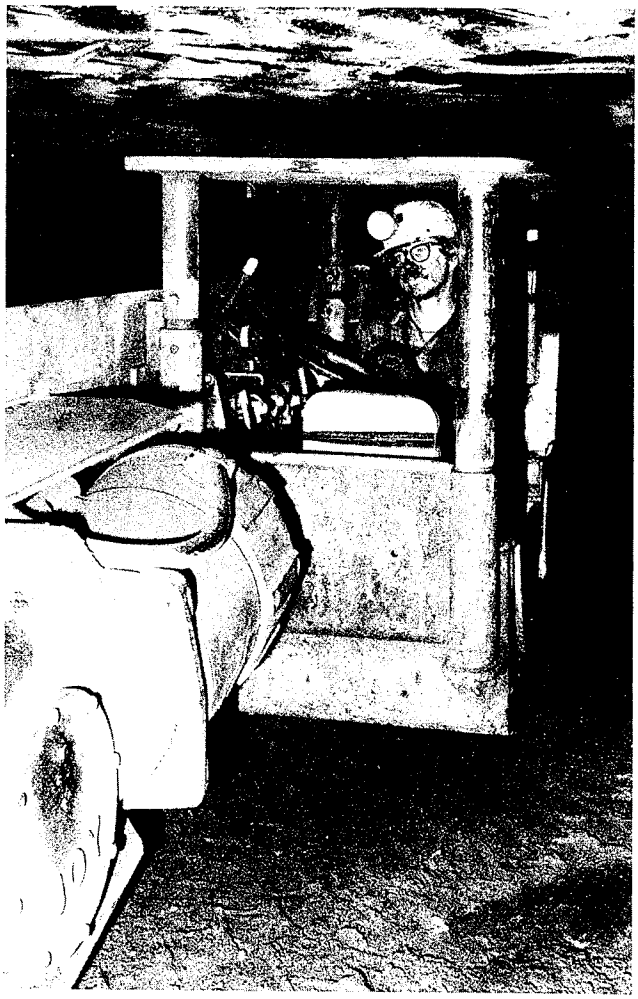
tions in which rewards and feedback could be used to make it less likely or less tempting for miners to go inby supports. Rewards would have to be tied to precursors of the behavior, however, not to the behavior itself. The costs involved in this strategy include the cost of the rewards or privileges being offered as incentives, and the time required to take periodic measurements of performance on the desired behaviors.

Disciplinary actions

Many companies use threats of disciplinary penalties to discourage unsafe employee behaviors. Very little, however, is known concerning the extent to which disciplinary procedures are actually applied, or whether they are effective at discouraging unsafe acts. Sulzer-Azaroff argues that many attempts to improve safety through the application of disciplinary actions are not very effective, because the reinforcement conditions are less than optimal.[5] The unwanted consequences of unsafe acts are often too infrequent, intermittent or delayed. The most effective application of unwanted consequences requires monitoring individuals continuously in order to catch and apply unwanted consequences following each unsafe act. In underground mining, it is impractical to do this.

Another drawback to the use of this strategy is that foremen may be unwilling to enforce the rules. As McGee points out, it is easy to make the rules, but difficult to invoke the penalties.[5] The first is an impersonal act, whereas the second is highly personal. A section foreman may refrain from threatening an employee with punishment, because he thinks that the employee (and perhaps others in the crew) will become hostile and uncooperative.

Individuals who are punished form judgments about whether the punishment was fair, and their perception of its fairness will guide their responses to the punishment. It is important that perceptions of inequity be minimized, because inequity can lead to many types



of employee behavior that are detrimental to the organization and to other employees, for example, frustration, apathy, absenteeism, sabotage or theft. Arvey proposes that judgments about the fairness of disciplinary actions are likely to be based on the following: the individual's knowledge about the ac-

tual rule infraction committed - whether the punishment somehow "fits the crime;" and whether other employees have committed similar offenses yet have gone unpunished.'[1]

It is very questionable whether disciplinary action should be viewed as an appropriate initial response to most types of undesired employee behavior. Its use, however, is more apt to be viewed as acceptable in situations where an individual is at high risk of being seriously harmed if his behavior is not changed quickly, as when employees fail to take a safety precaution that could cost lives.

In comparison to other strategies for discouraging miners from going under unsupported roof, the use of disciplinary action is more difficult to carry out effectively and is more likely to produce various forms of undesirable employee responses. The following are some things that might be done to maximize the effectiveness of this strategy and to minimize its negative side effects:

- Get input from section foremen and representatives from the hourly workforce in formulating policies about how to deal with people who go under unsupported roof. Employees are less likely to object to the use of disciplinary actions when employee representatives have voiced their support for it.
- An unambiguous policy on the organization's expectations concerning employee safety-related behavior is needed. This policy should clearly delineate the conditions under which negative sanctions will be applied,

Canopy saved the miner in this roof fall

should explain why it is important to the company and the employee that people do not go under unsupported roof, and should be communicated to the workers on a regular basis.

• Section foremen should be trained in the proper procedures for correcting unsafe employee behavior. They should be shown role models interacting with miners who are found doing something under unsupported roof, and should participate in role-playing exercises on how to handle this situation. It should be explained to foremen how important it is that they never ignore miners who they find under unsupported roof. When foremen ignore this behavior, they may be sending an implicit message to their crew that they either do not care whether people go under unsupported roof, or that they actually condone going under unsupported roof. It is crucial that the rules are enforced in a consistent manner.

• The disciplinary action should be applied soon after the infraction.

• The disciplinary action should be applied fairly and consistently—from situation to situation and from person to person.

The costs involved in this strategy include: the time and resources needed to formulate the policy and communicate it to the workforce; the costs associated with training foremen; the costs associated with finding and training replacements for employees who are disciplined through suspension, termination or transfer to a different job; and the costs associated with the reactions of those who believe they have been unfairly disciplined (work slowdowns, grievances, absenteeism, sabotage). Another drawback to this strategy is that it may not be effective at stopping foremen who go under unsupported roof. Because higher-level managers at most mines are seldom present at underground work sites, the

MSHA inspector seated under canopy modeling position in which the operator survived a major-roof fall.

foreman's behavior is largely unmonitored.

This strategy should not be the sole method or the predominant method for preventing miners from going under unsupported roof. It should be used in conjunction with other strategies.

Fear communication

Fear messages are a commonly used strategy for encouraging self-protective behavior. Fear messages may emphasize threats to physical safety, emotional health, social functioning, financial well-being, or other risks. Leventhal argues that the most effective use of fear includes a threatening message followed by appropriate and effective recommendations.[4] Those who make use of fear messages hope that employees will perceive the recommended behavior as leading to a reduction of the threat, and that they will begin following the recommended actions.

Research shows that these messages often produce significant changes in attitudes and intentions to perform self-protective acts (or avoid unsafe acts). Only a small number of studies have shown, however, that they had a long-term impact on behavior. Often, training designed to increase employees' fear of an accident has, at best, only a short-term impact on behavior.

One should not rely too heavily on fear messages as a means of stopping miners from going under unsupported roof. They are likely, however, to be beneficial for people who have never before worked underground. To many new employees, going under unsupported roof is likely to be viewed as a harmless behavior. Unless someone explains some of the basic concepts of roof support, people who have never worked underground are apt to have very little natural inclination to believe that roof with bolts in it is less likely to fall on them than roof without bolts or other supports. It is not intuitively obvious why bolts that are only a few feet in length are effective in supporting the thousands of tons of rock that lies above. Also, it is very likely that if they walked under unsupported roof a few times, nothing would fall on them. This would, unfortunately, tend to make them even less afraid.

Research suggests that the following are likely to maximize the effectiveness of fear communications:

- The message should attempt to evoke a high (versus low) level of fear—high fear of personal injury or death due to a roof fall accident, and high fear of the consequences of one's death or disability on one's family.
- It should be made clear that staying away from unsupported roof is an effective deterrent to being harmed by a roof fall.
- The actions that are suggested for avoiding unsupported roof should be relatively detailed and specific. The message needs to show how various tasks can be performed without exposing oneself to unsupported roof. It needs to show exactly what types of situations are likely to cause miners to go under unsupported roof and how these situations can be avoided.
- The source of the communication should have high credibility.
- Face-to-face, two-way forms of communication should be employed (as well as other forms).

• Efforts should be made to promote acceptance of the message by those who work in underground production crews and anyone who supervises these employees.

The costs involved in this strategy are minimal. They would include the time and resources needed to plan and execute the communication on a periodic basis. Unfortunately, there appears to be very little available in the way of films or other forms of communication that are apt to produce a high level of fear or reluctance to going under unsupported roof. The Bureau is planning to generate suitable materials as part of future research on this issue.

Employee participation

There is virtually unanimous agreement among safety experts that employees should be frequently consulted for ideas about improving their safety, and that they should be given a hand in establishing new safety procedures and policies. Because they work underground every day, miners are in a good position to understand what types of situations come up that make it tempting to go under unsupported roof. They also may have some good ideas about how these situations could be avoided.

Therefore, it would be beneficial for mine managers to take advantage of their employees' insights into this issue by soliciting their ideas and opinions. Miners should be asked to identify situations that are likely to tempt people to do things under unsupported roof, and to suggest what might be done to prevent these situations from occurring. This could be accomplished through interviews, surveys or small group discussions.

Survey results may help to reveal aspects of equipment, work procedures, or policies that may inadvertently encourage miners to do things under unsupported roof. The results may also be useful in identifying changes that would prevent situations from arising which may tempt miners to continue that practice. Survey results can also be a useful means of eliciting group discussions about the problem and how to resolve it. Getting people to talk about the dangers of going under unsupported roof and how to prevent this behavior would be a valuable supplement to the traditional lecture method of teaching about this issue.

The costs associated with soliciting input from the workforce include: the time and effort that are required to develop and to administer interviews or questionnaires; the compilation of survey results; and the organization of meetings with employees in order to discuss the survey findings and their implications. These costs may add up to be more sizeable than the costs of the other strategies reviewed in this article. Several studies on safety programs found, however, that the benefits of obtaining greater employee participation exceeded the costs.

Management concern

It is crucial that miners actually believe that upper management does not want employees to go under unsupported roof under any circumstances. As DeJoy notes, "attempts to influence the hazard-related beliefs of employees and to provide the resources necessary to support safe behavior may not

Table 1.—Evaluation of each strategy's potential for keeping miners away from unsupported roof.

Strategy	Chance of reducing behavior	Side-effects	Cost
Incentives and feedback	Average	Positive	Varies
Disciplinary actions	Uncertain	Negative	Average
Fear messages	Uncertain	Neutral	Below average
Employee participation	Above average	Positive	Average
Expressions of management concern	Above average	Positive	Below average

be successful if employees perceive that management values productivity to the extent that unsafe behavior is tolerated or even indirectly encouraged."[2] This suggests that top-level mine managers need to periodically voice their commitment to the goal of staying away from unsupported roof in all circumstances—even when it means that coal production must be delayed.

Table 1 lists the five strategies that have been identified as potential ways to encourage miners to stay away from unsupported roof and rates them on each of three dimensions. Although it may be possible to eliminate some of the circumstances that prompt people to go under unsupported roof, it may be many years before it is possible to eliminate all of them.

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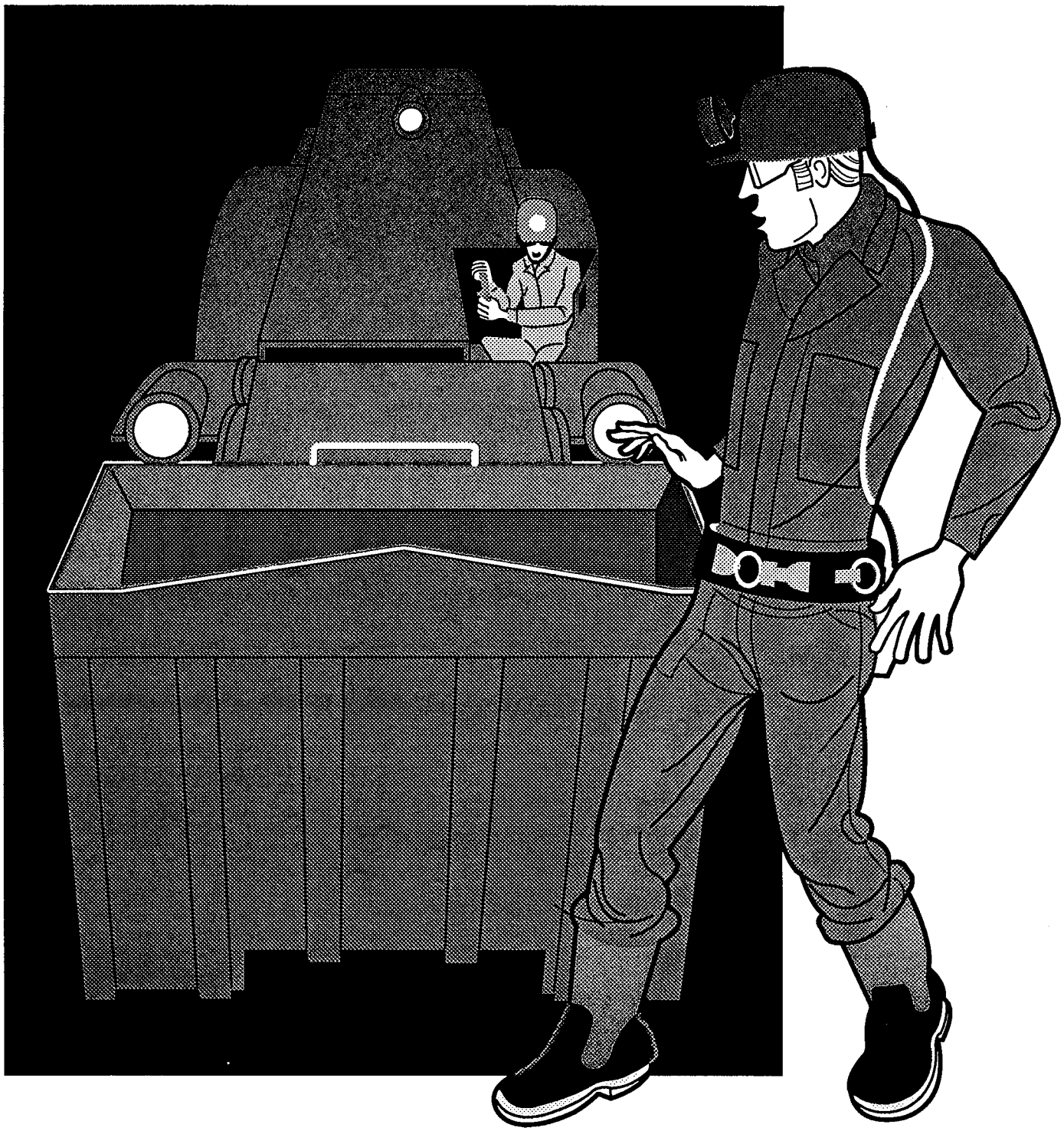


Stay *CLEAR* of moving equipment

'Safety in welding and cutting' details practices and procedures

ANSI rule covers labeling, ventilation, protective equipment, and individual responsibilities

By August F. Manz, Director-at-Large, American Welding Society, Miami, Florida

Proper labeling, ventilation, physical protection and fire prevention are among the key elements of welding safety. These points are discussed in detail in "Safety in Welding and Cutting" (ANSI/ASC Z49.1-88). The latest edition, published by the American Welding Society (AWS), is an update of the 1983 version, and is printed in a new two-column format—the standard is on the left with pertinent commentary on the right.

New labeling

An important, industry-wide labeling practice that indicates specific hazard levels is followed in the standard. In essence, the practice requires that the signal word:

- "Danger" appear on things that can kill;
- "Warning" appear on things that can cause serious harm or injuries;
- "Caution" appear on things that cause minor injuries.

This three-tier labeling procedure anticipates the expected ANSI Z535 Standard, which outlines an industry-wide labeling system.

Following the signal words "danger," "warning" or "caution," which identify hazard levels, labels describe the hazard and its consequences and list the appropriate precautionary measures. The AWS "Safety in Welding and Cutting" standard spells out these measures:

"Before use, read and understand manufacturers' instructions, Material Safety Data Sheets (MSDSs), and your employers' safety practices." The standard points out that MSDSs are required by OSHA standard 29 CFR 1910.1200.

"Keep your head out of fumes." Fume plumes are the clearly visible columns of fumes that rise directly from the welding or cutting action.

Use enough ventilation, exhaust, or both to keep fumes and gases from your breathing zone and the general area."

Adequate ventilation is defined by five factors:

- Volume and configuration of the spaces in which operations occur;
- Number and type of operations that generate contaminants;
- Allowable levels of specific toxic or flammable contaminants which are generated;
- Natural air flow;
- Location of the welders', and other persons', breathing zones in relation to the contaminants or sources.

The recommended method to de-

termine adequate ventilation is to sample for the composition and quantity of fumes and gases to which personnel are exposed.

Physical protection

In addition to ventilation, the AWS standard cites requirements for adequate physical protection.

"Wear correct eye, ear, and body protection." Requirements for protective clothing are detailed; eye and face protection must comply with ANSI Standard Z87.1, "Practices for Occupational and Educational Eye and Face Protection." An updated filter selection guide helps determine the appropriate lens shades.

Welding helmets with filter plates protect against arc rays, weld sparks, and spatter that strike directly against the helmet. But they are not intended to protect against slag chips, grinding fragments, wire wheel bristles, and similar hazards that can bounce or ricochet under the helmet. Spectacles with side shields, goggles, or other appropriate

eye protection must be worn to protect against these hazards.

Protective, flame-resistant gloves made of leather or other suitable materials are recommended. Insulated linings should be used to protect body areas exposed to high radiant energy. In production work, flame-resistant leggings or sheet-metal screens in front of workers' legs provide protection against sparks and molten metal in welding and cutting operations.

Preventing contamination

Other requirements of the new AWS standard include special precautions for working in confined spaces. According to the new commentary, service equipment must be located to prevent contamination of the atmosphere in confined spaces. This contamination may come from leaks in gas cylinders or fumes from welding power sources or similar equipment.

The standard also points out that brazing furnaces are, in many respects, a type of confined space. Brazing furnaces employ a variety of atmospheres to exclude oxygen during the brazing process. Potential hazards in operating brazing furnaces are:

- Personnel entering or working in adjacent areas may be asphyxiated where there is insufficient oxygen in the atmosphere to support life.
- Explosive mixtures of flammable gas and air can develop within the furnaces during generation or venting of atmospheres in them.
- Hazardous fumes or gases can accumulate in the work area due to the brazing process.

Individuals responsible

Job supervisors play a key role in providing a safe work site by making sure that conditions remain safe and ready for use. This can be aided by installing a mandatory "hotwork" authorization program. "Hotwork" is defined in the standard as any work involving burning, welding, or similar fire-producing operations.

Managers, job supervisors, and welders must be certain that there is fire protection equipment around welding and cutting sites. Supervisors should assign fire watchers as needed.

Fire watchers, as explained in the AWS standard, are persons assigned to work with welders to watch for fires resulting from welding, cutting, and brazing operations. The standard states that fire watchers, ***especially,*** must watch for fires in areas not readily ob-

served by welders, such as on opposite sides of walls, levels below, or hidden areas. They also must observe work areas for at least half an hour after the welders have left.

As many know, safety is a responsibility shared among managers, supervisors and welders. At the highest level, management should ensure that supervisors and workers are trained in proper welding safety practices. Supervisors, then, are responsible for handling equipment and on-site processes safely. Welders, the third link in the safety chain, must understand hazards and safe equipment operations; they should follow procedures spelled out in standards, manufacturers' instructions, MSDSs, and company policies. This joint responsibility, fully exercised by all three parties under the guidance of the new AWS Z49.1 "Safety in Welding and Cutting" standard, maximizes safety.

Reprinted from the May 1990 issue of ***Occupational Health & Safety*** *magazine.*

Handling and storage of compressed gases

The two common compressed gases used in the coal industry are oxygen and acetylene. Proper safety procedures must be followed to insure the safe use of these gases. Improper use of oxygen and acetylene can result in accidents which cause property damage, injury, and death. Follow the proper safety precautions when using, storing, handling, or transporting compressed gases.

Caution

Check cylinders for proper identification. When a cylinder label is not legible or is missing, the cylinder must be removed from service and returned to the supplier.

Secure cylinders during transportation, storage, and use to prevent accidental falls or movement. Remove the gauges and cap the cylinders when transferring from one location to another.

Points to remember

- Oxygen is stored in tanks under pressure as high as 2,200 pounds per square inch (P.S.I.).
- Always cap and secure the cylinder when not in use. If the valve is not protected and is broken off, the sudden release of pressure may cause the tank to become airborne.
- A violent fire may occur when oxygen comes in contact with oil, grease, and fuel. Spontaneous combustion is always a threat with oxygen, even without the presence of sparks, arc or flame.
- Acetylene cannot be safely compressed above 15 P.S.I.
- Acetylene tanks are filled with a porous substance such as asbestos or cement and saturated with acetone, which absorbs up to 300 times its volume.
- Maintain acetylene cylinders in an upright position or with the valve end raised to a minimum angle of 30 degrees to prevent acetone from being pulled from the cylinder.
- Store cylinders in a cool place and keep the valve cover on when not in use.
- Always make methane checks before

lighting torches and then frequently during use.
• Oxygen and acetylene should be used only in well ventilated areas.
• Oxygen is not compressed air; do not refer to it or use it as compressed air.

Remember these safety tips

• Cylinder valves must be free of all oil, grease and dirt.
• Blow out the cylinder valves before attaching the regulators to the cylinders by slightly opening the valve.
• Release the adjusting screw on the regulator before opening the valve.
• Stand to one side of the regulator before opening the cylinder valve.
• Open the cylinder valve slowly.
• Purge the oxygen and acetylene hoses individually before lighting the torch.
• Light the acetylene before opening the oxygen valve on the torch.
• Never use oil on regulators, torches, fittings, or other equipment in contact with oxygen.
• Do not use oxygen as a substitute for air.
• Check for methane. Keep work area free of anything that will burn. Have firefighting equipment available.
• Never use gas from a cylinder without a regulator.
• Always secure cylinders before removing cap.
• Always close valves on empty cylinders.
• Check work area for smoldering or burning materials after use.

Compressed gases safety quiz

Indicate whether answer is true or false.
1. Use of compressed gases is not hazardous when proper safety procedures are followed.
2. It is not necessary to secure cylinders during transportation.
3. Oxygen is stored in tanks under pressures as high as 2,200 P.S.I.
4. Oxygen will spontaneously combust without the presence of a flame.
5. Acetylene tanks are filled with a porous substance such as asbestos or cement and saturated with acetone.
6. Acetylene cylinders can be in a flat position during use.
7. Protective equipment should be worn when cutting or welding.
8. Fire-fighting materials should be available before starting, cutting, or welding operations.
9. Methane tests should be made only during welding and burning operations.
10. Cylinder valves should be blown out before attaching the regulators.

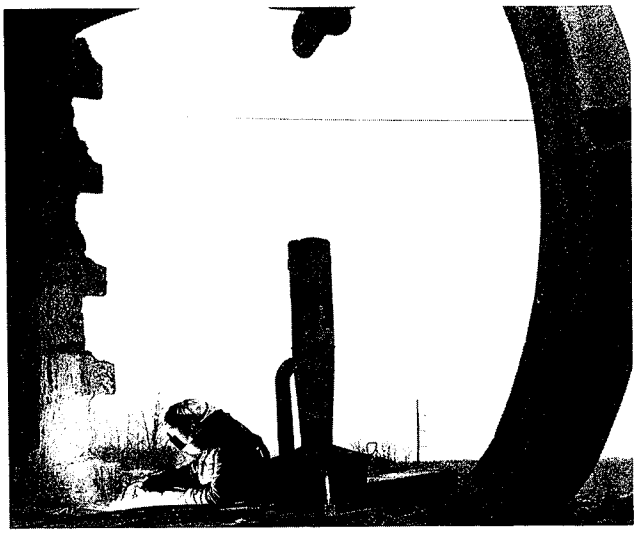


Photo by William Branson

ANSWERS: 1. F; 2. F; 3. T; 4. T; 5. T; 6. F; 7. T; 8. T; 9. F; 10. T.

Reprinted from the August 1988 issue of ***Topic-of-the-Month*** *published by Virginia Department of Mines.*

Holmes Safety Association
Monthly safety topic

Fatal powered haulage accident

GENERAL INFORMATION: A 57-year-old truck driver with 20 years of experience was fatally injured when he was run over by a backing-up dump truck.

The operation was a county-owned pit with a pumice and screening plant for cinder material on land leased from the Federal Government. A total of 15 persons were employed at the pit at any given time. The intermittent operation worked one, 8-hour shift, 5 days a week.

The cinder material was pushed down the slope of the mountain with a dozer to a stockpile area near the main hopper. A front-end loader was used to feed the plant from the stockpiled material. The material was transferred by conveyors, screened and conveyed to strategic stockpiles. The different sized materials were then transported by truck to various parts of the county.

DESCRIPTION OF ACCIDENT: A dozer operator stated he arrived at the pit on the morning of the accident around 6:45 a.m. He checked out and started the dozer to let it warm-up, and then walked up on a pile of dirty cinders next to where the dozer was parked. The dozer operator also stated he saw the victim arrive for work at 7:00 a.m.

Around 7:25 a.m., the dozer operator walked down the cinder pile towards his dozer when he saw another truck driver arrive in his truck, stop and then start to back up into the cinder pit. The dozer operator did not notice anything until he reached the dozer and glanced over towards the truck and saw the victim lying on the ground in front of the truck. The dozer operator and the truck driver immediately went to assist the victim.

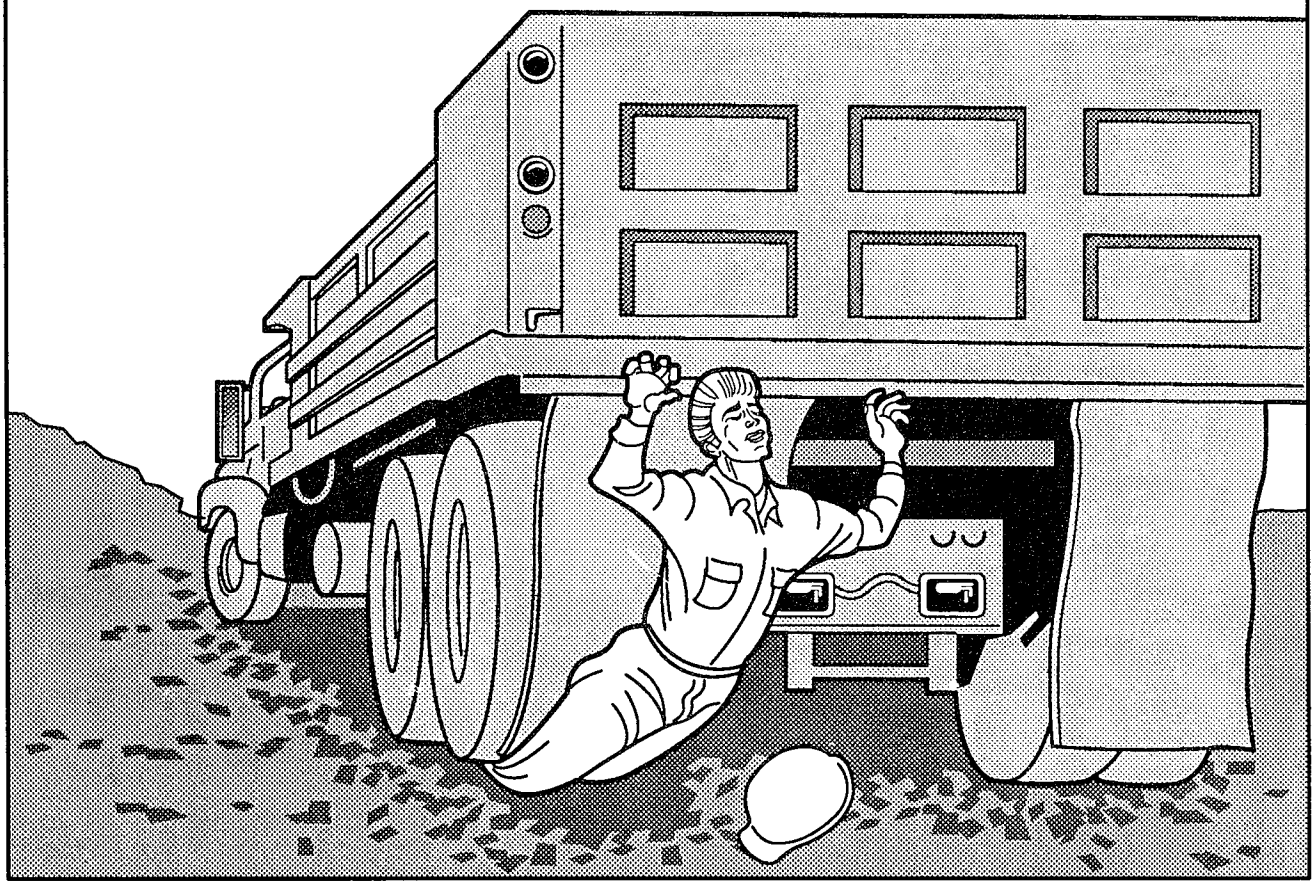
The truck driver stated he could not see very well when backing into the pit because the sun was just coming up and was reflecting into his eyes through the rear view mirrors.

Because there were no witnesses to the accident, it was believed that the victim walked behind the backing truck towards a front-end loader he planned to use to load his truck. It was also believed that the victim was distracted and was looking away from the backing truck, perhaps in the direction of the dozer operator, when he was struck and run over.

The truck driver used his truck radio to notify the county roads dispatcher to call an ambulance, which arrived at approximately 7:45 a.m. The victim was given first aid by the ambulance crew and transported to the hos-

Metal and Nonmetal mine fatalities to date — thru 03-10-92

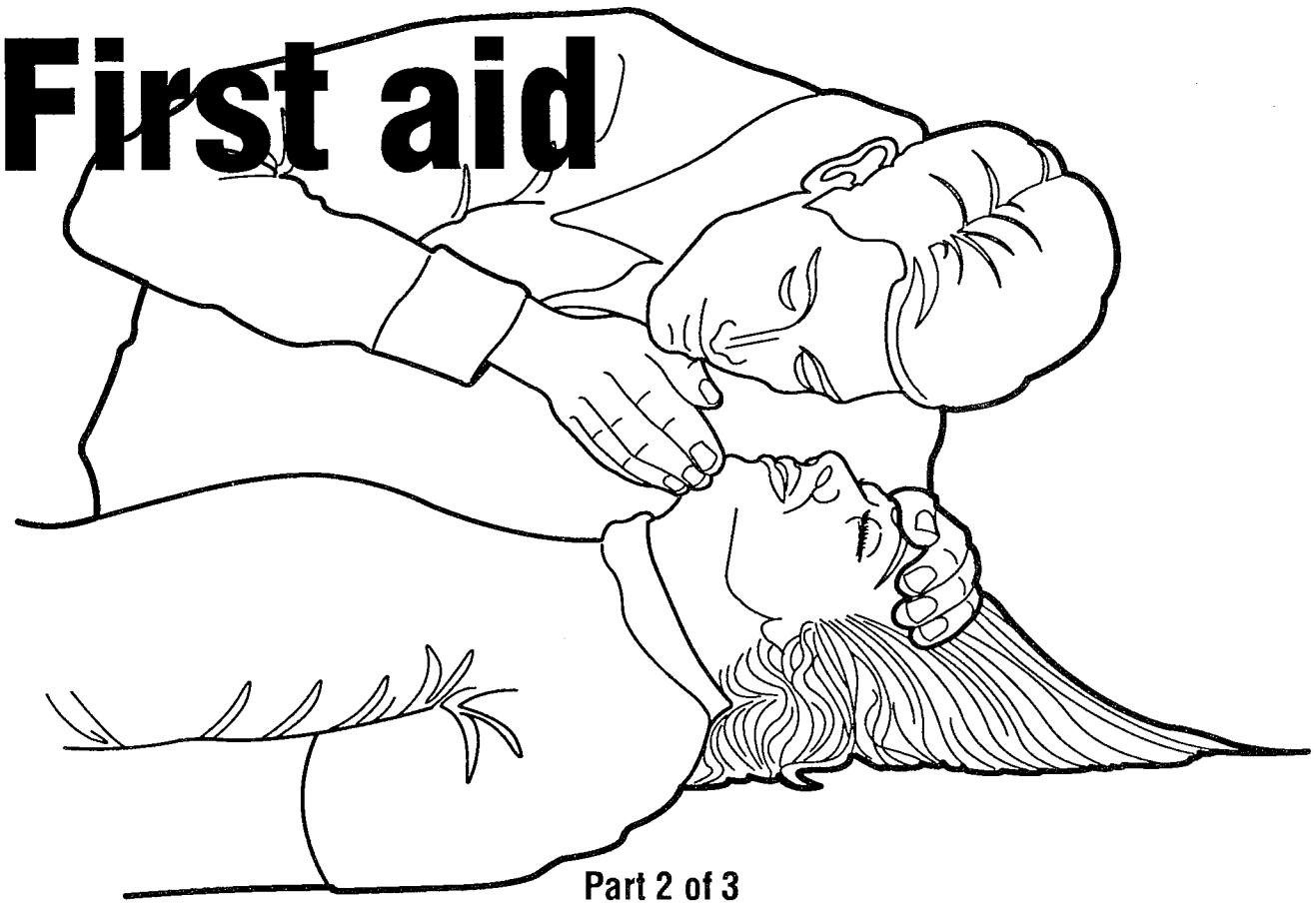
Type	1988		1989		1990		1991		1992	
	UG	S	UG	S	UG	S	UG	S	UG	S
Electrical	—	—	—	—	—	—	—	3	—	—
Fall of roof/back	—	—	2	—	1	—	—	—	—	—
Haulage	—	2	—	1	—	3	—	—	1	—
Machinery	—	1	—	—	—	1	—	—	—	1
Other	—	3	1	6	1	1	1	3	—	1
Total	—	6	3	7	2	5	1	6	1	2



pital where he died at 9:51 a.m. from massive crushing injuries.

CONCLUSION: The cause of the accident was the inoperable back-up alarm failing to warn the victim of approaching danger. A contributing cause was the victim placing himself in a hazardous position (in the pathway of a backing truck).

First aid



Part 2 of 3

Specific body area injuries

Nose bleed, dental, and chest injuries

Nosebleeds

Severe nosebleed frightens the victim and often challenges the first aider's skill. Most nosebleeds are self-limited and seldom require medical attention. However, in cases with head or neck injuries, stabilize the head and neck for protection. In some cases, enough blood could be lost to cause shock.

Types of nosebleeds

- *Anterior* (front of nose). The most common (90%); bleeds out of one nostril.
- *Posterior* (back of nose). Massive bleeding backward into the mouth or down the back of the throat; bleeding starts on one side, then comes out of both nostrils and down the throat; serious and requires medical attention.

First aid

Most anterior (front of nose) nosebleeds can be stopped by these simple procedures:

- Reassure and keep the victim quiet. Though a large amount of blood may appear to have been lost, most nosebleeds are not serious.
- Keep the victim in a sitting position to reduce blood pressure.
- Keep the victim's head tilted slightly forward so that the blood can run out the front of the nose, not down the back

of the throat, which may cause choking or nausea and vomiting. The vomit could be inhaled into the lungs.

- If a foreign object in the nose is suspected, look into the nose, but do not probe with a finger or swab.
- With thumb and forefinger, apply steady pressure to both nostrils for 5 minutes before releasing. Remind the victim to breathe through his or her mouth and to spit out any accumulated blood.
- If bleeding persists, have the victim gently blow the nose to remove any clots and excess blood, and to minimize sneezing. This allows new clots to form. Then, press the nostrils again for 5 minutes.
- Some experts recommend gently placing inside the bleeding nostril a cotton ball that has been soaked in hydrogen peroxide, a nasal decongestant, or plain water. Sometimes lack of time or materials prevent using this procedure.
- Some authorities suggest placing a roll of gauze (diameter of a pencil in size) between the upper lip and teeth and pressing against it with your fingers to stop the blood flow.
- Apply ice over the nose to help control bleeding.
- If the victim is unconscious, place the victim on his or her side to prevent inhaling of blood and attempt the procedures in the above list.
- Seek medical attention if any of the following occurs:

1. The nostril pinching does not stop the bleeding after a second attempt.
2. Signs and symptoms suggest a posterior source of bleeding.
3. The victim has high blood pressure, is taking anticoagulants (blood thinners) or large doses of aspirin.
4. Bleeding occurs after a blow to the nose (suspect a broken nose). Most nosebleed victims never need medical care since nosebleeds are self-limited, and the victim can control the bleeding.

Care after a nosebleed

After a nosebleed has stopped, suggest to the victim:

1. Sneeze through an open mouth, if there is a need to sneeze.
2. Avoid bending over or too much physical exertion.
3. Elevate the head with two pillows when lying down.
4. Keep the nostrils moist by applying a little petroleum jelly just inside the nostril for a week; increase the humidity in the bedroom during the winter months with a cold-mist humidifier.
5. Avoid picking or rubbing the nose.
6. Avoid hot drinks and alcoholic beverages for a week.
7. Avoid smoking or taking aspirin for a week.

Dental injuries

The following first aid procedures provide temporary relief for dental emergencies, but it is important to consult with a dentist as soon as possible.

Objects wedged between teeth

- Attempt to remove the object with dental floss. Guide the floss in carefully so the gum tissue is not injured.
- Do *not* use a sharp or pointed tool to remove the object. If unsuccessful, take the victim to a dentist.

Bitten lip or tongue

Apply direct pressure to the bleeding area with a sterile gauze or clean cloth. If the lip is swollen, apply a cold compress. Take the victim to a hospital emergency room if the bleeding persists or if the bite is severe.

Knocked-out tooth

More than 2 million teeth are accidentally knocked out in the United States each year. More than 90% of them can be saved with the proper treatment.

- When a permanent tooth is completely knocked out, save it and take it, along with the victim, to the dentist immediately. With proper first aid procedures, the tooth may be successfully reimplanted in the socket.
- Do *not* put the tooth in mouthwash or alcohol or scrub it with abrasives or chemicals. And do ***not*** touch the root of the tooth.
- Place the tooth in a cup of cold whole milk. Avoid low fat or powdered milk or milk byproducts such as yogurt.
- Take the victim and tooth to a dentist immediately (within 30 minutes). Some experts recommend that the tooth be placed in the victim's mouth to keep it moist until dental treatment is available. This method, though convenient, presents the risk, especially in children, of the tooth being accidentally swallowed.
- A partially extracted tooth can be pushed into place without rinsing the tooth. Then seek a dentist so the loose tooth can be stabilized.
- If in remote areas with no dentist nearby, replant a knocked-out tooth by first running cool water over it to clean away debris (do ***not*** scrub the tooth), and then by gently repositioning it in the socket, using adjacent teeth as a guide. Push the tooth so the top is even with the adjacent teeth. Successful replanting occurs best within 30 minutes of the accident. See a dentist as soon as possible.

Broken tooth

- Immediate attention is necessary when a tooth breaks since it may need to be extracted. Attempt to clean any dirt, blood, and debris from the injured area with a sterile gauze or clean cloth and warm water.
- Apply a cold compress on the face next to the injured tooth to minimize swelling.
- If a jaw fracture is suspected, immobilize the jaw by any available means—place a scarf, handkerchief, tie, or towel over and under the chin, and tie the ends on top of the victim's head. In either case, immediately take the victim to an oral surgeon or hospital emergency room.

Toothache

- Rinse the mouth vigorously with warm water to clean out debris.
- Use dental floss to remove any food that might be trapped between the teeth.
- Do ***not*** place aspirin on the aching tooth or gum tissues.
- If a cavity is present, insert a small cotton ball soaked in oil of cloves (eugenol). Do ***not*** cover a cavity with cotton if there is any pus discharge or facial swelling. See a dentist as soon as possible.

Although temporary relief can be provided in most dental emergencies, by all means, when in doubt, consult a dentist as soon as possible.

Chest injuries

Chest wounds may be either **open** or **closed. Open chest wounds** are caused by penetrating objects. **Closed chest wounds** result from blunt blows.

Signs and symptoms

Important signs of chest injuries include:

- Pain at the injury site
- Breathing difficulty
- Blueness of the lips and/or fingernail beds, indicating oxygen deficiency (cyanosis)
- Coughing or spitting up blood
- Bruising or an open chest wound
- Failure of one or both sides of the chest to expand normally when inhaling

Types of chest injuries and first aid

Rib fracture. The victim can usually point out the injury's exact location. Deep breathing, coughing, or movement is usually quite painful. There may or may not be a rib deformity, bruise, or laceration of the area. Shortness of breath, severe coughing, or coughing up blood all indicate a major injury rather than a simple rib fracture.

Do *not* bind, strap, or tape a rib fracture. Such wrapping predisposes the victim to pneumonia. Instead, the victim can hold a pillow against the injured area. Instruct the victim to take deep breaths to prevent pneumonia. With multiple rib fractures, the victim may be more comfortable with the arm strapped to the chest with a sling and several swathes.

Flail chest. A rib fracture involving three or more adjacent ribs that are broken in more than one place is known as a **flail chest** and represents a serious injury. The chest wall may move in the opposite direction to the rest of the chest wall during breathing (called **paradoxical breathing**). Stabilize the ribs by holding a pillow against them to improve breathing. Place the victim in a semi-sitting position, inclined to the injured side to assist breathing.

Penetrating wound. This wound must be closed quickly to prevent outside air from entering the chest cavity. Do ***not*** remove or attempt to remove an impaled object because bleeding and air in the chest cavity can occur. Stabilize the object in place with bulky dressings and pads.

Sucking chest wound. Have the victim take a breath and let it out; then seal the wound with anything available to stop air from entering the chest cavity. A household plastic wrap folded several times works well, or you can use your hand. Be sure that the wrap is several inches wider than the wound. Place a dressing over the plastic wrap, and tape it in place, leaving one corner untaped. This creates a flutter valve that prevents air from being trapped in the chest cavity. If the victim has trouble breathing, remove the plastic cover to let all air escape, then reapply.

Reprinted from the National Safety Council's publication: ***First Aid and CPR; Level 2.***
First Aid Institute, National Safety Council,
444 N. Michigan Ave., Chicago, IL 60611.

First aid quiz

Nosebleeds

Choose the best techniques for controlling most nosebleeds.

1. A. Place victim in a sitting position.
   B. Position victim lying down.
2. A. Keep the head tilted or slightly backward.
   B. Keep the head tilted slightly forward.
3. A. Pinch both nostrils for 5 minutes.
   B. Pinch only one nostril for 60 seconds.
4. A. Always seek medical attention.
   B. Seek medical attention for those taking blood thinners, large doses of aspirin, or those with high blood pressure.

ANSWERS: 1. A; 2. B; 3. A; 4. B

Dental injuries

Mark each statement true (T) or false (F).

1. Use dental floss rather than a toothpick to remove an object stuck between teeth.
2. If a tooth is knocked out, attempt reimplantation (placing tooth back in the socket) if you are in a remote area with no dentists nearby.
3. Clean and scrub the tooth before attempting to reimplant.
4. Put the knocked-out tooth in mouthwash or alcohol to preserve it.

ANSWERS: 1. T; 2. T; 3. F; 4. F

Chest injuries

Mark each statement yes (Y) or no (N).

1. Which of the following actions serve as effective immediate first aid for a sucking chest wound?

A. Remove a penetrating object from the chest.
B. Apply a sterile or clean dressing loosely over the wound.
C. Leave the wound uncovered.
D. Tape a piece of plastic tightly over the wound.

ANSWERS: A. N; B. Y; C. N; D. N

Check (✔) the appropriate action(s).

1. If the victim has trouble breathing after you have taped a piece of plastic over a sucking chest wound, you should:

A. Apply a second piece of plastic over the first.
B. Remove the plastic covering from the wound to allow air to escape from the chest cavity and then reapply.
C. Leave the plastic in place and check breathing.

ANSWERS: A. N; B. Y; C. N

Complete the following statements.

1. The aim of first aid for a sucking chest wound is to:

A. Not cover the wound.
B. Cover the chest's hole immediately to prevent air from entering the chest.

2. The aim of first aid for a flail chest is to:

A. Stabilize the injured chest wall.
B. Not bind the injured chest since binding interferes with breathing.

ANSWERS: 1. B; 2. B

Choose the best answer.

1. Which of the following materials, when taped at the edges, would make an effective covering for a sucking chest wound?

A. Clear plastic wrap
B. A large gauze dressing
C. A wash cloth
D. A pillow case

2. Flail chest signs and symptoms include:

A. Blood oozing from the injury site
B. Pain when breathing
C. Neck injury
D. Abnormal movement of part of the chest wall during breathing

ANSWERS: 1. A; 2. B,D

Preparing for mine disasters

Technical training for mine disasters may be adequate, but management preparedness is lacking

By Arthur P. Sanda

The question was simple enough: "In your opinion and experience, is the United States' coal industry prepared to respond to an emergency?" Despite its simplicity, the question became the first and last question of numerous interviews, because the responses to the repeated query seldom answered the question. When pressed, the almost universal comment was: "If I had an opinion, it would be 'I don't think so.' But I really don't know."

The Mine Safety and Health Administration (MSHA) believes that it is prepared, now. The Bureau of Mines is working on it. West Virginia University has worked on it and its Extension Service is training miners for it. But the status of industry preparedness remains elusive.

MSHA—which once had rolling squads of rescue experts literally living in railroad cars—until recently could not have given any more of a definitive response to the question. What had been lacking, and apparently many believe still is, in the industry is a comprehensive mine emergency management plan.

One result of the MSHA internal review of its handling of the Pyro mining disaster (see associated article) was the replacement of individual district office response programs with one that is agency-wide, including the headquarters group.

In developing the MSHA program, William J. Tattersall, assistant secretary of labor, enlisted the aid of industries outside the coal industry. "These usually are tightly guarded secrets within companies," Tattersall explained, "but there were those who were willing to share their emergency response programs with us. In industry, any company that does not have such a program has not sent their people to any Harvard-type advanced management courses."

In pursuing the question of how MSHA shares its program with the industry, the assistant secretary offers, "We would be happy to work with them, but there is no present means with which to force the industry to develop their own programs."

Not required

Under the Federal Mine Safety and Health Act, coal mine operators must have MSHA-approved plans covering ventilation, roof support and evacuation. But, for the present, there are no regulations requiring MSHA-approved emergency response programs. In such situations, however, rescue plans must have MSHA concurrence and, should MSHA determine that the effort is being mishandled, the agency can assert its authority and fully take over the operation.

With its new response program in

place, and feeling it proved itself in the handling of the Granny Rose Coal Co. Big Mama mine explosion earlier this year, MSHA is confident of its ability to fulfill its responsibilities in an emergency situation. But what about the mining companies?

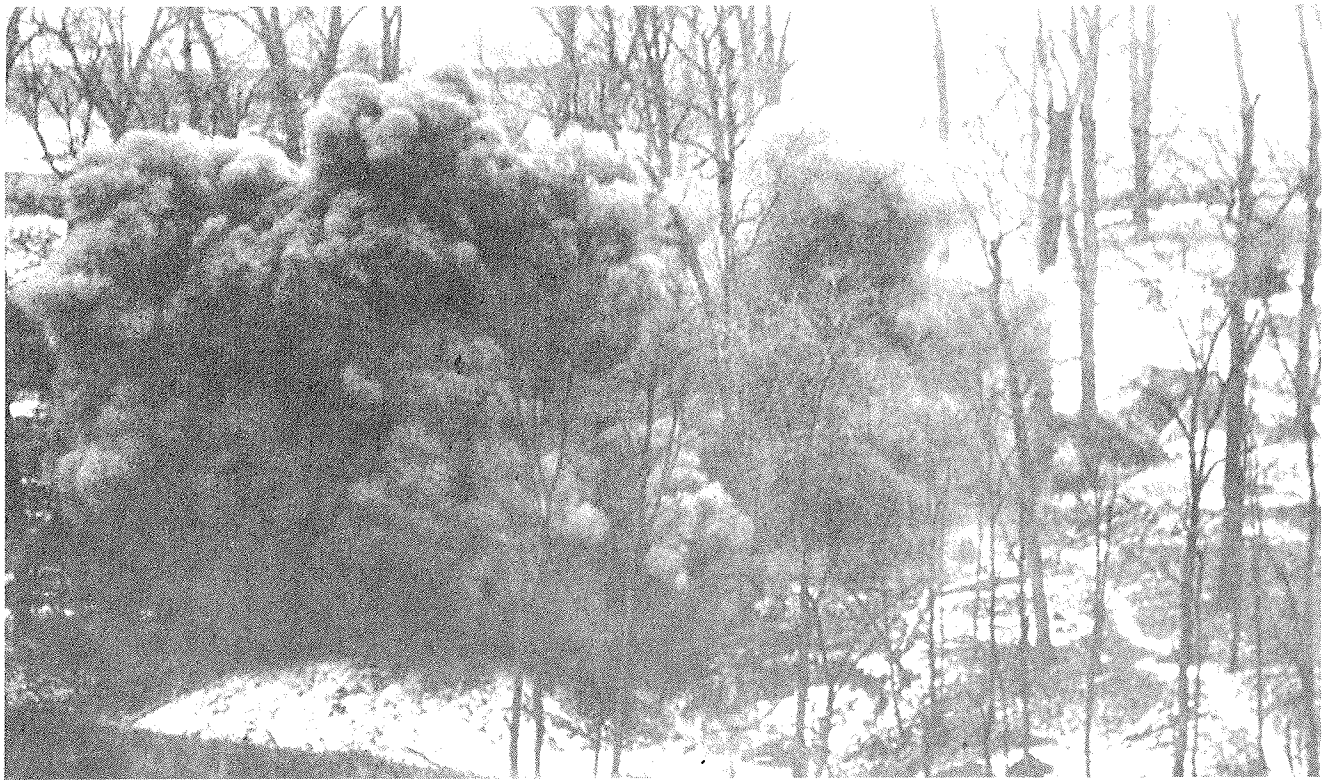
According to MSHA, most, if not all, major coal companies have emergency response programs in place. Of concern to them, however, is the degree to which those plans are implemented or understood at the mine level. All too often, they say, an emergency plan at the mine is little more than a list of telephone numbers of whom to call and in what order. Further, it is assumed that the smaller the operation, the more limited the resources and, therefore, the worse the preparedness.

Shifting concern

With mine rescue team availability mandatory under the act, and with resources still available within MSHA, the concern now appears to be less with the industry's technical ability to handle emergencies. Numerous programs exist to enhance that. Individual, state, and MSHA-sponsored meets are designed to develop teamwork, coordination, confidence and some experience through simulation. The West Virginia University Mining and Fire Extension Services have developed a training program reminiscent of the old underground fire brigades and there are continuing training activities at the MSHA Academy in Beckley, West Virginia, as well as within several individual companies.

With the acceptance of hands-on, how-to programs, the concern today is shifting to a company's ability to manage the surface aspects of an emergency.

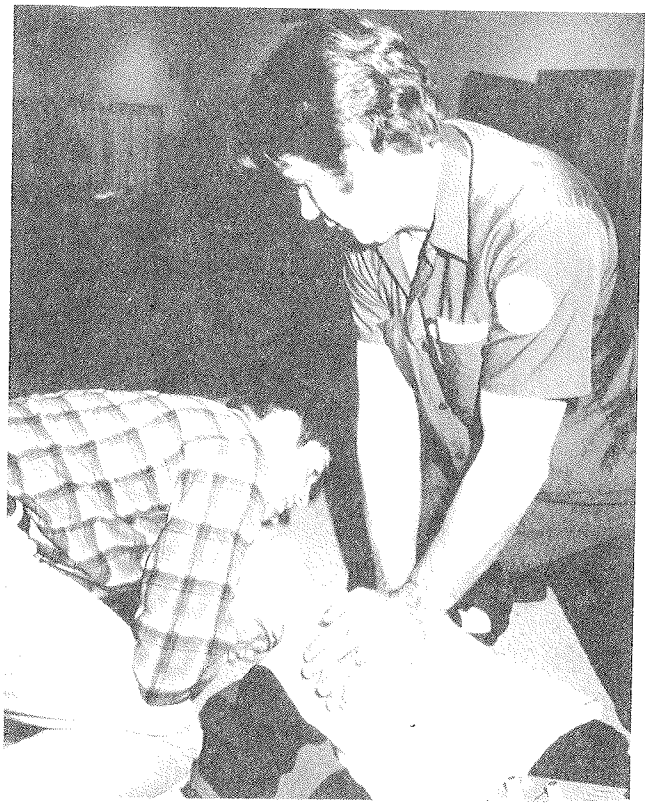
In 1986, the West Virginia University Mining Extension Service com-



pleted work on a 5-year U.S. Bureau of Mines contract to develop a comprehensive mine rescue training program. This developed into a series of modules designed to meet the requirements of 30 CFR Part 49, a program still available through MSHA.

In addition, the contract called for the development of a management version of the mine rescue series. Today, the 1-module program generally is referred to as a generic mine emergency preparedness program. In an effort to convey the information and availability of the program to the industry, 10 technology transfer workshops were held in five states: West Virginia, Colorado, Pennsylvania, Missouri, and Arizona. More than 100 mining and mining-related companies were represented.

According to the project director, Ron Althouse of West Virginia University, "It took 14 to 18 months of vigorous work from day one to completion, and then forever to keep the program viable. The difficulty is in getting the information to those who make the decisions.



"Almost any operator really doesn't know as well as the experts how to put together the means with which to meet an underground crisis," he continued. "The industry as a whole has not paid attention to crisis management. Their people are not prepared. But, there are enough people out there who want to do something. They just don't know how. The trick is to identify them, identify the something, and then develop the how."

Non-coal application

In a related effort, in 1985, the State of Arizona contracted with the Bureau of Mines (Bureau) to develop an emergency response program for small and remote mines. (Under the federal act, with the approval of the MSHA district manager, such mines could obtain waivers to the requirement that each mine must have two mine rescue teams within 2 hours ground transportation time.)

"The program elements were all encompassing," explained Jim Peay, supervisory engineering psychologist and the Bureau's technical project director on the mine emergency preparedness program contract with the West Virginia University Extension Service. "It addressed planning, communications, transportation, equipment deployment, training and institutionalizing other procedures— meaning how the program will be continued upon

completion of the Bureau's involvement. The intent was to marshal all available resources and work out an emergency response plan. This involved state and federal regulatory agencies, local and state law enforcement departments, associations, private industry and even the U.S. Air Force."

Follow-up audits found emergency response equipment was being kept in good order and that the rescue units were capable of responding to an emergency, Peay noted. "It was about as successful a demonstration project as one gets," he said. "There were more resources available than people realized, it's just that no study had been made. While this was not a coal mining project, developing the cooperation and the inter-agency communications system used is applicable to coal."

While he said that he doesn't know how many coal companies are prepared for an emergency, Peay said he does know several have done extensive planning. "How many or how well companies are prepared, I don't know," he explained. "I do feel the industry is improving continuously in terms of preparedness and that it is concerned with loss control."

The Red Adairs

The industry's success in transforming disasters from the everyday to the unusual is itself creating a problem. With fewer disasters, and the passage of time, those who are experienced in managing emergencies are becoming

Jim Walter trains First Responders

Several years ago, Jim Walter Resources (JWR) Inc. held its first aid capabilities up to the mirror and didn't like what it saw. Today, following an extensive and continuing effort in basic training and advanced volunteer programs, the company basks in its own reflection.

"In doing a self-audit, we realized our first aid program simply wasn't what it should have been," offered Art Sullivan, general manager—safety. "To improve that situation, we started with the premise that we had to realize we could not totally eliminate accidents from coal mining, but we could make the first aid available to our 2,700 employees the best possible."

Under the direction of first aid trainer Dale Byram, JWR established a three-tiered program. The first tier involved an updated and improved first aid course for the mandatory 8-hour annual refresher training; the second, a more advanced First Responder Program; and the third, a highly trained Emergency Medical Team.

First responders trained beyond first aid

As the name implies, the First Responder Program consists of volunteers—nearly 200 men and women—who have been trained beyond the mandatory first aid practices and who would be the first to be called to an

fewer. Recognizing this, the Bureau has undertaken a new project which may someday develop into computer-based expert systems, a "Red Adair" on diskette.

The two-phase project calls for searching available literature on mining and non-mining emergencies and taped interviews with a select group of industry and agency personnel. Starting with just five such experienced people within MSHA, Bureau researchers have developed a list of 60 people, equally divided between active and retired, who, because of the frequency with which their names were mentioned in early interviews, are believed or accepted to be experts in the field.

From this group, about half of which actually will be involved, interviewers hope to create a history of how previous emergencies were managed and how they might have been or should have been. The interviews began in November 1989 and are expected to be completed within 2 years. In the meantime, transcription and publication of completed interviews will begin next year.

According to Jim Peay, they are looking for two products out of this project: first an oral history, so that these experiences are not lost, and then, when combined with information garnered from various publications, a resultant body of knowledge to be put into a decision-making aid.

If it does develop into a computer-based system, it's probable the expert information would be added to site-

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accident, unless, of course, more advanced medical treatment was readily available.

The program kicks off with weekly all-day classroom sessions over a 5-week period. These sessions include classroom work, lectures, work assignments and weekly testing of hands-on skills. To remain in the program, each volunteer must maintain at least a 70% average and must pass a final examination on all the material covered. Having done that, the candidates ride 8 hours with the local ambulance service before receiving their orange First Responder hard hats. The orange color was chosen to give both high visibility and quick recognition.

"A requisite of this program," Byram explained, "is a commitment on the part of the volunteer to respond to an emergency and to apply the skills he or she has acquired. That's not easy in this age with the fear of AIDS. Although we teach every precaution, that still takes commitment and courage."

The advanced first aid techniques taught in the First Responder Program are built on the ABC foundation taught in the 8-hour refresher course: airway, breathing and circulation. A typical scenario at an accident would be the volunteer applying basic ABC first aid while a First Responder is called. The First Responder would care for the victim until the arrival of an EMT (Emergency Medical Techni-

specific information such as mine plans, ventilation and roof control plans, geological conditions and mine atmosphere. In the event of an emergency, detailed information on changes taking place within the mine would be entered into the system. Utilizing the mine data and the historical base, the system would assist management by listing the decisions that must be made under certain circumstances. The system will not be making decisions.

Mine fires

Two projects, a little more hands-on than heads-up, each in its way is attempting to make the coal industry more aware of the need to be prepared to handle a mine fire.

The MSHA Academy and a fire school jointly conducted by the Fire and Mining Extension Services of West Virginia University offer both classroom instruction and field work. Trainees must negotiate a smoke-filled maze while wearing self-contained breathing apparatus and using fire extinguishers and high-pressure hoses. Small teams from participating coal companies are taught the basics of firefighting, predominantly by J.T. Hodges of the university's Fire Extension Service.

Equally important is the preliminary work done by Bill Moser of the Mining Extension Service. "When a company contracts with us to present a class, we insist on an on-site audit of their mines," he said. "We want to know the level of their abilities and the state of their equipment. We meet with their

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cian) or other more advanced professional medical personnel.

"This usually is on the surface," Byram explained. "The first step is immediate aid. The second is for the First Responder to assess the situation to determine if the injury is life or limb threatening. If it is, the First Responder requests that an ambulance or helicopter be waiting for them when they reach the surface.

"Of prime importance, we want our people to be, and they are, aggressive to the emergency but conservative toward their capabilities. We train them to know their limitations and when to turn things over to a more highly trained person."

First responders train for EMT

Those more highly trained individuals are found in the third tier of the JWR first aid program, the Emergency Medical Team. In addition to being First Responders, all the members of the eight-man team are trained to at least second-level EMTs, with three of them attaining the rating of third level. One is now an EMT-paramedic and another will be later this year.

Indicative of their expertise, Byram said that last year the team became the industry's first-ever, on-site advanced life support team to receive standing orders from a physician. Under Alabama law, advanced life support—intravenous fluids and heart defibrillation—only can be

top operating people and, with success, have broadened their perspective of existing and potential capabilities. We teach as much how to be prepared for a fire as how to fight one."

Since the program's inception in the spring of 1987, Moser has visited more than 50 coal mines and put nearly 500 people through the 2-day course. Next year, the program will be expanded to include a more advanced school for graduates of the course. "The limiting factor we now face," he explained, "is not having a permanent fire training center where a more comprehensive course can be conducted. Though, if it wasn't for the cooperation and generosity of MSHA Academy people, and the use of their facilities here, there probably never would have been a school to begin with. There's just so much more that needs to be done."

The Bureau, at its Lake Lynn research facility, takes a different tack, offering a 2-day mine fire preparedness program without the hands-on firefighting, concentrating on demonstrations of various fire phenomena.

"With our simulated mine facilities and instrumentation," explained the Bureau's Ron Conti, "we can duplicate various fire and explosion scenarios, from methane ignition, to belt fires, to equipment fires, and we can give our students an up-front view of a developing situation. Presently, our goal is to enhance industry awareness of underground fires, their detection, control and suppression. In the future, we hope to expand our 2-day program to 4

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given when a second-level EMT or a paramedic is in direct communication with a physician. Under standing orders, advanced life support can be given while that communication is being established. Further, the JWR team can administer cardiac drugs.

Team members are trained to act both autonomously and in synchronization. Individually, they are capable of performing all aspects of first aid. As a team, each takes a specific responsibility. For example, in finding an unconscious person, while some team members ensure that the area is secure, others perform a preliminary survey of the victim. One member administers basic ABC first aid—airway, breathing and circulation—while another checks for bleeding. If necessary, mouth-to-mouth resuscitation is begun, which could advance to cardiopulmonary resuscitation (CPR) with the aid of a second team member. In the meantime, a secondary survey of the victim is made, checking for additional injuries such as broken bones. Finally, bandaging is completed and the victim is removed from the mine.

EMT's activities extend to mine rescue

In what JWR believes is another industry first, the Emergency Medical Team's activities also extend to mine rescue work. All the members have received mine rescue training and, as two four-man teams, work in conjunction with the company's mine rescue teams, primarily to provide

days and add open fire pits so that we can include hands-on experience in extinguishing fires."

Additionally, Conti said that they are proposing that the Bureau conduct a needs analysis, utilizing data collection forms now being developed by a committee. "We plan to survey a number of miners and to visit various mine sites to determine the existing level of comprehension and competence, as well as preparedness. We hope to have that information within a year. In the meantime, we'll continue our program. We'll be doing something while we find out where we are."

Both programs have waiting lists, despite no widespread publicity or solicitations of industry.

Emergency/disaster

As pointed out by a number of people interviewed for this article, a mine emergency does not necessarily equate to a disaster. An emergency can range from a simple fan outage to a fire or explosion. From the point of view of MSHA and the Bureau, it is not so much the industry's ability to rise to the occasion as it is its ability to manage the occasion—a question only each company can answer for itself, but one which many believe the industry must address.

advanced life-saving capabilities. In the event of an emergency, three medical team members accompany the rescue team to the fresh air base. During the initial exploration of the mine, one medical team member becomes the sixth man on the mine rescue lifeline. If there are people missing, that member remains with the rescue team throughout the search. At least two Emergency Medical Team members remain at the fresh air base at all times.

The accomplishments of those involved in the first aid programs, as well as that of the company, have not gone unnoticed. Among the first who lauded the program was Milt Zimmerman, an MSHA supervisory inspector out of Birmingham, Alabama. "Jim Walter Resources has gone far beyond what is required to give its people the best first aid possible and those volunteers providing it have given unselfishly of themselves and should be acknowledged. They're doing a fine job," Zimmerman said.

Personal recognition, however, is neither the motivator nor the satisfier for these people, according to Sullivan. "The advanced Emergency Medical Team and the First Responders have proven their worth several times in the most meaningful way possible, in lives saved and the minimization of further injury, trauma and suffering of accident victims. And they've done it in their communities as well as on the job. Because of them, the reflection of our first aid program now is pure Adonis."

Study answers questions on health effects of borax and boric acid

Does boron build up in the body tissues from exposure in the workplace? What about effects on male fertility from borax/boric acid exposure?

The answer is no in both cases, based on data contributed by 17 U.S. Borax employees in the first study and 610 respondents in the second.

Results of the workplace studies will have statistical and scientific value far beyond thresholds of the Boron and Wilmington plants. According to an article in the company publication, *Pioneer,* international medical and health journals are to report on the findings.

The absorption study investigated possible effects of borax exposure and also the extent of arsenic exposure in 17 employees, who voluntarily stuck to a rigidly-enforced "healthy" diet, donned air-monitoring equipment and submitted regular blood and urine samples for analysis over a 1-week period.

Measuring levels of boron in blood and urine following exposure for high, medium and low levels of borates gave clues to whether the body was able to effectively maintain acceptable boron levels.

Employees exposed to the highest levels of boron on the job tested well within the range found in the general unexposed U.S. population.

"In short, the body very effectively excretes boron, and there is no buildup in blood or body tissues over time," according to the report in *Pioneer.*

In investigations of trace amounts of arsenic exposure, levels found were so low that technicians had trouble measuring them. Highest levels were 50 to 100 times lower than the OSHA limit of 10 micrograms. Arsenic occurs naturally in borate ore.

Recently completed, also, was a study of the effects of workplace borax and boric acid exposures on male fertility. Of 834 eligible employees, 610 chose to participate.

Rather than showing any fertility problems, preliminary results indicate more children are born to spouses of male employees than would be predicted based on national birthrate statistics.

One interesting phenomenon related to gender of children did turn up in the study. It appears there are more girl babies than boys born to company workers at Boron. The national average predicts that of 1,000 children, 488 will be girls and 512, boys. At Boron, the figures are closer to 517 girls and 485 boys.

Studies enhance the ability to monitor worker health to ensure safety.

Reprinted from the California Mining Association's February 1992 issue of ***California Mining.***

Secretary's Message

On February 4, the Holmes Safety Association (HSA) Executive Committee met in Charleston, West Virginia to finalize this year's annual meeting at Split Rock, Pennsylvania. The conference agenda was completed and brochures have been printed and distributed.

The Executive Committee selected San Antonio, Texas, as the site of the 1993 annual conference. The conference will take place June 1-3.

I am proud to announce that the State of Ohio became our newest state council. This brings us up to a total of six state councils.

We are again requesting your assistance in updating the mailing list for the *HSA Bulletin*. We have placed a form on page 1. If you have not done so already, please complete this form and return it to me as soon as possible. This will allow you to continue receiving the Bulletin without interruption.

Robert Glatter, Secretary

Training Advisory Council members reappointed

All of the members of the advisory council were reappointed by University of Nebraska at Kearney Chancellor, William Nester, to serve another year.

"Red" Holmes, who has served on the council since its beginning, retired this past year after many years with the Lyman-Richey Company. He has consented to serve another year with the council and we appreciate his valuable input. Thank you, "Red."

It was decided to add another seat on the advisory council to include the current chairman of the Nebraska Concrete and Aggregate Association Safety Committee, Ted Minarick, of Morse Bluffs. He will serve in that capacity this year. Ted is the operator of the Bluff Gravel Co. Welcome, Ted.

Rick Follmer, with T & F Sand and Gravel will continue as chairman for another year, aided by the other members:

Tobin Anderson–*Overland Sand & Gravel*
Gary Backhaus–*Backus Sand & Gravel*
John J. Bode–*Werner Construction Co.*
Joe Dethloff–*Kerford Limestone*
Dean Hefti–*Greystone Manufacturing*
Chris Hunke–*Paulsens, Inc.*
Jerry Meyer–*Consolidated Sand & Gravel*
Jim McGee–*MSHA, Topeka Field Office*

The Nebraska Safety Center wants to thank all of you, individually and collectively, for your time and valuable assistance.

Reprinted from the Winter 1992 issue of the Nebraska Mine Safety Training Newsletter, Kearney, NE.

REAP alert!

The Mine Safety and Health Administration has developed this "REAP alert" in an effort to share with coal miners the serious concern caused by the five recent underground mining fatalities, all of which have been from the fall of roof or rib. The following is a brief summary of the accidents.

January 1, Tennessee—a conventional mining section was pillar mined by slabbing the entire pillar. Two crew members were sitting in an intersection watching the roof. A large horseback (about 20 feet wide) fell, killing two miners and injuring a third. *The pillar mining plan was not being followed.*

February 5, West Virginia—again, pillar mining was being conducted on a continuous mining section. A massive roof fall occurred at an intersection. The section foreman was killed and two miners were seriously injured.

February 11, Utah—a miner was killed on a longwall development section that had been experiencing difficult roof conditions in a fault area. A portion of the rib and roof fell on the miner while he was in that area.

February 12, Kentucky—the roof bolting machine operator was installing resin bolts in a crosscut which had been cut through, when he was struck by a section of draw rock which fell from the unsupported area. *The required sequence of bolt installation was not followed.*

February 20, Colorado—the victim was standing between the last two rows of permanent supports, marking places on the roof for the next row of bolts to be installed. A section of roof dislodged between the bolts, knocking the victim into an area of unsupported roof, which fell, killing the miner.

In 1991, there were 40 underground mine fatalities. Half of these fatalities were caused by falls of roof or rib. To partially answer why, think about the following:

- Five of the miners went inby permanent support!
- In eight miner deaths, the approved roof control plan was not being followed!
- Failure of roof support systems contributed to deaths of three miners!

Effective training is an important consideration in preventing roof fall accidents! Please consider the above three points as they relate to your mine and ensure:

- the training program fully addresses all aspects of roof control,
- all miners are committed to rigidly following the roof control plan, and
- no miner travels under unsupported roof!

The last word...

"What a different world this would be if people would only magnify their blessings the way they do their troubles."

"One thing you learn the hard way is that there is no easy way."

"How come diamonds are a girl's best friend but a man has to settle for a dog."

"Every advance in civilization started with a stupid question."

"A minute of action is better than an hour of worry."

"Keep in mind that the man who makes people laugh secures more friends than the one who forces them to think."

"Failure is only the opportunity to begin again, more intelligently."

"Those who have the most to say usually say it with the fewest words."

"A sharp tongue and a brilliant mind are never found in the same skull."

"It doesn't matter who pays your salary; you are always working for yourself."

"Love is conceived by the mind, nourished by the heart, and can be killed by the tongue."

NOTICE: We welcome any materials that you submit to the Holmes Safety Association Bulletin. We cannot guarantee that they will be published, but if they are, we will list the contributor(s). Please let us know what you would like to see more of, or less of, in the Bulletin.

REMINDER: The District Council Safety Competition for 1992 is underway – please remember that if you are participating this year, you need to mail your quarterly report to:

Mine Safety & Health Administration
Educational Policy and Development
Holmes Safety Association Bulletin
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Arlington, Virginia 22203-1984

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