The Holmes Safety Association BULLETIN

November 1998

contents:

The **Holmes Safety Association Bulletin** contains safety articles on a variety of subjects: fatal accident abstracts, studies, posters, and other health- and 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. For more information visit the *MSHA Home Page* at ***www.msha.gov***

PLEASE NOTE: The views and conclusions expressed in Bulletin articles are those of the authors and should not be interpreted as representing official policy or, in the case of a product, represent endorsement by the Mine Safety and Health Administration.

COVER: This month's cover finally reveals how desperate we are for color photos—the cupboard is bare. We are now reduced to drawing pictures. This indicates why we continually ask for submissions from our readers. If you have a potential cover photo, please send an 8" x 10" print to the editor, Fred Bigio, MSHA, 5th floor—EPD #535, 4015 Wilson Blvd., Arlington, VA 22203-1984

KEEP US IN CIRCULATION
PASS US ALONG

Building successful teams: an important part of a behavior-based safety process

By Travis Rhoden, J. J. Keller and Associates

"Given the way most companies have been dealing with safety and health, total employee involvement for occupational safety can be hard to imagine, let alone achieve. But, people really do care about their own health and safety, and most care about other people's safety. No one wants to see another person get hurt. People just don't know what to do to prevent injuries. They don't know how to actively care, " says Dr. E. Scott Geller, a leading proponent of behavior-based safety, author, lecturer, and Professor of Psychology at Virginia Polytechnic Institute and State University. A team-based process can do just that. It can help create an actively caring culture.

What is a team?

Merriam Webster's Collegiate Dictionary (1996) defines team as "a number of persons associated together in work or activity" and teamwork as "work done by several associates with each doing a part, but all subordinating personal prominence to the efficiency of the whole" (page 1209).

According to Dr. Geller, author of *Building Successful Safety Teams: Together Everyone Achieves More* (1998), a team of people working together for industrial safety consists of as few as two people or as many as fifteen who have complementary skills, assignments, or abilities for completing a particular task. Effective teams have members who share a common mission and relevant goals, and they share specific methods to reach their goals and accomplish their mission. They also have an evaluation system in place for holding themselves mutually accountable for goal-directed responsibilities.

What are some advantages of teams?

Not all workplace situations require teams. There are occasions when a person can work independently and still achieve high performance. But for certain aspects of behavior-based safety to work (observations and feedback, and incident analysis are two examples) teams are necessary.

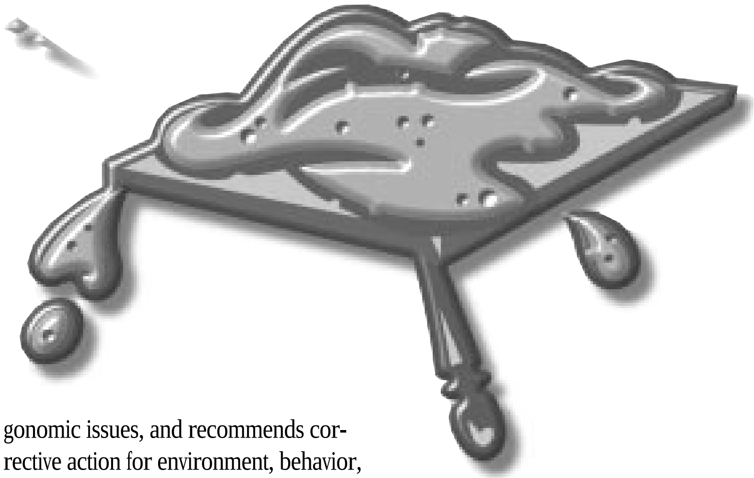
In fact, behavior-based safety thrives on teamwork. According to Dr. Geller, organizations that combine the principles and methods of behavior-based safety with appropriate teamwork, can improve their safety performance beyond all expectations (1998). Specifically, teams provide the following advantages:

- Shared ownership
- Diversity (knowledge, skills, experience)
- Interpersonal feedback and support
- Representation from various work positions
- Synergy (the whole is greater than the sum of its parts)

What kinds of teams are crucial to behavior-based safety?

While there is no concrete listing of critical behavior-based safety teams (teams will vary depending on organizational needs), there are several teams which have been used successfully by many companies to translate certain principles of behavior-based safety into effective practice. As provided by Dr. Geller, they are listed below:

1. Safety Steering Team—Oversees entire observation and feedback process, or any other application of behavior-based safety.
2. Observation and Feedback Team—Develops, implements, evaluates and refines behavior-based observation and feedback procedures.
3. Ergonomics Team—Conducts periodic audits of workplace settings, evaluates employee suggestions regarding er-



gonomic issues, and recommends corrective action for environment, behavior, or both.

4. Incident Analysis Team—Conducts fact-finding evaluations of “near miss” reports and injuries, including behavioral, environmental, and person-based factors; and recommends corrective action.

5. Celebration Team—Plans and manages celebration events to recognize process activities and reward achievement of milestones.

6. Incentives/Rewards Team—Oversees the design, implementation, evaluation and refinement of behavior-based incentive/reward programs to motivate participation in designated safety improvement activities.

7. Preventive Action Team—Evaluates reports of rule/policy violations, decides whether the violator should be punished and chooses the penalty.

How are the teams created and evaluated?

There are several steps which should be included in team building, from selecting team members to continuing, disbanding or restructuring a team. These steps, as they relate to industrial safety, are described below.

Select team members

The first step in safety team building involves selecting the right persons to serve on a team. This step shouldn’t necessarily be accomplished on a ‘‘first come, first served” basis. Ideally, the safety director or safety committee (representing different areas of the work place) should develop a list of potential candidates for a given team. Then they should approach these individuals and ask if they would be interested in serving on a particular safety team.

What kinds of people typically make good members of a safety team? Most importantly, the candidate must be committed to safety. Perhaps an individual has done something recently to warrant such a claim. Maybe he dropped a detailed recommendation in the “safety suggestion box” or went beyond the call of duty to help a co-worker.

Showing commitment to safety is a critical characteristic to look for when selecting team members. However, there are others. The best team members also like working with other people and communicate well, and desire to enhance the safety and health of others.

Explain the team’s assignment

After team members have been selected, they must be made aware of their assignment. If the team members are not sure of their assignment, they will spend effort working toward something that may or may not be a desired outcome. Therefore, it is critical that all members know the team’s mission, resources that are available to accomplish it, their authority with regard to the mission, and the degree of control the team has over the outcome of its decisions.

Write a formal mission statement and plan of action

In this step, the team will draft its mission statement, followed by a plan of action. The mission statement should describe the overall purpose of the team, define the ground rules for team meetings, address budget issues, specify what the team will produce, and assign team roles (team leader, team facilitator, treasurer, reporter, etc.) (Geller, 1998)

Once the mission statement is written, the team should plan how it will proceed. This should include identifying goals needed to accomplish the team’s mission, setting a time frame to accomplish goals, and assigning each team member tasks related to team goals. This step can be accomplished in a variety of ways, which depends largely on the team’s mission, characteristics, and personality.

Perform as a team

During this step, the team must perform tasks related to its goals. Productivity will begin to soar. The team will hold productive meetings; problems will be discussed openly; and team loyalty will be seen.

Evaluate the team’s performance

In this step—`feedback should be given to the team which allows it to improve. Most everyone receives a performance evaluation at some time during their employment. And, most realize the value of those “feedback” sessions.

After all, individuals can not improve without receiving feedback directly related to their performance. Teams are no different. For a team to improve, it must be evaluated. A popular method of doing this is by using self-evaluation forms which members of a team can complete to assess and improve team progress. The Safety Steering Team described earlier evaluates input from all teams on an ongoing basis to decide what needs to be done to improve the system.

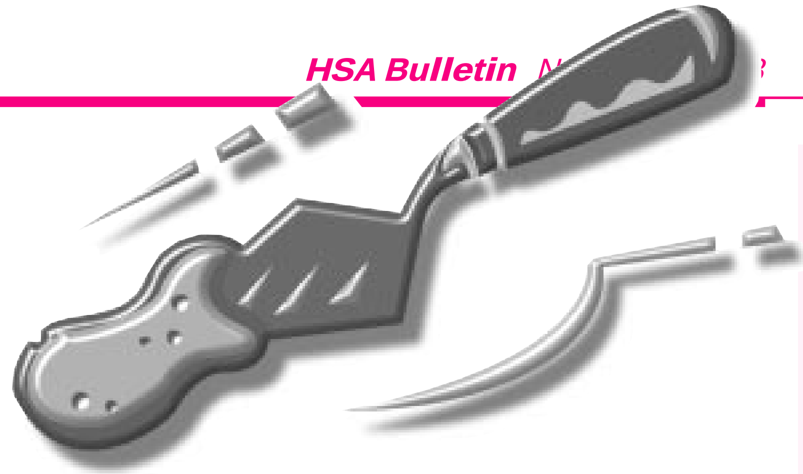
Decide the team’s future

In the last step, it must be determined whether the team will continue, disband or restructure. Many discuss this stage as the time when a team realizes it has completed its work and adjourns or disbands. For behavior-based safety teams, this is seldom the case. The work of the teams listed earlier is never finished. Certain projects or assignments may end, but, according to Dr. Geller, these teams need to work continuously if they hope to achieve constant safety improvement.

The membership of these teams will change periodically and team goals will vary, but the challenges of behavior observation and feedback, incident analysis and corrective action, ergonomic analysis and intervention, and behavior-based recognition and celebration will remain. The methods and procedures used to meet these challenges will change and in fact they will successively improve if appropriate evaluation processes are implemented (Geller, 1998).

Behavior-based safety teams are key to reducing potential for injuries

A very frustrating part of the safety profession is realizing that no matter what measures are taken, the potential for worker injury will still be present.



However, it is possible to reduce the odds that injuries will occur. Engineers and policy makers have made great strides in reducing workplace injuries. But, their efforts have not eliminated the problem of worker injury. Behavior-based safety is the next logical step in this process. By focusing on the psychological aspect of safety, the odds a workplace injury will occur can be further reduced.

But, for this to happen, workers need to be taught the principles behind safety improvement. According to Dr. Geller, "We let THEM apply those principles and in turn control the process. People on the shop floor have the most opportunity to control safety. They're the ones who can have the biggest impact on keeping people safe—if they understand the principles behind the safety process, and if they get involved." (1998) That can happen with behavior-based safety teams.

For additional information, contact J. J. Keller & Associates Inc., 3003 Breezewood Lane, Box 368, Neenah, WI 54957-0368, 1-800/843-3174, ext. 7304

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U.S. produces record amount in '97

U.S. coal production reached a record 1.089 billion short tons in 1997. The record U.S. eoal output in 1997 was an increase of 2.3% over 1996 coal production, according to data released by the Energy Information Administration (EIA).

The electric power industry consumed a record 922 million tons last year to fuel generating plants, up 2.8% from 1996, the EIA said. The increase in coal use for generation was primarily due to a substantial decline in nuclear power and moderate growth in electricity demand, according to the EIA.

As the U.S. electric utility industry moved further toward deregulation and more competition last year, many utilities sharply curtailed their nuclear generation. In 1997, the EIA said coal consumption in the non-electricity sectors (residential, commercial, and industrial users) fell by 2.6% from 1996 levels to 105.8 million tons.

According to the EIA, U.S. coal imports edged up slightly, increasing 5.1% to 7.5 million tons, while coal exports declined almost 8% to 83.5 million tons—reversing two years of growth.

"The decline was mostly in steam coal exports as a result of weak international coal prices and strong competition from other coal-exporting countries," the EIA said.

Although domestic coal demand increased in 1997, the price of coal declined, continuing its downward trend that started more than a decade ago. The average price utilities paid for coal dropped by 1.1% to $26.16 per ton, while the price for industrial coal remained relatively unchanged at $32.40 per ton, the EIA said.

According to the EIA, the average price of U.S. coal exports declined slightly to $40.55 per ton, while import prices edged up by 2.6% to $34.32 per ton.

Reprinted from the July 1998 issue of ***Coal Age****.*

By Robert B. Hurley

More than 60,000 chemicals, almost 1.5 billion tons, are produced and used in the United States every year. Approximately 2,000 of these chemicals are deemed hazardous by the Department of Transportation. The National Institute of Occupational Safety and Health Pocket Guide to Chemical Hazards lists 677 chemicals or substance groupings that are found in the work environment. Accidental exposure to these chemicals can occur during manufacture, storage, transport, use or disposal and pose a serious threat to health and safety. Employers and employees must clearly understand the properties of the chemicals present in their work site, and identify those which have the potential for injury.

The eye is a magnificent organ. It is our "window to the world". Yet in 1995, according to a National Safety Council study, 140,000 eye injuries occurred in the work place. Because partial or full loss of sight from a chemical burn has an impact on both employee and employer, companies must take necessary steps to implement and maintain an effective safety program that minimizes hazards, provides proper eye protection, dispenses immediate first aid, and educates and trains employees on the proper use and maintenance of primary protection and first aid devices.

Hazardous chemicals can be present in solid, liquid, powder, mist and vapor forms. Many of these substances cause mild and temporary effects, but severe injuries can result from direct chemical exposure. When hazardous substances are present, OSHA's Code of Federal Regulations, Title 29, Parts 1901 to 1910, states: "Where the eyes or body of any person may be exposed to injurious corrosive chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use."

The ANSI (American National Standard Institute) Z358.1 Standard for Emergency Shower and Eyewash Equipment is the definitive standard for meeting the OSHA requirement for "suitable facilities." The standard requires that emergency eyewash devices be placed within 100' or 10 seconds of potential hazards, and within 10' of strong caustics or acids. The eyewash location must be readily accessible, easily identified and free of obstructions.

Copious irrigation immediately

Serious burns to the eyes or skin are caused by strong acids or strong alkalis. The severity of a chemical burn is determined by the concentration of the chemical agent, the duration of exposure, and the pH of the solution. Alkali burns are usually more severe than acid burns because alkalis rapidly penetrate the cornea, and continue to damage tissue.

Because of the potential for loss of vision, a chemical burn of the eye is an emergency situation that requires immediate first aid to limit the damage. Experts agree that the most important first aid procedure for the chemically burned eye is copious irrigation within seconds of the injury.

Studies have shown that there are significant differences in the outcome of chemically burned eyes that received prompt irrigation and those that did not undergo immediate flushing. In cases where the eyes were flushed promptly, patients required less surgery, had shorter hospital stays, and faster recoveries.

The flushing process should remove chemicals from the eye and the surrounding area. It is important to remove particles which may be lodged on or under the eyelids. Alkalis tend to cling to ocular tissue and can resist removal by irrigation. All areas of the conjunctiva and cornea must be thoroughly irrigated.

The need for immediate flushing requires the placement of emergency eyewash facilities in strategic, well marked locations where chemical hazards exist. The eyewash solution delivered by the eyewash station should be formulated to cause as little additional damage or discomfort to the injured person.

Flushing solutions

Flushing fluids act to remove the offending chemical by irrigating, diluting and neutralizing ion concentrations in the affected areas of the eye.

The ANSI Z358.1 Standard specifies that emergency eyewash stations must deliver flushing solutions to both eyes at a minimum flow rate of 0.4 gallons (1.5 liters) per minute for 15 minutes. The immediacy of irrigation is the critical component—not the volume—provided the volume and flow pattern is sufficient to flush completely in and around the eye. Irrigation should continue until the injured person is under the supervision of a medical professional.

Because the cornea is one of the most sensitive areas of the body and an injured eye has less resistance to infection than the blood stream, the use of contaminated solution to flush the eyes can cause serious infection. Recent studies have reported that emergency eyewash stations, plumbed and portable, can be a source of potential infection unless the stations are regularly maintained and the flushing fluid quality is carefully monitored. These microorganisms have been found in eyewash station flushing fluid:

Acanthamoebae—the severity of Acanthamoebae eye infections is well documented. Such infections are resistant to antibiotic therapy.

Pseudomonas Aeurginosa and Pseudomonas Cepacia—both of these organisms are identified as human pathogens. Pseudomonas Aeurginosa is a causative agent of eye infections.

Enteric Bacilli, Entamoeba, and other bacterial pathogens have been found in potable water used in emergency eyewash devices.

Flushing fluid can be contaminated by the use of potable (tap) water containing microorganisms and from bacteria on the walls of water pipes or inside stationary units. Microorganisms may also be introduced during mixing, filling or inspection. If a self-contained unit is not completely sealed, microorganisms can enter from the surrounding air, as well.

In plumbed and self-contained eyewash units, the lack of turbulent flow, nutrients present in the water or flushing solution, and favorable ambient temperatures (microbes thrive in a broad temperature range of 10˚ to 45˚C) all contribute to the growth of microorganisms in the portable unit and in the pipes delivering water to plumbed units.

Plumbed stations deliver tap water at the temperature of the water source. The water can be too cold or too hot, causing user discomfort and limiting effective flushing. Depending on the location and type of system, the water may contain chemicals such as chlorine, solids, irritants, and microbial contaminants. Because of the cornea sensitivity, the use of contaminated solution to flush an eye may compound an injury or result in serious infection.

While potable water is widely available, it is not the preferred solution for emergency flushing. Solutions for emergency flushing should be clean, free of

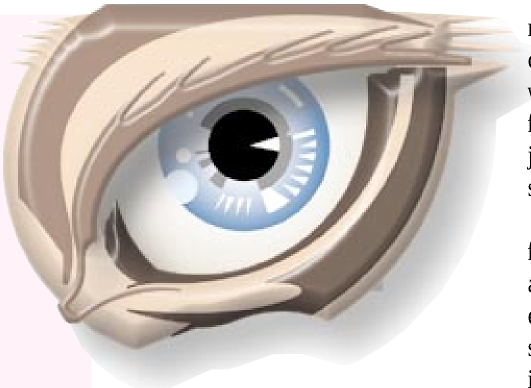
contamination, preserved, isotonic and pH balanced to reduce the likelihood of causing additional damage and discomfort to the eye.

A preservative added to potable water in self-contained gravity-fed stations will inhibit the growth of many microorganisms, but is not effective in controlling the growth of all microorganisms. In addition, the preservative does not remove other organic or inorganic contaminants. Contaminated water or flushing solution is not an acceptable eye irrigant.

The temperature of the flushing fluid is also a prominent factor in effective flushing. The current standard, Z358.1-1990, recommends a delivered water or flushing fluid temperature range of 60˚F to 95˚F. Fluids at temperatures above the recommended range may further damage the eye and can accelerate the chemical reaction. Cold water may limit effective flushing because of the shock and discomfort it causes.

Eyewash equipment criteria

The Hazard Communication Standard, 29 CFR 1910.1200, requires employees to identify and evaluate all chemicals used in the work place. This regulation further requires that the employers develop a complete hazard communication program that provides employees with information about hazardous chemicals in their work place, and



training on identification and detection of those hazardous chemicals. The employer must provide appropriate safety equipment, emergency and first aid procedures required for the safe use of chemicals used in the work place, and for emergency response if an employee is exposed to a hazardous chemical.

After the potential chemical hazards have been identified, the employer must select and install emergency eyewash units in appropriate locations throughout the facility. Safety professionals can choose from a variety of delivery systems and flushing fluids when selecting emergency eyewash devices for their facility.

Types of emergency eyewash stations

Plumbed: Permanently connected to a source of potable water that is delivered from the plant supply or a separate supply source. Water temperature and water quality is dependent on the source and the piping system. Plumbed eyewash units are offered in a range of models, and in combination units with emergency showers.

Self-contained, gravity-fed: Contains its own flushing fluid and must be refilled or replaced after use.

Self-contained, pressurized units: Deliver potable water or potable water with a preservative, are pressurized from an external source, and may be mounted on a mobile stand.

Personal Eyewash Units: Personal (secondary) eyewash devices do not meet the Z358.1 standard for primary devices, and are intended to support, not replace, primary, plumbed or self-contained units. Personal eyewash devices can be placed close to a hazard to flush the eyes immediately until the injured person can reach a plumbed or self-contained station.

Personal devices can also be used for continued irrigation when moving an injured person from the primary eyewash unit to medical care. Personal eyewash products are available in sizes from 1/2 oz. to 6 gallons.

Emergency eyewash selection criteria:

1. The eyewash unit required for a hazard area must meet the current standards set out in ANSI Z358.1.
2. Determine the best location for the eyewash unit-one that can be easily identified and accessed in an emergency, with no obstructions.
3. Determine costs of installation: Is there is a potential for future facility modifications or changes? What will it cost to relocate the unit?
4. For plumbed units, is a source of potable water close at hand? Is there a drain to service the unit?
5. Evaluate maintenance requirements:
• The ANSI Standard requires that plumbed units be flushed weekly.
• Self-contained units are to be maintained in accordance with manufacturers' instruction. Flushing fluid changes may be required weekly if water is used. If water is blended with a preservative, changes are recommended every 2 to 6 months. Self-contained units utilizing a flushing solution prepared on-site by mixing a concentrate with potable water require solution changes at periods from 4 to 6 months. Fluid levels in self-contained stations must be checked on a regular schedule to ensure that proper fluid quantities are available for a full 15 minute flush.
• Tank type, self-contained stations must be drained, removed from its location, inverted to remove residual fluid, then cleaned and disinfected prior to refilling with new flushing fluid. New self-contained eyewash stations like Fendall's PureFlow 1000 utilize factory sealed fluid cartridges which have a 24 month expiration date, and require five minutes or less to replace.
6. Choose the correct eyewash fluid:
• Potable water: Potable (tap) water is currently the only flushing fluid delivered by plumbed eyewash stations and is also available for use in self-contained, gravity-fed, or pressurized units. While potable water is widely available, it is not the preferred solution for emergency flushing.
• Potable water with a preservative: A preservative added to potable water in self-contained, gravity-fed stations will inhibit the growth of many microorganisms, but is not effective in controlling the growth of all microorganisms. In addition, the preservative does not remove other impurities, bring the pH into the proper range, or provide an isotonic solution.
• Potable water mixed with a prepared concentrate: Eyewash manufacturers offer factory prepared concentrates that, when mixed in the proper ratio with clean, potable water, provides a preserved, saline solution which is recognized as superior to potable water, or potable water with a preservative, for emergency flushing.
• Purified, preserved, buffered, saline solution prepared by the manufacturer and sealed until use: Fendall's PureFlow 1000 unit provides 15 minute flushing utilizing a fluid delivery system with hoses and nozzles which are factory sealed to resist contamination. These components are integral with the fluid cartridges and are automatically changed when the cartridge is replaced.

Education and emergency training

The finest emergency eyewash equipment in the best locations can still be ineffective if employees are not trained and educated about all of these: the location of devices in their work area, how to properly activate and use the device in an emergency, how to obtain immediate medical assistance, and how to ensure that the eyewash stations are properly maintained and ready for use.

In many instances, the victim of an eye injury will need assistance in locating and activating an emergency eyewash device. Employees should be trained to assist their coworkers when an injury occurs. Most important, employees must be provided with proper eye and face protection, and educated about the importance and use of personal protective devices.

The type of emergency eyewash device, maintenance of that device, and the flushing solution used, can greatly affect the treatment and eventual recovery of a chemically injured eye. Complete information can be found in OSHA Standard 1910.151, titled Medical Services and First Aid, and ANSI Z358.1 Standard for Emergency Shower and Emergency Eyewash Equipment.

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Reprinted from the November 1997 issue of the Rimbach Publishing Co.'s ***Industrial Hygiene News.***

Last U.S. asbestos mine reports healthy workers, healthy overseas markets

When the King City Asbestos Mine Company (KCAC) claimed rights to mine asbestos ore in 1963 in southern San Benito County, the mineral was approaching peak demand.

A Hollister, Calif. newspaper, "The Freelance," recently featured a story that put a positive light on the CMA member company, the last asbestos mine operating in the United States.

The deposit 55 miles southeast of Hollister continues to produce a particularly short-fibered asbestos type that KCAC supplies to overseas markets.

Short fiber chrysotile asbestos ore is processed to produce extremely high purity fibers that can be used in roofing compounds, asbestos, cement composites and specialty adhesives, coatings and sealants.

In Japan, KCAC has found a thriving market for the fibers in the manufacture of a cement-board popular for housing construction.

According to a recently published article on the nation's only remaining asbestos mine, KCAC president Ed Kleber believes this versatile mineral would still have many domestic users were it not for costly government regulations.

The regulations are the result of the discovery by the Environmental Protection Agency of a link between cancer and a lung disease called asbestosis and at least one of six or so types of asbestos.

In the 1980s, industry lawyers successfully appealed an EPA ban on all types of asbestos. They based arguments on acknowledged probable differences among asbestos types and the agency failure to conduct an analysis of the economic effects of an outright use prohibition.

Now, some states, including California, require institutions such as schools and hospitals to respond to public pressure to remove asbestos.

Kleber points out that asbestos is still used in the United States. One example is in industrial brakes, but this does not incorporate the short fiber type.

Presently, KCAC produces the same short-fibered asbestos that keeps it out of the remaining domestic market but that could someday be free of the asbestos stigma.

Employees at KCAC since 1963 have reported no incidences of sickness in a total of 250 workers. There are x-rays of current employees, and all retirees are going to be contacted, Kleber is quoted as saying.

He reports that consultants are producing data that KCAC plans to combine with its survey results to produce documentation for the claims that local asbestos deposits are "significantly less hazardous" than others.

A few miles northeast of the KCAC mine, a federal Superfund cleanup is almost complete of the defunct Atlas Mine that once produced asbestos.

According to the federal EPA project manager for the cleanup, he is unaware of any Atlas workers becoming sick. This contrasts with records of many other asbestos mines worldwide.

Reprinted from the September 1998 issue of ***California Mining.***

Diesel exhaust: A critical analysis of emissions, exposure, and health effects

Summary of a Health Effects Institute (HEI) Special Report HEI Diesel Working Group

By Kathleen Nauss, Health Effects Institute (HEI)

Diesel engine emissions are highly complex mixtures. They consist of a wide range of organic and inorganic compounds distributed among the gaseous and particulate phases. Public health concern has arisen about these emissions for these reasons:

- The particles in diesel emissions are very small (90% are less than 1μm by mass), making them readily respirable.
- These particles have hundreds of chemicals adsorbed onto their surfaces, including many known or suspected mutagens and carcinogens.
- The gaseous phase contains many irritants and toxic chemicals.
- Oxides of nitrogen, which are ozone precursors, are among the combustion products in the gaseous phase.
- There is a likelihood for humans to be exposed to diesel emissions or their atmospheric transformation products in both ambient and occupational settings.

Diesel emissions have the potential to cause adverse health effects. These effects include cancer and other pulmonary and cardiovascular diseases. However, diesel engines are only one of many sources of ambient particulate matter and gaseous air pollutants. Therefore, it is difficult to measure the exposures from various sources, and to distinguish the potential health risks attributable to exposure to diesel exhaust from those attributable to other air pollutants.

For over a decade, the Health Effects Institute (HEI) has supported a broad-based research program to evaluate the health risks of diesel emissions, including investigations of carcinogenesis, modeling studies, and emissions characterization. It also organized a Diesel Working Group consisting of scientists with expertise in automotive engineering, atmospheric chemistry, toxicology, pathology, molecular biology, epidemiology, and environmental sciences to examine what is known, not known, and still uncertain about the health risks of exposure to diesel emissions.

The HEI Diesel Working Group focused its evaluation on a set of issues that it thought were critical to assessing the carcinogenic risks of exposure to diesel exhaust. Its Special Report[1] includes background papers that contain in-depth discussions of emissions, exposure, toxicity, carcinogenicity, and dose-response relations. The Report also contains a paper that synthesizes the Working Group's determination of what conclusions about the carcinogenicity of diesel exhaust could be drawn from the available scientific data and identifies important information gaps.[2] The major findings of the HEI Diesel Working Group are discussed in this summary.

Emissions[3]

The composition of diesel exhaust varies considerably depending on engine type and operating conditions, fuel, lubricating oil, and whether an emissions control system is present. Diesel engine emissions have changed dramatically over the last 30 years because of improvements in engine technology, emissions controls, and fuel formulation. Emissions of oxides of nitrogen and particulate matter from the diesel engines introduced in the late 1980s and early 1990s are significantly lower than those from older engines. As a result, characterizations of modern-day diesel exhaust cannot be used to estimate past exposures, nor can they be used reliably to project future emission profiles.

Exposure[3-6]

It is very difficult to assess exposure to diesel emissions because they are highly complex mixtures and constitute only a small portion of a broader mix of air pollutants. For example, combustion of other materials, such as fossil fuels and tobacco, produce many of the same chemical components that are present in diesel emissions; furthermore, both natural and man-made sources of respirable particles are common. No single constituent of diesel exhaust serves as a unique marker of exposure; however, scientists can use the levels of fine particles or elemental carbon (both of which are much higher in diesel emissions than in other combustion products) as surrogate indices of diesel exhaust particulate matter. When estimating exposure to diesel emissions, the following factors need to be considered:

Because of improvements in engine design and emissions control technology, and the use of reformulated fuels, future human exposures to diesel engine emissions will differ from past and current exposures. However, reductions in exposure to diesel emissions will be gradual because of the long life of heavy-duty diesel engines, and will be offset as the use of diesel engines grows.

The fact that the chemical and physical characteristics of diesel emissions will change as new technology and fuels are implemented cautions against automatically assuming that a decrease in the amount of emissions will result in a decrease in risk.

Once emitted, diesel emissions undergo atmospheric transport and transformation processes that may alter the toxic, mutagenic, or carcinogenic properties of the original constituents, creating new products that may be either more or less hazardous than the original emissions.

Exposure to diesel exhaust particulate matter has been assessed in occupational settings and some ambient environments. Although the existing data are limited, some estimates of the range of human exposure to diesel emissions can be made:

In some occupations, diesel emissions contribute a high proportion of the particulate and gaseous air pollutants. The estimates for workplace exposures to diesel exhaust particulate matter range widely, from approximately 1 to 100g/m^3 (eight-hour averages) in some occupations such as trucking or transportation, to 100 to 1,700g/m^3 for occupations such as underground mining where equipment powered by diesel engines is often used in enclosed spaces.

The information on ambient exposures is sparse. In an analysis conducted in the Los Angeles Basin in the early 1980s, diesel emissions accounted for approximately 3% of the mass of total particulate matter and 7% of the mass of fine particles emitted into the atmosphere. Average monthly values for ambient levels of diesel exhaust particulate matter ranged from 1 to 3 g/m^3 in areas with low levels of air pollution. These values are in general agreement with the range of nationwide annual average values derived by the U.S. Environmental Protection Agency using vehicle emissions factors, sales information, and pollutant exposure models. In the Los Angeles study, the highest monthly average levels of diesel particulate matter were approximately 10 g/m^3 at the most polluted locations during winter months, the period of highest exposures. Short-term or peak exposures to diesel particulate matter, especially in urban settings such as street canyons, are usually higher than monthly or annual average concentrations.

Human responses[7]

Given the limited exposure information, it is a challenge to determine the contribution of diesel exhaust to human cancer. The Diesel Working Group developed the following conclusions after reviewing over 30 epidemiologic studies of workers exposed to diesel emissions in occupational settings for the period 1950 through the early 1980s.

The epidemiologic data are consistent in showing weak associations between exposure to diesel exhaust and lung cancer. The available evidence suggests that long-term exposure to diesel exhaust in a variety of occupational circumstances is associated with a 1.2- to 1.5-fold increase in the relative risk of lung cancer compared with workers classified as unexposed.

Despite the concern that confounding by cigarette smoke might explain the observed risk elevations, most studies that controlled for smoking found that the association between increased risk of lung cancer and exposure to diesel emissions persisted after such controls were applied, although in some cases, the excess risk was lower. Only a few epidemiologic studies considered other potential confounders such as nondiesel particles, environmental tobacco smoke, asbestos exposure, diet, and socioeconomic factors. At present, there is insufficient evidence to conclude whether confounding by these factors influenced the results.

As is frequently the case in epidemiologic studies of air pollutants, none of the studies measured exposure to diesel emissions or characterized the actual emissions from the source of exposure for the period of time most relevant to the development of lung cancer. Most investigators classified exposure on the basis of work histories reported by the subjects or their next of kin, or by retirement records. Although these data provide relative ranking of exposure, the absence of concurrent exposure information is the key factor that limits interpreting the epidemiologic findings and using them to make quantitative estimates of cancer risks.

Animal responses[8-12]

The carcinogenic activity of diesel emissions has been convincingly demonstrated in rats. Nearly lifetime exposure for 35 hours or more per week to high concentrations of diesel exhaust particulate matter (2,000 to 10,000 g/m^3) causes an exposure-dependent increase in the incidence of benign and malignant lung tumors in rats. No consistent evidence suggests that diesel emissions induce cancer in rats at sites other than the lung. Prolonged exposure to diesel emissions does not produce lung tumors in hamsters, and the results in mice are equivocal, which suggests that species-specific factors play a critical role in the induction of lung tumors by diesel emissions.

Recent reports from two independent laboratories support the idea that the particle-associated organic chemicals play little or no role in the development of lung tumors in rats exposed to high concentrations of diesel emissions. No significant differences were noted in tumor incidence or histopathologic characteristics between rats exposed to diesel exhaust and those exposed to carbon black (a surrogate for the diesel particles minus the adsorbed organic compounds). These results do not completely eliminate a possible role for the adsorbed chemicals, some of which are potent mutagens and carcinogens. If bioavailable, they could play a role in carcinogenesis that might not be detectable in the rat bioassay because their effect is either too subtle or is masked by the overwhelming response of the rat's lungs to high concentrations of inhaled particles.

Even though the evidence strongly suggests that prolonged exposure to high concentrations of diesel exhaust particulate matter induces lung tumors in rats, the Diesel Working Group recommends caution in extrapolating these results to humans for the following reasons:

The lung tumors observed in rats exposed to high concentrations of diesel emissions may be due to a species-specific response to inhaled particulate matter rather than to a carcinogenic mechanism that also occurs in humans. When rats and other laboratory animals are exposed to high concentrations of diesel exhaust particulate matter or other poorly soluble nonfibrous particles for long time periods, lung clearance mechanisms are impaired and particles gradually accumulate in the lungs; this condition is referred to as lung overload. In the rat, lung overload has a characteristic threshold and initiates a progressive series of cellular responses, including inflammation, alveolar epithelial cell proliferation, and fibrosis. These responses are more severe in rats than in mice or hamsters, and appear to be associated with the subsequent development of lung tumors.

Although characteristic exposure thresholds for lung overload, as well as for the nonneoplastic and neoplastic responses, have been noted in the rat, extrapolation of no-effect levels for exposure to diesel exhaust from one species to another is problematic because of wide inter- and intraspecies variations in particle clearance rates and in susceptibility to cancer.

Our knowledge of the mechanisms by which prolonged exposure to high concentrations of diesel emissions produces lung tumors in rats is incomplete. At the high concentrations of diesel emissions used in the rat bioassay, the data imply that the diesel exhaust particulate matter triggers inflammation and cell proliferation. Such responses are thought by many scientists to cause cancer through indirect or "nongenotoxic" mechanisms rather than by direct interaction with DNA, as would be caused by the mutagenic chemicals adsorbed to the particles. At this time, however, only circumstantial evidence supports the hypothesis that diesel emissions induce rat lung tumors by nongenotoxic mechanisms.

The rat bioassay data do not exclude the possibility that diesel exhaust may induce lung cancer by different mechanisms in different species, or by different mechanisms in the same species at different exposure levels (e.g., predominantly nongenotoxic mechanisms under high-dose exposure conditions and genotoxic mechanisms under low-dose exposure conditions).

The Diesel Working Group cautioned that using the rat bioassay data (obtained at high-dose exposure levels) to make quantitative estimates of the carcinogenic risk of exposure to diesel emissions at environmentally relevant exposure concentrations may overestimate risk if the mathematical models used to extrapolate from high to low doses and from animals to humans do not (1) account for particle overload and associated inflammatory and proliferative processes, (2) recognize the apparent existence of a threshold for particle-induced biologic responses, such as impairment of lung clearance mechanisms, inflammation, cell proliferation, and tumor development, and (3) consider the mechanistic relation of the nongenotoxic injuries to the development of lung tumors in laboratory rats.

Integrating exposure data with information from human and animal studies to characterize the potential carcinogenicity of diesel emissions

The Diesel Working Group found that it is not presently possible to base a risk characterization of diesel exhaust solely on either the human or the animal data. Instead, the Working Group evaluated and integrated the available information from diverse data sets to make the most informed judgments about the potential carcinogenicity of exposure to diesel exhaust.[2]

Key issues concerning the human health risk of diesel exhaust are: Does particle overloading occur in humans under environmental exposure conditions, and if so, does it trigger processes that lead to lung cancer. In the rat, the animal species most sensitive to diesel exhaust, lung tumors are produced after nearly lifetime exposures for 35 hours or more per week to high concentrations of diesel exhaust particulate matter (2,000 to 10,000 g/m^3). These concentrations are approximately three orders of magnitude higher than current estimates of average atmospheric concentrations of diesel exhaust particulate matter (1 to 10 g/m^3). One mathematical extrapolation model suggests that lung clearance mechanisms would not be impaired in humans even if they were exposed continuously (24 hours per day) to levels of particulate matter in this ambient range. According to this model, the levels of respirable particles that would be needed to depress lung clearance mechanisms in humans under continuous exposure conditions are greater than 100 to 200 g/m^3. This, however, is an unlikely exposure scenario, even for most workers. Under more realistic intermittent exposure conditions (eight hours per day, five days per week), the model predicts that the concentration of particulate matter needed to impair lung clearance would be 500 to 1,000 g/m^3. Only a limited number of workers, primarily miners, are exposed to concentrations of diesel exhaust particulate matter close to this range.

If we assume that particle-induced mechanisms of lung tumorigenesis operate similarly in rats and humans, the analysis above implies that there is some biological rationale for extrapolating the rat bioassay data to the small population of workers who are routinely exposed to high concentrations (greater than 1,000 g/m^3) of diesel exhaust particulate matter and who may have impaired lung clearance mechanisms. Because of the large interspecies differences in particle clearance, the rat bioassay data also may be relevant to those workers who are exposed to levels of diesel particulate matter one order of magnitude lower (100 to 1,000 g/m^3). However, the toxicity and modeling data do not support the assumption that exposure to diesel exhaust particulate matter alone at the levels found in most ambient settings (1 to 10 g/m^3) would be sufficiently high to overwhelm lung clearance processes and, thus, induce lung tumors by a mechanism driven by inflammation and cell proliferation.

Summary

A wealth of information is available about the potential for diesel emissions to cause cancer. Epidemiologic studies of different occupational cohorts consistently show that the risk of lung cancer among workers classified as having been exposed to diesel exhaust is approximately 1.2 to 1.5 times the risk in those classified as unexposed. However, the lack of definitive exposure data for the occupationally exposed study populations precludes using the available epidemiologic data to develop quantitative estimates of cancer risk. When appropriate human information is not available, some policymakers have relied on the results of animal bioassays to estimate human risk. This document raises questions about the validity of using the rat bioassay data to characterize the potential human risk associated with ambient exposure to diesel emissions. The reason for this uncertainty is that the mechanism of lung tumor induction that appears to operate in rats continuously exposed to high concentrations of diesel exhaust and other particulate matter may not be relevant to most humans, who are exposed intermittently to levels of diesel exhaust particulate matter that are two or three orders of magnitude lower than those used in the rat bioassays. The development of unique markers of exposure to diesel emissions and a better understanding of the mechanisms of carcinogenesis would help to establish scientifically valid links between the lung cancers observed in laboratory animals and the human disease, thus improving the accuracy of cancer risk assessments.

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URL: www.dieselnet.com [Accessed 10 June 1998].
This paper published in May 1997

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A note about the Health Effects Institute:
The Health Effects Institute (HEI), established in 1980, is an independent and unbiased source of information on the health effects of motor vehicle emissions. HEI supports research on all major air pollutants. Consistent with its mission to serve as an independent source of information on the health effects of motor vehicle and other pollutants, the Institute also engages in special review and evaluation activities. Typically, HEI receives half its funds from the U.S. Environmental Protection Agency and half from 28 manufacturers and marketers of motor vehicles and engines in the United States. However, HEI exercises complete autonomy in setting its research priorities, conducting evaluation and in disbursing its funds.

*To learn more about HEI, please visit their home page at http://www.healtheffects.org or contact Dr. Kathleen Nauss (e-mail: knauss@healtheffects.org). Copies of the **HEI Diesel Report** can be obtained from: The Health Effects Institute, 955 Massachusetts Avenue, Cambridge, MA 02139*
Tel: 617-876-6700, fax 617-876-6709.

Coal accident summary

Fatal roof fall accident—Underground coal mine

General information

The mine is located near Oceana, West Virginia. The mine developed from the surface into the Hernshaw Seam—which averages 44 inches in height. The mine employs 26 persons on two production shifts, operating five and six days a week, using one continuous-mining unit. The mine produces an average of 1500 tons of coal daily. Advance and retreat mining have been performed in this mine. The roof is supported with 48-inch anchor bolts and 36-inch resin-grouted bolts during development, and a combination of roof bolts and posts during retreat mining. At the time of the accident the mine was using a full pillar extraction method.

Description of accident

On Friday, June 12, 1998 at 7:00 am, the day shift crew, under the supervision of the section foreman, entered the mine and traveled to the 001-0 MMU main working section. The section foreman assigned duties to the section crew and mining began in the No. 2 entry. Mining was conducted in the Nos. 2, 3, and then No. 6 entries, mining lifts left and right from the gob outby. Coal in the No. 1 entry was not mined because of adverse roof conditions, as was the case in the No. 7 entry on the right side. Mining continued without incident until about 12:45 pm. The roof bolter operator and the section foreman were setting roadway and breaker timbers and watching the immediate roof. The continuous-mining machine—a Joy 14CM15 with radio-remote control—was trammed outby the pillar blocks being mined from the No. 6 entry to allow room to set the timbers. The scoop operator brought enough timbers to the No. 6 entry for roof supports. According to the section foreman and the roof bolter operator, all timbers were set according to the approved roof control plan. Two lifts had been removed from the inby end of the No. 6 entry pillars, left and right. The section foreman and the roof bolter operator were in the process of setting five breaker timbers for the left lift to be mined from the No. 36 pillar block. The victim was walking into the area to assist the roof bolter operator and the section foreman. The roof bolter operator and the section foreman heard a timber pop and a piece of the roof fell. Both miners ran to safety, but they could feel a wind gust at their backs. Afterward, they realized that the victim, a continuous-mining-machine helper, was caught by a large section of the mine roof. The fall of the immediate roof at the accident scene measured 5 feet wide, 12 feet in length, and ranged from 1 to 5 feet in thickness. The section foreman and the roof bolter operator observed the victim underneath the roof material, pinned to the mine floor.

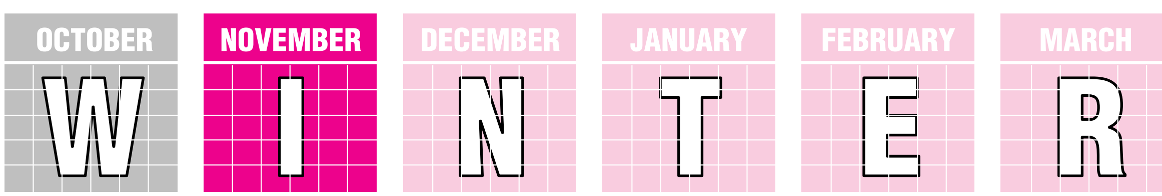
Conclusion

The mine roof in the area where the accident occurred, as well as other areas of the section, was supported with 42-inch fully grouted bolts. The roof bolts were installed on four- to five-foot crosswise and four-foot lengthwise spacing as required by the approved roof control plan.

The mining method at the time of the accident consisted of seven entries developed on 50-foot centers advancing and 70-foot centers for crosscuts. The 001-0 MMU section had extracted three rows of pillars and encountered cracks in the immediate roof. A partial pillar was then left in the No. 1 and No. 7 entries while mining the 4 through 7 entries, when the accident occurred. The mine roof is sandstone with the immediate roof ranging from shale to sandstone. The layer of shale roof ranges from four to five feet thick.

The accident and resulting fatality occurred because undetected cracks that were not visible were present in the mine roof of the No. 6 entry. As a result, the weakened immediate roof fell prematurely and without warning while miners were installing roadway and breaker posts and preparing the area for mining the next pillar lifts

Summarized by the editor, Fred Bigio, from an MSHA accident report.



ALERT reminder: ● ***Always maintain adequate mine ventilation and make frequent checks for methane and proper airflow.*** ● ***Know your mine's ventilation plan and escapeways. Properly maintain methane detection devices. Communicate changing mine conditions to one another during each shift and to the oncoming shift.*** ● ***Control coal dust with frequent applications of rock dust.*** ● ***Make frequent visual and sound checks of mine roof during each shift. NEVER travel under unsupported roof.***

Retreat mining pillar stability

By Christopher Mark

Room-and-pillar retreat mining has been growing in popularity because of productive new technology, including remote control continuous miners, extended cuts, and mobile roof supports. Pillar retreat mines can achieve the same high recovery as longwalls, with lower capital costs and greater flexibility. Unfortunately, between 1990 and 1995, nearly 30 percent of all roof and rib fatalities occurred on retreat mining sections. Also, millions of tons of minable coal are left in place each year because of pillar squeezes, floor heave, pillar line roof falls, and pillar bumps. Traditional pillar design methods are of little help due to the complex mining geometrics and abutment pressures that are present during pillar extraction.

The ***Analysis of Retreat Mining Pillar Stability*** (ARMPS) program was developed to ensure that pillars of adequate size for all anticipated loading conditions. ARMPS calculates a ***Stability Factor*** (SF) based on estimates of the loads applied to, and the load-bearing capacities of, pillars during retreat mining operations. The program can model the significant features of most retreat mining layouts, including angled crosscuts, varied spacings between entries, barrier pillars between the active section and old (side) gobs, and slabcuts in the barriers on retreat. It also uses the Mark-Bieniawski pillar strength formula (discussed elsewhere in this article), which considers the greater strength of rectangular pillars.

The ARMPS method is being verified through analysis of past pillar recovery case histories. To date, 105 case histories have been obtained from ten states. Studies indicate that pillar failures in 92 percent of the cases where the ARMPS SF was greater than 1.5, 95 percent of the pillar designs were satisfactory. SF values ranging from 0.75 to 1.5 show mixed results, as both successful and unsuccessful cases are found.

Current research is directed toward determining which factors may contribute to satisfactory conditions when the ARMPS SF is in the 0.75 and 1.5 range.

The ARMPS program is a proven aid in planning pillar recovery operations. It is easy to use and provides analysis in a very short time. ARMPS is currently in use at mines in Kentucky, Pennsylvania, Tennessee, and West Virginia, and regulatory agencies have also made extensive use of the program. ARMPS is just one aspect of current health and safety research directed toward improving the health and safety of room-and-pillar retreat mining. Other issues that are being addressed include preventing massive pillar collapses/air blasts, the design of retreat panels for bumper control, and the application of mobile roof supports.

Rectangular pillar formula

Most pillar strength formulas were developed for square coal pillars. An example is the Bieniawski formula:

$$Sp = S1\,[0.64 + (0.36\, w/h)],$$

(1) where Sp = pillar strength,
S1 = in situ strength,
w = pillar width (least plan dimension), and
h = pillar height.

Bieniawski recognized that his formula underestimated the strength of rectangular pillars, but because it was based on in situ testing of square specimens, there was no obvious way of estimating the “pillar length” effect. Today, we know that when a pillar fails, the stress is lowest at the rib and greatest in its central core. The stress profile is the function that describes the stress level at any point between the rib and the core. The pillar’s ultimate load-bearing capacity is the stress profile integrated over the area of the pillar. The square pillar formulas do not explicitly consider the internal stress distribution, but they imply a stress gradient because of the w/h effect. The stress gradient implied by the Bieniawski square pillar formula was derived mathematically and found to be:

$$Ó = S1[0.64 + (2.16\, x/h)],$$

(2) where x = distance from the pillar rib, and
Ó = pillar stress

The Mark-Bieniawski rectangular pillar strength formula was obtained by integrating equation (2) over the area of a rectangular-shaped pillar, then dividing by the load-bearing area:

$$Sp = S1[0.64 + (0.54\, w/h) - (0.18\, w2/Lh)],$$

(3) where L = pillar length

This formula indicates that the increase in strength in a rectangular pillar depends on both (w/h) and (w/L). For example, this formula suggests that the strength of a strip pillar with a very large w/h ratio is nearly 50 percent greater than predicted by the original square pillar formula. A pillar whose length is twice its width is predicted to be 10 percent.

Reprinted from NIOSH’s Pittsburgh Research Center’s ***Mining Health and Safety Update.***

To obtain a single copy of the ARMPS computer program, send a double-sided, double-density diskette to: Christopher Mark,

Metal/Nonmetal accident summary

Fatal fall of person accident—Underground silver mine

General information

A shaft repairman, age 57, was fatally injured when he fell down a vertical mine shaft while turning an ore skip prior to hoisting waste material. The victim had a total of 32 years of mining experience, the past 19 years at this operation. He had worked 11 years five months as a shaft repairman.

The mine was located near Kellogg, Idaho. The mine was normally operated two, 8-hour shifts a day, five days a week. Total employment was 274 persons; of this number, 202 worked underground.

The mine was a multiple level underground operation which produced 900 to 1,000 tons of silver, antimony, and copper bearing ore daily. Access to the mine was by vertical shafts and horizontal drifts along the ore veins. The mining method was horizontal cut and fill.

Description of accident

On the day of the accident, the victim reported for work at 10:00 pm, his normal starting time. The lead shaft repairman assigned the victim to help hang pipe on the 1700 level.

At about 4:30 am, the cager, went to the 1700 level to get the shaft repairman to help him turn the skips from hoisting ore to hoisting waste. The victim, the lead shaft repairman, and the cager rode the chippy cage to the Jewel shaft collar. The three men rotated the north skip/cage combination without problems, then proceeded to turn the south skip/cage. The guides were unlocked and moved out of the way, and the skip hoist was belled above the collar. The lead shaft repairman, who was standing on the west side of the collar area, pushed on the skip/cage while the victim pulled on it from the east side. The ore storage bin was located on the west side of the collar and the waste storage area was located on the east side. The skips had to be manually rotated 180 degrees to switch between ore and waste hoisting cycles. This task was performed at the collar level by first unlatching and swinging open a 26-foot section of the wood guides in each compartment. The distance between the open guides was 54 inches and the diagonal measurement of the cage was 71 inches. Therefore, the skip and cage had to be forced several feet away from the center line of the shaft so the skip could be rotated.

During the skip rotation procedure at the time of the accident, the skip in the south compartment became jammed between the southwest corner gate post on the west side and the guide support column on the north side. The bottom of the cage was 34 inches above the collar level floor and horizontally displaced from the east side of the shaft wall 21 inches at the southeast corner and 31 inches at the northeast corner. The victim fell down the south compartment from the east side work area through the opening between the shaft compartment and the jammed cage.

During the swinging process, the suspended skip/cage became lodged, so they decided to use the tugger to pull the skip free. The cager went to the tugger located at the south end of the station while the lead shaft repairman hooked up a sheave block on the west side. The victim, who was on the east side, said that he was going to pry the skip free with a bar. The victim threw the bar on the floor of the cage and started to climb into the cage, when he slipped and fell into the open shaft.

Loose material had fallen from the skips and discharge chutes, accumulating on the collar level floor. The headframe structure over the collar level was partially enclosed; however, uncovered openings in the structure and irregularities in the concrete floor permitted precipitation to enter and accumulate around the hoist compartment openings, creating muddy conditions.

Both the victim and the cager were wearing safety belts but were not secured to a lanyard. The shaft compartments were not covered during this activity.

Local authorities were notified and efforts were begun to remove the victim's body from the shaft.

Conclusion

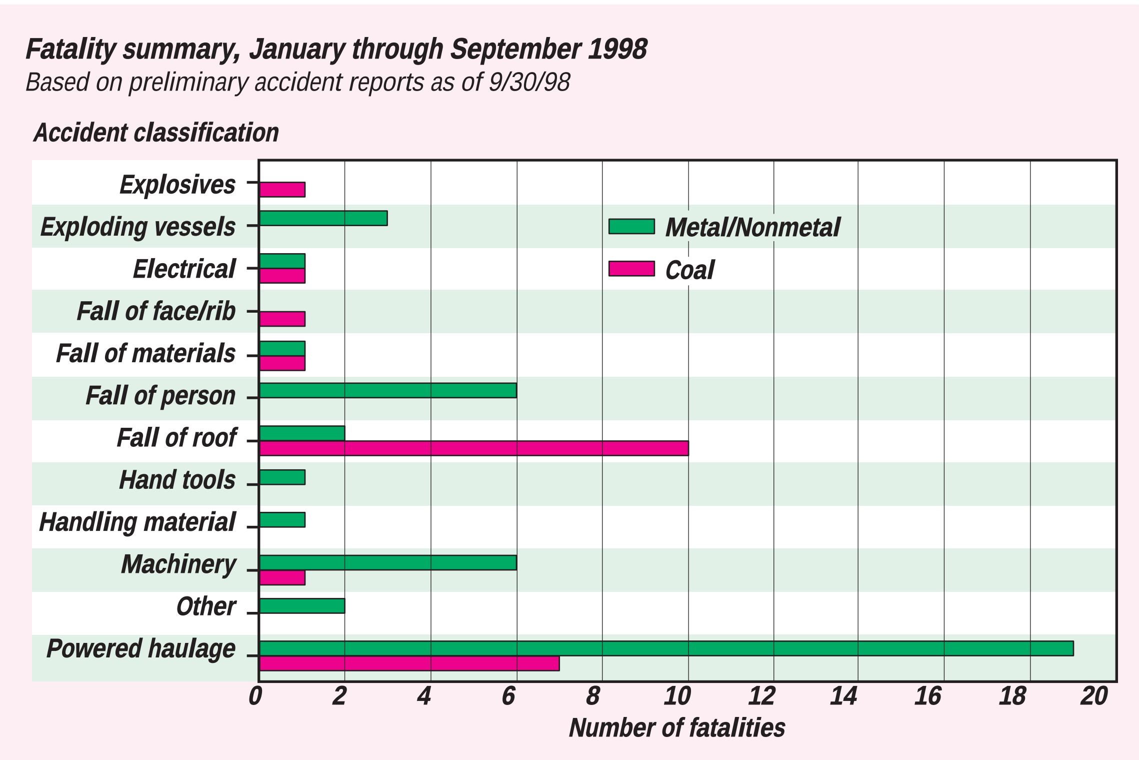
The accident was caused by lack of an effective program to ensure the use of personal fall protection when working around the open shaft and to ensure that the open shafts were covered. When questioned, employees indicated that swinging the suspended skips/cages over the open shaft to rotate them, without using personal fall protection or covering the shafts, had been a common practice.

After the accident, the mine operator initiated a number of procedures designed to cover deficiencies in the safety program: (1) All employees working around the shaft were trained in the proper use of personal fall protection and the company initiated a program to ensure compliance. (2) Shaft openings are designed to accept covers especially made for work around the shaft—a procedure to ensure that shaft covers would be used while rotating the skips is now in effect. (3) An explanation of work place examinations and safety checks, along with supervisory responsibilities, was conducted. Shift employees were also counseled on the same topic. Workplace examinations are now being conducted.

Summarized by the editor, Fred Bigio, from an MSHA accident report.

Third quarter fatality statistics

This article updates the status of fatalities occurring in both coal and metal/nonmetal mines from January through September of 1998. Based on preliminary accident reports, as of September 30, 1998, 64 fatalities have occurred at coal and metal/nonmetal mining operations. During this period, 22 fatalities occurred at coal operations and forty-two fatalities occurred at metal/nonmetal operations. Fall of roof fatalities in coal and powered haulage fatalities in metal and nonmetal were the most frequent accident classification, each of these classifications caused 45 percent of the fatal injuries.



Below is a summary of coal and metal/nonmetal statistics:

Coal Mining

Ten of the fatalities were classified as fall of roof. Of the 22 fatalities, 9 occurred in Kentucky and 6 occurred West Virginia. Seventeen fatalities occurred underground and five occurred on the surface.

Metal/Nonmetal Mining

Nineteen of the fatalities were classified as powered haulage and 6 each were fall of person and machinery. Twelve fatalities occurred at sand and gravel operations and 8 occurred at limestone operations. Five fatalities occurred in Texas, three each occurred in Iowa, Michigan, and Oregon. Thirty-seven fatalities occurred at surface operations and five fatalities occurred underground.

Submitted by:
John V. Forte, National Mine Academy, Beckley, WV

Roof monitoring safety system for underground stone mines

Objective

The Roof Monitoring Safety System (RMSS) provides a first step in roof behavior awareness. By understanding and measuring roof movement in an underground mine, the potential for injuries or fatalities to mine workers from fall of ground can be lessened. Also, officials at an underground mine with a history of data on roof movement are better prepared to make a decision on remedial actions if falls of ground become a problem. The RMSS provides a safer, simple, and inexpensive means for measuring roof movement.

Background

Statistics show that falls of ground (i.e., roof or rib rock) are responsible for a high number of mining injuries and fatalities. In all of mining, workers in the underground stone sector face the most serious risk from fall of ground, according to Mine Safety and Health Administration injury statistics from 1992 to 1996.

In addition to the present dangers associated with underground stone mining, national trends indicate that this sector will expand in future years. A proactive approach toward understanding roof behavior allows for mine planning and development that affords the safest conditions for the mine worker. In the United States, there are currently approximately 95 underground stone mines (predominantly limestone). The stone produced is used primarily for construction and secondarily for lime in chemical applications.

Approach

During the past few years, the Pittsburgh Research Laboratory of the National Institute for Occupational Safety and Health (NIOSH) examined and characterized conditions at 43 underground stone mines. Observations during these visits revealed a limited degree of roof monitoring beyond visual inspection. Existing monitors typically require the miner to measure movement at the roof. If conditions are unstable, the miner may be in harm's way while recording data.

Based on these circumstances, researchers concluded that a simple, inexpensive monitoring instrument with the capability for remote readings could lead to a safer way of recording data, as well as more widespread monitoring and understanding of roof movements. A monitor to meet this need was subsequently designed and tested. The key features of this monitor are *(1) remote capability*, i.e., it allows a miner to determine if roof movement occurred while at a location away from where dangerous conditions may exist, and (2) *inexpensive and simple design*, i.e., it allows for fabrication of the

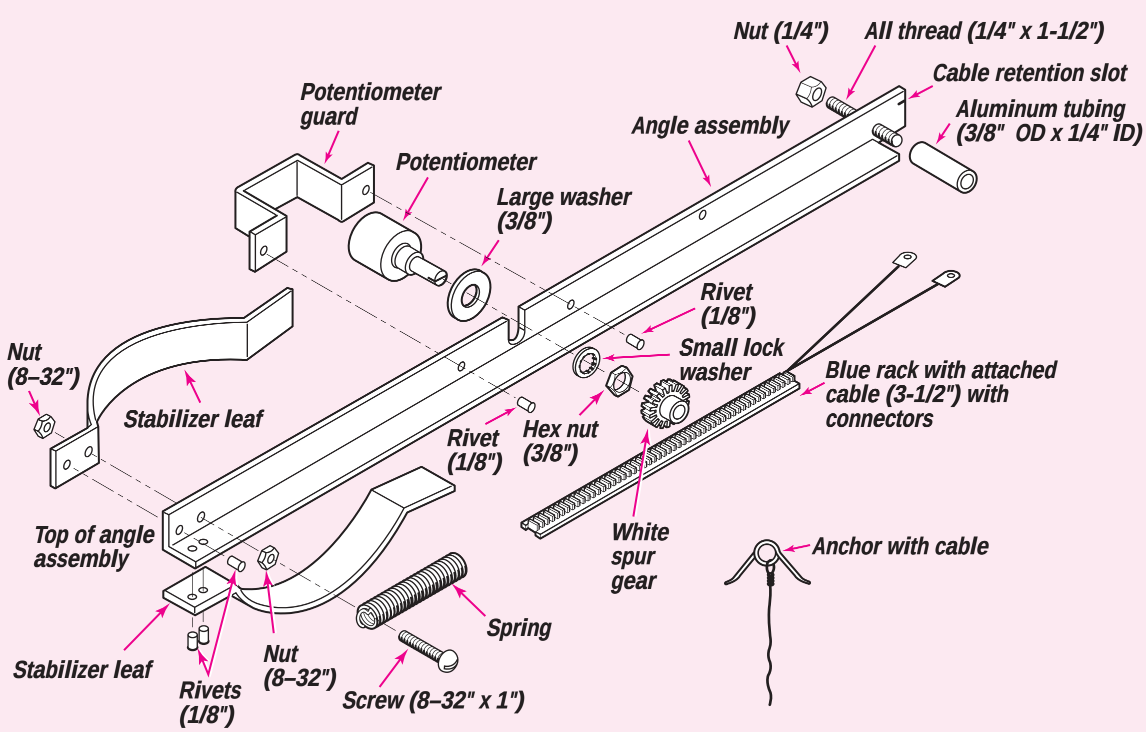
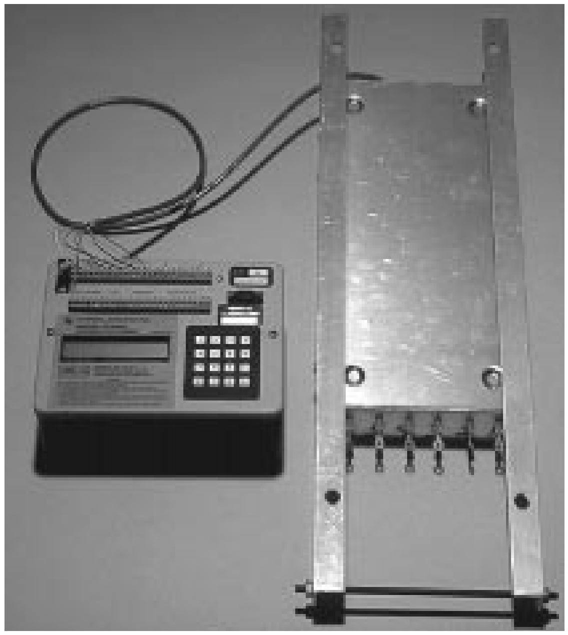


Figure 1.—Overview of RMSS components



At left: Single point, in-hole RMSS with Multimeter readout.

At right: Multi-point RMSS with a digital readout device.

monitor at the mine site, as most of the monitor parts are readily available at local hardware or supply stores.

How it works

An overview of the RMSS components is shown in figure 1. Movement of rock layers within the mine roof is measured relative to a fixed-point calibration at the monitor housing. The housing contains a spring-loaded cable attached to a plastic rack and spur gear. Movements are detected by the transfer of electromotive forces through the rack to the spur gear, which is attached to a 500-ohm potentiometer. Movements are measured through the tension spring that is attached to one end of the monitor. When movement occurs, the cable is pulled and the resultant electromotive force is recorded by the potentiometer. Movement is precisely measured by comparing the output of the potentiometer to a control-level calibration and can be read from cable extended from the roof to a ground-level location. A reading can be made with a voltmeter at appropriate time intervals or hooked to a data acquisition system for more thorough data collection.

The monitor requires a 2-in-dia. hole extending approximately 12 to 20 ft into the roof. The first step requires that the anchor, with cable attached, be inserted into the hole above any separations or partings. The RMSS is inserted entirely into the hole leaving about 1/2" of space between the roof line and the 1/4" all-thread at the bottom of the RMSS. The unit is firmly placed into position by tightening the all-thread while holding the nut.

A multimeter is used to read the RMSS. The limiting factor in obtaining accurate readings is the quality of the multimeter. Lower quality meters had resolutions and accuracies in the range of 2 ohms and 0.5%, respectively while higher quality meters yielded resolutions and accuracies in the range of 0.1 ohm and 0.07%, respectively. A resolution of 1 ohm represents the ability to resolve about 0.004" of movement.

Total cost for the device, less the cost of a multimeter, is about $25 to $35.

Accomplishments

The RMSS was introduced at a NIOSH "Safety Seminar for Underground Stone Mines" in Evansville, IN, on December 10, 1997. During the first half of 1998, monitors were installed at 5 mines one in Illinois, three in Kentucky, and one in Pennsylvania, with plans for installations in other mines. A summary report detailing use of the monitors and evaluation by mine workers and operators is planned for January 1999.

Patent status

An application for a patent on the RMSS has been filed.

For More Information a detailed instruction booklet (25 pages) is available giving complete details on parts, assembly, and installation of the RMSS. To receive a free copy, contact L.J. Prosser, Jr., or Anthony T. Iannacchione, Ph.D., NIOSH Pittsburgh Research Laboratory, Cochrans Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070, phone: (412) 892-4423 or (412) 892-6581, fax: (412) 892-6891, e-mail: lfp2@cdc.gov or aai3@cdc.gov

To receive additional information about mining issues or other occupational safety and health problems, call 1-800-35-NIOSH (1-800-356-4674), or visit the NIOSH Home Page on the World Wide Web at http://www.cdc.gov/niosh

Mention of any company name or product does not constitute endorsement by the National Institute for Occupational Safety and Health or the Mine Safety and Health Administration.

*Reprinted from the August 1998 edition of NIOSH's **Technology News**, No. 475. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.*

Roof fall kills young miner who used vehicle to ram timber

Dangerous methods to remove roof support, in which a young miner deliberately crashed a three-wheel personnel carrier into a timber to remove it, and a lack of an emergency plan combined to take the life of the miner.

Investigators found that the operation had not done enough to prevent the fatal accident at its underground coal mine in Buchanan County, Va. Investigators concluded the mine operator's failure to conduct examinations, control the mine roof, and remove roof support by remote control resulted in a fall of roof on June 4 that killed a 25 year-old coal miner.

Investigation revealed that the operation failed to conduct an examination in the area before the company removed permanent roof supports. In addition, investigators found that the mine had not supported or controlled the mine roof in order to protect miners. It was also noted that inadequate pre-shift examination which failed to detect what the investigators described as "readily visible wide roof bolt spacing and loose draw rock." The mine was cited for using methods other than remote means from a location of inadequate roof support: investigators said miners removed three timbers by running a three-wheel personnel carrier into the timbers, which resulted in a fatal fall of roof material.

According to investigators, the victim, who normally operated a continuous haulage bridge, had removed two timbers from along the No. 2 belt using a battery-powered, rubber-tired, three-wheeled personnel carrier. Justice was having trouble removing the third timber, so the section foreman told him to let a scoop knock out the timber. Witnesses said the victim told the foreman he could do it, and the foreman told the miner to "have at it," according to investigators.

The victim used the personnel carrier to ram the timber and a large piece of rock fell, trapping him in the vehicle. Miners worked to free him, gave him cardiopulmonary resuscitation, and took him out of the mine on a mantrip.

When miners got to the surface, they discovered an ambulance had not been called. After some confusion, a miner called the telephone operator and asked for the County Sheriff's Dept. The police called for an ambulance for the mine. Two miners put the victim in the back of the pickup and left for the hospital. About 15 minutes later, they met the ambulance and transferred the victim. The ambulance took the victim to the local hospital, which referred the miner to a Medical Center in Kingsport, Tenn. Fog precluded a med-evac flight from the hospital, so the ambulance took the victim to Richlands, Va., and a medical flight took him to Bristol Regional Medical Center in Bristol, Tenn. The victim succumbed to his injuries at 12:26 p.m. on June 5.

*Reprinted from the September 21, 1998 edition of **Mine Regulation Reporter** by Pasha Publications Inc.*

Three children killed in 1922 coal mine disaster

On a hot Sunday morning in June a group of children were picking blackberries in the vicinity of the south manway escape shaft to the large No. 6 Central Coal and Coke Company Mine at Huntington, Arkansas. This escape shaft was located about 3/4 of a mile south of the main hoisting and air shafts. The surface entrance to this shaft was completely boarded off with a small door leading into an enclosure about 2 feet wide and 4 feet high. This door was not locked. No one knows for sure but it is presumed that the heat of the day caused the children to seek the cooler environs of the manway to cool off. According to the story of the little Roberts girl, who was overcome but later rescued, Yancy Roberts was sitting on the floor with his feet on the first step leading down the manway. In minutes he was overcome and fell forward into the shaft to the first landing which is 10 steps, or about 12 feet, from the surface. Willie Roberts immediately rushed to the first landing to rescue her brother and was overcome. Then Dollie and Edith Roberts went down and met the same fate. The other two Roberts sisters, Gladys and Minnie ran a mile to their home and informed their father, John Roberts and R.G. Dunlap, who happened to be at the Roberts home. The two men rushed to the scene. They immediately went down into the shaft and Roberts almost succeeded in bringing one of the children to the surface when he toppled over and fell backwards down in the shaft. Both men were overcome.

Robert Porter, 19, a strong robust young man, was on duty as watchman at No. 6 Mine. He heard of the accident and together with Zack Hubbard, proceeded at once to the scene. Porter went down into the shaft and tied a rope around Dunlap's body and proceeded at once to the surface. He and Hubbard then pulled Dunlap out. He was unconscious but on being brought to fresh air quickly regained consciousness. Porter then tied a rope around himself and proceeded down the shaft to the second landing. One of the girls, in falling down the shaft, rolled to the second landing. He secured the girl from this point and started up the stairway carrying her bodily in his arms. He had almost reached the surface when he was suddenly overcome and fell back in the shaft to the third landing with the girl in his arms. He was still conscious but could not move. He begged pitifully for fifteen to twenty minutes for someone to come down and get him, or pull him out. In his anxiety and excitement, he had twisted and tangled the rope, which was attached to his body, around the winding stairs in such a manner that it was impossible for Hubbard to pull him out.

Considerable time elapsed before any of the officials of the coal company heard of the accident and reached the scene. As soon as they were notified, John Wilkinson, Fire Boss, and John Garth, Mine Foreman, proceeded to the scene and took charge of things. Had these men not arrived, it is likely that more would have lost their lives as a large crowd had gathered. Three of the unfortunate victims were lying on the first landing in the shaft where they could easily be seen by the gathering crowd. Strong armed methods were needed to hold the crowd back. In the meantime, Mine Foreman Garth and Fire Bosses Wilkinson and Rodenheiser descended the stairway to the first landing by holding their breath. They then secured and brought three of the Roberts children to the surface. Physicians, who were at the scene, worked on the three children. They pronounced two of them dead but the third girl, Willie Roberts, showed signs of life. Three hours after being rescued, she regained consciousness. The three men who rescued the children from the first landing were almost overcome. The other three victims were on the second and third landings. It was impossible to reach them as the black damp (carbon monoxide—CO_2) was suffocating. This mine had been closed down since April 1 due to a coal strike. Water had accumulated and had risen some fifteen feet up the main air shaft. Under the existing circumstances ventilation could not be restored. In order to clear this portion of the manway, rescuers used an ordinary house fan. About 4,000 feet of electric line was hung from the main shaft to this escape shaft. This fan was lowered to the third platform in the shaft and run at high speed. After the fan had been running for an hour it cleared the atmosphere to the extent that the other three bodies were recovered. They had been in the shaft at least five hours. Strangely, little Willie Roberts was the second person to be overcome and was in this deadly atmosphere for an hour or more and lived through the ordeal.

The Bureau of Mines McAlester, Oklahoma Station was notified of this disaster at 2:00 pm June 25 and requested to bring oxygen breathing apparatus. W.W. Fleming, Foreman Miner packed eight sets of breathing apparatus and caught the Rock Island train, which left McAlester at 2:35 pm the same afternoon. The train arrived at the scene of the disaster at 7:30 pm. The last body was taken out of the shaft at 7:00 pm. It was not definitely known whether or not there were any more children in the shaft. The miners and company officials requested that the apparatus be kept at the scene until a check of all the children in the mining camp was made.

The escape shaft the children fell into was 170 feet in depth. It was partitioned off in the center with one side open so that material could be hoisted or lowered into the mine. The other side was provided with a winding stairway such as was commonly placed in escape shafts with about 10 steps to the tier. None of the seven persons fell lower than the third landing which was about 25 feet. Had they fallen to the bottom of this shaft it would have been much more difficult to recover the bodies.

*This actual account is from the official Bureau of Mines Preliminary Report by W.W. Fleming. This report is on file in the Library Archives at the National Mine Health & Safety Academy at Beckley, WV and was e-mailed to Fred Bigio for editing and possible inclusion in the **Bulletin** by Jane M. Demarchi.*

Dead

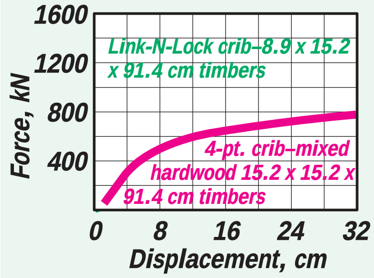
John Roberts, age 36, father
Yancy Roberts, age 11, son
Dollie Roberts, age 14, daughter
Edith Roberts, age 10, daughter
Roland Porter, age 19, son of mine foreman Joe Porter

This unusual and tragic accident happened 76 years ago. Children continue to play on mining property. And, tragically, children continue to lose their lives on mining property. If you have children and live near an active mine or an abandoned mine, read this story to them. Caution them and their friends about entering any sort of shaft and of the dangers they could possibly encounter at any active or abandoned mine site.

Link-N-Lock cribs

Link-N-Lock cribs provide higher support capacity with less wood. These cribs, developed and manufactured by Strata Products (USA) Inc., improve the capability of conventional wood cribbing. The Link-N-Lock is constructed from timber blocks that are notched on both ends such that they stack much like a log cabin. This arrangement provides full contact among adjoining timbers as opposed to 40% contact provided in conventional 4-point cribbing stacks.

Comparison of strata products Link-N-Lock crib supports and conventional 4-point crib



This concept provides greater support capacity, improves stability, and reduces material handling by 30 percent or more. These supports are ideal for bleeder entries and other long-term support areas. For more specifics the assessment and testing of the Link-N-Lock cribs, call Tom Barczak at (412) 892-6557 or fax your inquiry to (412) 892-6891.

Reprinted from NIOSH's Pittsburgh Research Center's ***Mining Health and Safety Update—New Concepts****.*

Surgeon reconstructs teen's hand after blasting cap accident

A 14-year-old Spokane, Wash., teenager whose hand was mangled in a blasting cap accident on July 28th has undergone plastic surgery to reconstruct his thumb and forefinger.

The boy was playing with blasting caps when one exploded in his right hand, blowing off the tip of his second finger. The top knuckle of his ring fnger is permanently fused. The blasting cap also sprayed shrapnel into his face.

He and three other teenagers had been working on their bikes in a friend's garage when the friend showed them where his father was storing a box of 400 blasting caps. The blasting caps were brought home after his mine's explosives bunker was broken into several times. He said he was afraid the thieves would return. Unsure of his legal options, he decided to temporarily store the blasting caps in his garage. "Everyone's sorry it happened. I don't care what happens financially to me. I was mostly concerned about Brian's eyes."

The teen said he didn't know what a blasting cap was, and he didn't realize one was attached to the fuse he was holding. The other fuses, he said, simply burned and died out.

An investigator with the Washington State Department of Labor and Industries is currently investigating the incident. The Sheriff's Dept. seized the blasting caps and took them to a bunker.

The teen's mother is glad the injuries weren't worse, but she's also angry. "He shouldn't have been playing with fuses or blasting caps," she said. "And his friend's father shouldn't have been storing them in a cabinet in his garage. If they're going to store it, they should lock it," she said.

The family has not decided if they will seek civil damages.

Reprinted from the Sept. 4, 1998 issue of ***Mine Safety and Health News*** *by Legal Publication Services.*
Further edited by Fred Bigio, editor

Virginia honors slate miner

Walter W. Burnette, an 86 year-old shovel operator for a slate mine, was honored in Washington, D.C. as Virginia's Outstanding Older Worker.

Burnette retired Jan. 1, 1979. A Virginia mining company, F&M Construction, contacted him a short time later and proposed that he help them out for a couple of weeks.

More than 19 years later, he's still on the job operating heavy equipment. F&M management praise him as one of their most dependable workers—he's never late, he doesn't miss work, and he sets a good example for younger employees.

The award program was initiated by Green Thumb, America's oldest and largest provider of mature worker training and employment, in cooperation with the U.S. Department of Labor's Employment and Training Administration and the U.S. Department of Health and Human Services' Administration on Aging.

Burnette told people, "work as long as you can, you stay in much better health."

Reprinted from the April 3, 1998 edition of ***Mine Safety and Health News****.*
Further edited by Fred Bigio, editor

INDEPENDENT CONTRACTORS live by "BEST PRACTICES"

MSHA launches safety initiative to address Independent Contractor fatalities

Speaking before a gathering of mine operators, independent contractors, and other industry representatives at the National Mine Health and Safety Academy in Beckley, W. Va., on October 20, Assistant Secretary of Labor for Mine Safety and Health, J. Davitt McAteer announced the onset of a multi-faceted initiative aimed at reducing the high number of independent contractor fatalities occurring at mining operations nationwide. Records show that 181 independent contractor employees have been killed, since 1990, while performing work on mine property.

The Assistant Secretary stated, "Today's mining industry employs more independent contractors at U.S. mining operations than ever before. There are important roles that we all must play—independent contractors, mine operators, miners, as well as MSHA—in reducing the number of fatalities among independent contractor employees at mining sites."

Use of independent contractors has more than doubled since 1983 when employment of contractors to perform work at mining operations numbered approximately 11,000. That year, six percent of coal miner workers were employed by independent contractors and accounted for four percent of the 70 coal mining deaths that year. Over the next ten years, contractor employment reached more than 27,000, and by 1993, contractor employees accounted for 28 percent of the 47 coal mining deaths recorded in that year.

The past several months MSHA has been hosting a series of safety seminars for independent contractors. These seminars are providing opportunities for mine operators, independent contractors, and other interested parties to share ideas and develop practices to improve safety and health for contractor employees and miners alike.

The remaining seminars include: December 1 at the Beville State Community College on Route 78 Summiton, Alabama (starts at 8:00 a.m.), and December 3 at the Tower West Lodge/Best Western - Highway 14 & 16, Gillette, Wyoming.

In addition to the seminars, MSHA is also distributing instructional and training materials intended to educate independent contractor employees about the hazards they may face when entering a mine site. MSHA personnel are working closely with contractors to identify training needs and will provide assistance in developing training programs to ensure contractor employees receive training that is relevant to mining hazards they may encounter. The agency is also distributing posters, hard hat stickers, dashboard checklists, and "best practices" pocket cards informing and reminding workers of potential hazards and how to avoid them. Mine operators are urged to discuss these materials with all contractors who perform work on their property.

MSHA is calling upon mine operators to be certain that independent contractor employees are fully informed that they are required to follow certain safety standards while on mine property. Mine operators are to provide contractors with required site-specific hazard training when they enter mine property.

It will take the cooperation and assistance of every one within the mining community to overcome the problem of independent contractor injuries and fatalities. Independent contractors need to be aware of problem areas and everyone must act to remove hazards that hurt contractor employees and operator employees alike.

Reprinted from an MSHA press release dated 20 October 1998, number V-286. For further information, contact Rodney Brown of MSHA at 703-235-1452.

Skin care in the workplace

By John W. Fowler - Industrial Skin Care Category Manager, Kimberly-Clark Away From Home Sector

Skin is the body's largest organ. It serves as a suit of armor, keeping the body safe from dirt, bacteria and infection. It also insulates the body, helping to regulate body temperature and offer protection from heat and cold.

Skin has a complex system of protection and renewal built-in. When properly cared for, skin will rebuild itself regularly and secrete oils to keep it supple and pliant. The outer layer of skin, called the stratum corneum, is actually a layer of dead cells that protects the more tender skin beneath it. It is important to keep the stratum corneum healthy to keep out irritants and protect the body from absorbing bacteria and chemicals.

Skin takes a beating in day-to-day life. It gets knocked, scraped and jabbed, and it comes in contact with chemicals, harsh substances, soils, dirt and bacteria in the work environment. Daily activities can compromise the skin's system of renewal and protection, leaving the body vulnerable to a variety of infections and diseases. In some work environments, such as food processing, skin also can come into contact with, and be responsible for the spread of bacterial contamination. Skin on the hands and fingers can transmit chemicals and bacteria to more sensitive areas, such as eyes; to items being handled, such as raw meat; and to the hands of others.

In fact, skin disease and hand injuries make up one of the largest categories of occupational illnesses and can result in lost work time and increased company costs. Therefore, it is important for industrial hygienists, safety professionals and employees to understand their skin care options and to choose the correct skin care system/regimen for their needs.

Skin cleansers

Skin care products are expected to perform some tough tasks, such as removing deep grime or killing bacteria, and yet they are expected to leave the skin feeling and smelling great. However, the very nature of heavy duty cleansing or killing bacteria, calls for active chemicals, many of which can be either unsafe or strip the skin of its natural oils.

There are a variety of skin cleanser products on the market, from general purpose cleansers for light cleaning, to antimicrobial cleansers for use in food processing, to heavy duty industrial cleansers and high performance products.

Most industrial facilities, such as factories, auto body shops and machine repair shops, will want to investigate the variety of industrial products on the market: natural solvent-based and non-solvent-based; waterless cleansers; shampoos for hair and body; powdered cleansers for use with water; as well as creams and lotions used before, during, and after work to make cleanup easier and to help moisturize the skin.

Solvents are usually added to industrial cleansers to help dissolve tough dirt, grease, asphalt, tar, paint and inks. The best industrial cleansers contain natural cleansers such as D'Limonene, and are free of petroleum bases and low in volatile organic compounds (VOCs). Cleansers containing kerosene or other harsh chemicals can severely dry and damage the skin.

Grit is often added to industrial cleansers to help dislodge dirt by mechanical action. Polymer (plastic) bead grit is often used because it is smooth and feels less scratchy to the skin while being highly effective. Some natural grits, such as ground corncobs and nut shells, are also often used.

Before work, creams can be used as part of a skin care routine that helps protect hands, especially around the nail area. Such creams should absorb quickly and not be greasy. Some creams used before work are referred to as "barrier creams" and claim they protect the skin from harmful chemicals. Lotions used after work should absorb quickly and contain additives to help soothe and restore the skin.

If employees complain about the greasy feeling associated with many before-work creams, they may be using too much cream or not allowing the cream to penetrate the skin. By applying the right amount of the product (one push from the dispenser) several minutes before they actually begin work, the cream has a chance to penetrate the skin and the hands no longer feel greasy. (Tip: Put the dispenser of "before-work-cream" by the time clock or on the entry area to work.)

Wash your hands the right way

Heavy duty grease and grime deserves a heavy duty hand washing. To get your hands truly clean, and to keep your skin from drying out, just follow these simple tips:

1. Wet the hands and forearms using a stream of warm running water. Excessively hot water is harder on the skin, dries the skin and is too uncomfortable to wash for the recommended amount of time. Cold water prevents proper lathering of the soap and therefore soil and germs may not be washed away.

2. Apply cleanser Dispensers should be used to deliver the proper amount of cleanser while protecting the remaining product from contamination.
Use a product designed for your cleaning task—general purpose, antimicrobial, or industrial skin cleansing.

3. Lather thoroughly Scrub the hands and forearms well, for at least 15 seconds, and use a nail brush if necessary. Repeat until the skin is thoroughly clean.

4. Rinse thoroughly. Dry hands completely with a paper towel. Leaving soap residue on the skin and incomplete drying contribute to dermatitis.

5. Repeat steps 2–4 if hands were particularly dirty or greasy.

6. Use the paper towel to turn off the faucet to prevent recontaminating clean hands [and use the same paper towel to grasp the washroom door knob].

7. Use hand cream after washing and periodically during the day.
Hand cream helps restore the skin's natural oils that help keep it resilient. Skin conditioning agents (emollients) soften and smooth skin, and moisturizers reduce the shedding of dry skin flakes and microorganisms.

Importance of dispensers

While the choice of skin cleansers has a direct relation to the condition of workers' skin, selecting the correct dispensing system can affect how well and how often workers clean their hands.

Proper dispensing systems should be the right size to be mounted in convenient areas to encourage usage. Personnel often complain that they are too busy to wash their hands. Dispensers mounted in numerous convenient locations allow workers to wash with a minimum of time and also clearly state management's intention about hand washing.

Proper dispensing systems should provide controlled dispensing for cost-effectiveness. They should be easy to activate with one hand or a forearm so the user doesn't have to soil the dispenser if their hands are heavily contaminated or very dirty. The remaining product should also be protected from contamination. Even antimicrobial cleansers (food processing) can become contaminated if organisms are repeatedly introduced during usage. Bar soap and bulk soap can be sources of contamination and may help spread bacteria.

Getting the most from a skin care system

Industrial hygienists and others responsible for selecting skin care systems should follow these tips for maximum skin care efficacy at the most cost-efficient price point:

- Smaller plant sites often purchase consumer products. However, consumer products are not developed to meet the productivity, durability, and dispensing requirements in commercial facilities.
- Look at product formulations with the right efficacy for the task, so the power of the cleanser can be matched to the cleaning requirement of the user.
- Consider biodegradable/safe ingredients to minimize impact on the environment.
- Motivate employees to increase the frequency and effectiveness of skin care through continuing education and products that are pleasant and effective to use.

For additional information on industrial skin care products, contact Kimberly-Clark Corp., 1400 Holcomb Bridge Rd., Roswell, GA 30076-2199, 800/835-8351

Reprinted from the March 1998 issue of the Rimbach Publishing Co.'s ***Industrial Hygiene News.***

THE LAST WORD…

"If dandelions were hard to grow, they would be most welcome on any lawn."—Andrew V. Mason

"Often the best way to win is to forget to keep score."—Marianne Espinosa Murphy

"The truth of the matter is that you always know the right thing to do. The hard part is doing it."—Gen. H. Norman Schwarzkopf

"I always prefer to believe the best of everybody—it saves so much time."—Rudyard Kipling

"The average tourist wants to go where there are no tourists."—Sam Ewing

"The nice thing about egotists is that they don't talk about other people."—Lucille S. Harper

"If a window of opportunity appears, don't pull down the shade."—Tom Peters

"My father always told me, 'Find a job you love and you'll never have to work a day in you life.' "—Jimmy Fox

"While an original is always hard to find, he is easy to recognize."—John L. Mason

"There is one difference between a tax collector and a taxidermist—the taxidermist leaves the hide."—Mortimer Caplin

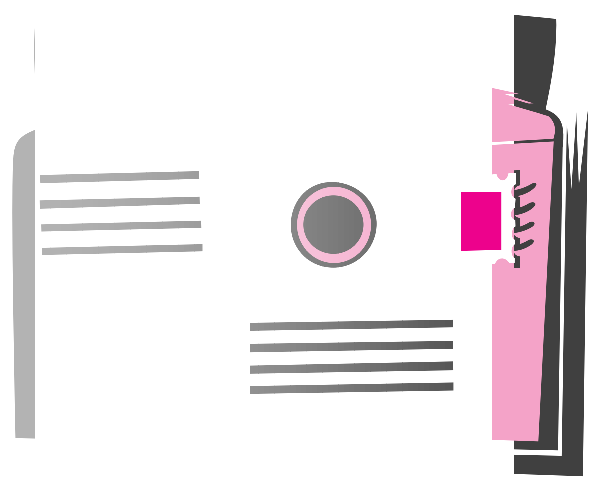
NOTICE: We welcome any materials that you submit to the Holmes Safety Association Bulletin. For more information visit the MSHA Home Page at www.msha.gov. We **DESPERATELY** need color photographs suitable for use on the front cover of the ***Bulletin.*** We cannot guarantee that they will be published, 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 1998 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
P.O. Box 4187
Falls Church, Virginia 22044-0187

Please address any comments to the editor, Fred Bigio, at the above address or at: MSHA—US DOL, 5th floor—EPD #535A, 4015 Wilson Blvd., Arlington, VA 22203-1984.

Please phone us at (703-235-1400).



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Al Simonson	Emeritus	MN
Harry Thompson	Emeritus	PA

*We are short of articles on metal/quarry safety and welcome **any** materials that you submit to the Holmes Safety Association Bulletin. We **DESPERATELY NEED** color photographs (8" x 10" glossy prints are preferred however, color negatives are acceptable—we will make the enlargements) for our covers. We **ALSO NEED** color or black and white photographs of general mining operations—underground or surface. We cannot guarantee that they will be published. If they are, we will credit the contributor(s) within the magazine. All submissions will be returned unless indicated.*

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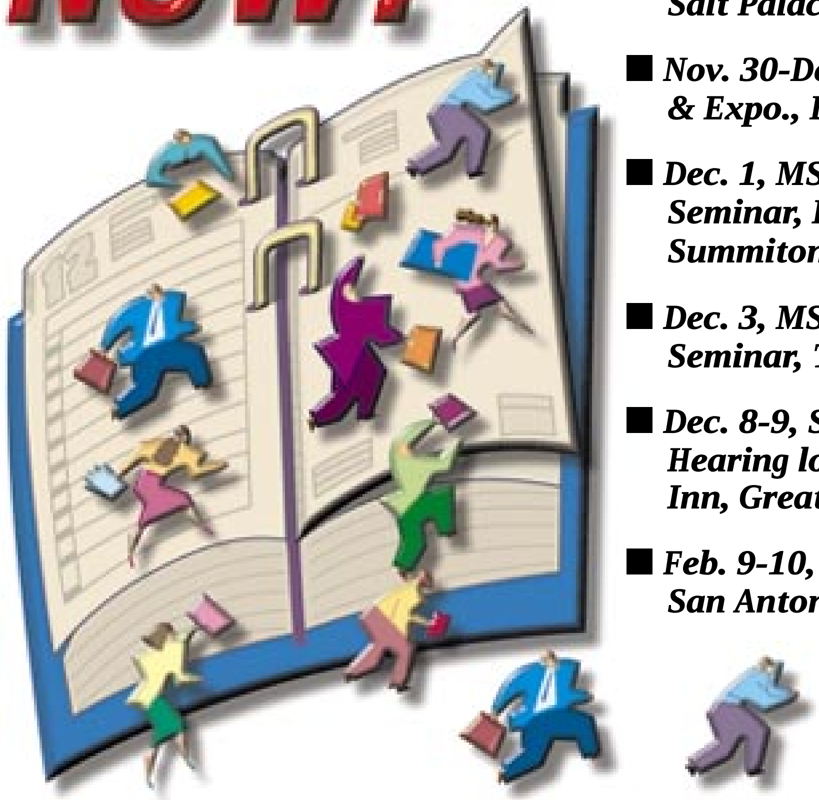

Upcoming events:

- *Nov. 15-18, 34th Ann. Int'l Cement Seminar, Salt Palace Conv. Ctr., Salt Lake City, UT*
- *Nov. 30-Dec. 4, NWMA 104th Annual Meeting & Expo., Doubletree Hotel, Spokane, WA*
- *Dec. 1, MSHA Independent Contractor Seminar, Beville State Community College, Summiton, AL*
- *Dec. 3, MSHA Independent Contractor Seminar, Tower West Lodge, Gillette, WY*
- *Dec. 8-9, Safety Seminar for UG Stone Mines/ Hearing loss Prevention Workshop, Holiday Inn, Greater Cincinnati-Northern KY Airport*
- *Feb. 9-10, South Central Conference, San Antonio, TX*