

The Holmes Safety Association

BULLETIN

March 1998

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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 is an electronically altered older—1970s—photo from the editor’s collection. [If you have a potential cover photo, please send an 8" x 10" print to the editor, Fred Bigio, MSHA, 4015 Wilson Blvd., Arlington, VA 22203-1954]

**KEEP US IN CIRCULATION
PASS US ALONG**

IN FOCUS—Cable bolts: a “new support”

By Thomas P. Mucho

Cable bolts are emerging as the newest “twist” for roof support in U.S. underground coal mines. For decades cable bolts installed in underground metal mines in the United States and Canada used cement-based grouts for anchoring. The cement anchoring process, because of the time and expense for installation, made cable bolts impractical for use in coal mines. Today, the introduction of resin-anchored cable bolts provides a system more consistent with traditional U.S. coal mine roof bolting practices and requirements. Expectations are that the utilization of cable bolts for a number of U.S. mining applications will expand, particularly in coal mining.

Cable bolt support technology, including hardware and anchorage systems, continue to evolve to satisfy U.S. mining industry requirements. Innovations have improved the ease and speed of cable bolt installation and the overall economy of cable bolting; efforts continue to expand

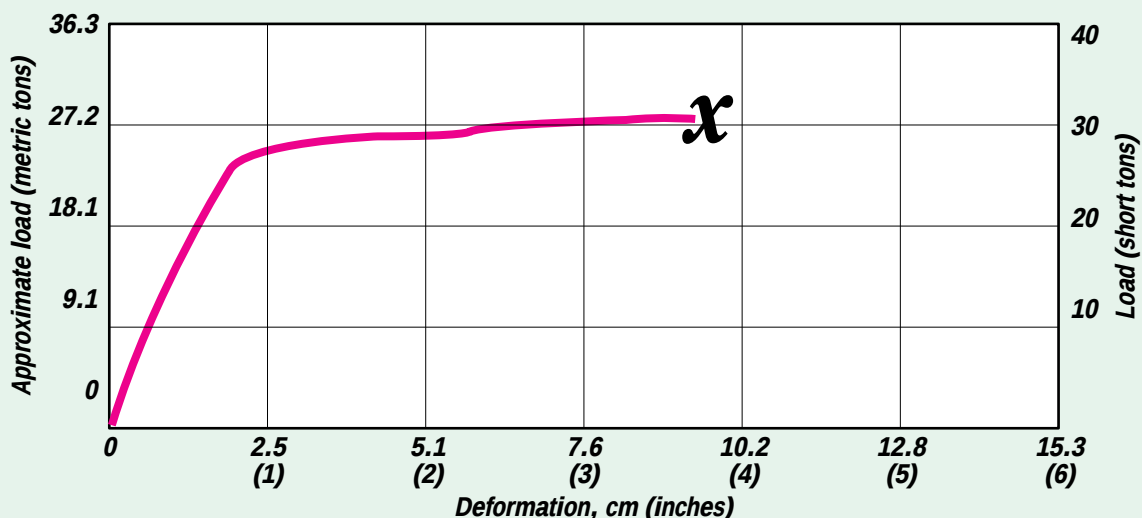
these capabilities. For cables to be successfully implemented into the various ground control areas to which they seem suited, the range and mechanics of this support performance need to be fully understood. A variety of factors can affect cable system performance, including the mine geology and stress conditions. Variables that must be considered for cable installation include hole size; cable length (grouted length and free length); resin composition and formulation; the number, type, location, and relative size of cable anchors or buttons; and the use of resin dams/keepers. The health and safety research program, through cooperation with cable bolt and resin manufacturers and coal mining companies, is evaluating these key parameters through in situ testing at a number of coal mines, as well as at our Lake Lynn Laboratory near Morgantown, W.Va. Much of the early cooperative coal mine cable bolt testing involved western U.S.

longwalls. Recently, we completed the first test of cable bolts at an eastern U.S. longwall site in southern West Virginia with a cooperating coal company (see “IN THE FIELD”).

Manufacturers offer features that improve performance and/or ease of installation. Resin dam/keepers, devices intended to contain the resin in the anchor location, and metal “stiffeners” near the bolt head are examples. In addition, roof bolt resins are being formulated for use with cable bolts; some of these resins are specially mixed to ease installation.

Because of the coal industry’s interest in injury prevention and safety and the potential cost savings, the growth in use and development of cable bolt systems is expected to continue. Some advantages of cable bolts compared to traditional roof supports used in coal mines are detailed below.

Wide secondary/supplemental support applications—Currently, most mines testing cable bolts use



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them in secondary and supplemental support applications, such as cribless longwall tailgates, bleeder entries, headgate support, long-life or critical openings, and timberless room-and-pillar secondary support applications. Cables may someday be used as primary support, because the flexibility of cable may be amenable to automated installation in mid- to low-seam coal mines.

Wide load/deformation range capability—Normally, have more deformation (or stretch) than traditional roof bolts. Common cable bolts and grout length 3.66 m (12 ft) cable with 1.52 m (5 ft) of resin grout will be at “yield” at about 1.9 cm (3/4 in) of deformation, yet will continue to slightly build load and deform to 7.6 to 10.16 cm (3 to 4 in) of deformation (see Figure 1). This performance is good for many applications. By fully grouting the bolt in resin a “stiffer” (less deformation to yield) performance can be obtained. Likewise by varying the amount and/or type of resin, an even “softer” performance, with much more stretch and/or yield before failure, is possible.

Greater support strength—The typical 7 strand cable bolt noted previously will typically yield at about 25.4 metric tons (28 short tons) and not fail until about 29 metric tons (32 short tons) (see Figure 1). This is more than most roof bolts, giving high support resistance per support. A converse benefit for many secondary

support applications is that cable bolts will eventually fail unlike some wood supports, which hardly ever fail. This may be advantageous for some secondary support applications (see “IN THE FIELD”).

Lower labor/material costs—The cost and scarcity of timber have been a driving force in the development and use of new secondary support system technologies, especially for western U.S. longwall operations. Foremost among these technologies is cable bolting, which has replaced wood cribs as the main tailgate support in several western mines. With the application of cable bolting, a 40% reduction in direct labor and material costs can be achieved over that of timber cribs. Much prime forest land is also potentially preserved.

Prevention of injuries—Originally, a reason for conducting health and safety research on cable bolts was the large number of injuries that occur from the handling of timbers and cribs. Such injuries cause human suffering and can be very expensive to a mining operation because of lost-time injuries and worker compensation claims. Cable bolts greatly reduce these injuries. From an operational standpoint, cable bolts reduce the amount of material that has to be stored and transported underground by 70% to 80% when compared to using timber cribs. This frees up equipment and also reduces road traffic and maintenance

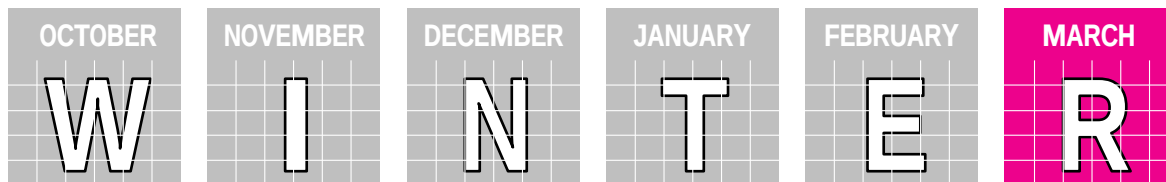
Improved ventilation/escapeways—Ventilation is also

improved with cable bolts. Studies have shown that the resistance to ventilation from wood cribs was decreased by 25% when cable bolts were used. This reduction in resistance has a positive impact on dust control as well as ventilation costs. The improvement in ventilation becomes extremely important when designing a super longwall panel where cable bolts may be the key to the successful operation of these super panels. With a cribless gate road, the use of the tailgate as an escapeway is greatly enhanced. Walking through the restricted space between the cribs is eliminated while exiting the face does not require climbing over and around the tailgate entry. This also provides greater clearance for supplying and maintaining the face and tailpiece.

Flexibility—Because cable bolts are flexible, long supports can be installed very quickly and easily in limited seam height.

Enhanced miner safety—Many of the above advantages combine to provide better working conditions. Obviously, the support strength of cable bolts, improved ventilation, and reductions in dust and materials handling injuries serve to improve health and safety conditions for the miner.

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Reprinted from the Pittsburgh Research Center's **Mining Health and Safety UPDATE** web site—accessed March 1997.



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.



Miner scaling loose roof after a fall—notice the hanging bolts

IN THE FIELD—Crips versus cables

By Thomas P. Mucho

A field site in the Eagle Coalbed served as the first full-scale test of a cable bolted cribless tailgate on a longwall in the eastern United States. The Pittsburgh Research Center completed this initial test in December 1995 at a mine in southern West Virginia. Previously, most cribless cable bolt test areas and usage had been in the Western United States. Generally, the immediate roof in the mine changes from a sandstone to shale. In the study area, the immediate roof consisted of massive, but small (45.7-61 cm (18-24 in)) sandstone layers separated by thin coal streaks. Primary roof support was 1.07 m (3.5 ft), grade 60, No. 6 resin bolts installed on 152-cm (5-ft) centers using T-2

channels. Cables were 3.66 m (12 ft) with 1 .52 m (5 ft) of resin anchorage in rows of 1.2 m (4 ft) on 1.8 m (6 ft) centers. Intentions were to locate the test site in what could be anticipated to be the worst ground conditions along the longwall panel within a given timeframe. As a result, the study site was positioned under a stream valley that had been associated with past ground control problems. The site was also under a longwall barrier pillar in the Upper Powellton Coalbed that had been previously mined.

In this study, cable bolts proved more than adequate to provide a stable cribless tailgate. Other advantages and possibly some disadvantages were also

noted compared to cribs.

The field instrumentation used was:

- Multipoint sonic probe roof extensometers (extos) to measure roof movements.
- Hydraulic and pressure pads on cable bolts to measure support loading.
- Roof/floor convergence pads to measure bottom heave (roof movements known from extos).
- Automated data collection system for extos—a first in cooperation with the Canada Center for Mineral and Energy Technology (the Pittsburgh Research Center has since purchased its own similar unit).

The cable bolts and instrumentation were installed just prior to the adjacent

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longwall face passing the test area, enabling the recording of the side abutment loading effects from the panel. There was very little roof movement during and after the passing of the adjacent longwall face. However, there was considerable bottom heave (inches) in the crib areas as opposed to almost no heave in the cable bolted area (tenths of an inch). This same pattern, more bottom heave in the crib area, was also true of the floor heave resulting from the front abutment during the panel longwall mining. We were never able to ascertain the reason for this difference in behavior.

The tailgate roof in the cable bolted area was extremely stable during the longwall mining with only a total of one tenth of an inch of total movement over the approximately 6.1 m (20 ft) monitored with the extensometers, even for those read up to 10.4 m (34 ft) inby the longwall face. The cribbed area was also reasonably stable with a maximum of a little over 1.27 cm (1/2 in) of total movement in the roof in an extensometer. The extreme stability in the cable area was also noted by the

low cable bolt loads, almost none until the face passed, and generally only a few thousand pounds gained until they passed the end of the shield caving beam. Crib convergence, and therefore loading, was also low, mainly increasing because of the bottom heave of the longwall front abutment loading.

Although roof stability was relatively the same, stable in both the cribbed and cabled areas, there were some notable differences in caving characteristics between the two support types. The cables would support the tailgate entry to distances of approximately 22.9 m (75 ft) behind the longwall face. They would then begin to fail in a domino fashion until the resulting fall would approach near the inby end of the shield caving beam. This cyclic caving was noted throughout the cable area. Also, caving would be nearly complete to the edge of the tailgate chain pillar. In contrast, crib caving, while also cyclic, would usually be in periods of hundreds of feet. Also, all of the cribs would not fail, especially not the line nearest the chain pillar. This difference in caving characteristics

resulted in less front abutment loading on the longwall panel and tailgate through the cable area compared with the cribbed areas. This was evidenced by tailgate rib sloughage, tailgate area panel coal sloughage, and roof noise in the tailgate. There can be pros and cons to these differences in behavior.

Likewise, the differences in caving behavior produced an impact on face ventilation. Because of the tighter caving in the cable test area, almost all of the longwall air traveled along the face with little traveling behind the shields, especially in the tailgate area. Tailgate gob ventilation was also reduced. This may unfavorably impact gassy gob longwalls, but should be a plus for longwall dust control due to higher face air utilization for dust removal.

A further evaluation of tailgate cable bolts in weak roof conditions for comparison with this strong roof environment is expected to be the next phase of this work by the Pittsburgh Research Center.

Reprinted from the Pittsburgh Research Center's Mining Health and Safety UPDATE web site—accessed 3/1997.

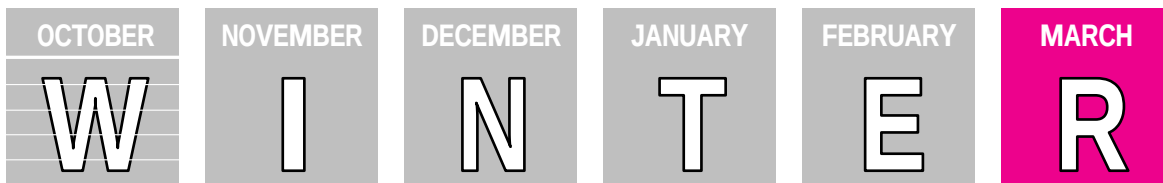
June 30, 1903; Hanna No. 1 Mine, Hanna, Wyo.; 169 Killed

(From *Cheyenne Daily Leader*, June 30-July 6, 1903)

At 10:30 am, the mine was rent by an explosion of gas when 215 men were in the pit. Flames burst forth with great fury, and the mouth of the mine was filled with debris. The explosion was thought to have originated 1-1/2 miles underground. The blast tore timbers from the slope and

hurled them far outside. Entrance was made through the manway, and bodies of men and mules were found throughout the mine. A fire was burning, and gas accumulated in the workings. Forty-six men were rescued alive. A survivor related that 2 explosions occurred about 2 seconds

apart. One was from blasting, the other from the ignition of gas and dust. Attempts to control the fire and open the lower levels failed. The mine was sealed at the 14th level. The mine was reopened in November, but some parts were left sealed and 1 body was not recovered.



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.

Grace period toll-free hotline available until April 17

MSHA extends grace period for mining-related illness reporting

The Labor Department's Mine Safety and Health Administration (MSHA) today announced it has extended the "grace period" during which mine operators can report occupational illness cases to the agency without the risk of penalty. The present grace period was scheduled to end on, Feb. 13, but has now been extended until April 17, 1998 because of a continuing request from both industry and labor.

"We have received more than 1,300 reports of occupational illnesses during the grace period that will be extremely valuable in helping us determine the nature and scope of mining-related illnesses in the industry," said Davitt McAteer, assistant secretary of labor for mine safety and health. "This extension of the grace period will allow us to receive even more of this important information."

MSHA began the grace period Oct. 15, 1997 and extended it until Feb. 13, 1998, to allow mine operators additional time to review their records and verify that they have reported all cases of occupational illness that have occurred in the last five years. To date, MSHA has received reports of black lung, asbestosis, silicosis, chemical exposure, dermatitis, and hearing loss. The new extension gives mine operators more time to report previously unreported illness cases to MSHA. The agency will take no enforcement action for late filing of reports of illnesses if the reports are filed during the grace period.

Mine operators, including independent contractors, are required by law to send a report to MSHA within 10 days after they are notified or otherwise learn that a miner has an illness that

may have resulted from working at a mining operation, or for which an award of compensation has been made.

Miners and operators who want to find out if an illness has been reported, or to leave a message, comment, or anything else they would like to tell MSHA, may call toll free at 1-888-249-8223 on MSHA's "Grace Period" Hotline. This toll free line will be available for use until April 17.

After the grace period ends on April 17, citations issued for failure to report occupational illnesses will be subject to review for consideration of a higher penalty than normally levied for such violations.

Reprinted from the U.S. Department of Labor's Information NEWS, V-37 Feb. 13, 1998, Chicago, IL, Mine Safety and Health Administration. For further information contact: Rodney Brown at (703) 235-1452.

ACCIDENT REPORT

Housekeeping more than keeping up appearances

Good housekeeping is sometimes seen more as a question of appearances than a real safety issue. But two incidents at one mine show it can make a big difference to the safety of workers.

Within the space of a few months, two workers were injured climbing over a muck pile and around scrap in a previously backfilled cross-cut. One worker slipped and a piece of muck pinned his thumb against an old rail. He lost his thumb nail and needed eight stitches to close the wound. The second worker stepped on a rock and twisted his ankle.

When the incidents were investigated, the company learned the two workers were climbing back to get to a cache of tools and equipment they had

stored behind the muck pile. They felt forced to do this because they had no secure place to keep items like saws, clamps, and hose mending gear.

The investigation pointed out the importance not just of safe storage, but of the efficient movement and ordering of materials.

Locking tool boxes or storage cabinets would keep the necessary tools and equipment handy, but secure. Tools could be labeled by print or color to indicate which crew they belong to.

A printed list on the door of the tool storage box would help keep track of stock, allowing operators to order items that are missing or running low. That would eliminate the need to hoard supplies in an unsafe location.

The key elements of good housekeeping:

1. When you see a spill, clean it up or block it off and report it immediately. The next person might not see it.
2. Never store materials in walkways or near stairs.
3. Secure wires, cables and hoses away from walkways.
4. As you work, inspect your worksite frequently for tripping or slipping hazards and eliminate them.
5. Put tools and equipment back in their proper place when they are no longer required.

Reprinted from Ontario [Canada's] Natural Resource Safety Association's July/August 1997 issue Health & Safety RESOURCE.

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Despite precautions, coal mining remains a dangerous occupation

Jeffrey Leib Denver Post Business Writer

In the U.S., underground coal mining may be safer now than it has ever been, but workers who travel beneath the earth every day still face dramatic perils.

Miners at a coal mine near Paonia, Colo. learned that lesson May 10, 1996, when a huge "bounce," or pressure bump in the earth above them caused portions of the mine's roof and walls to collapse, trapping six miners. It was the most recent serious underground coal mine accident in Colorado.

The bounce occurred when pressure from the earth's cover over the mine was released suddenly as miners dug coal from pillars 1,560 feet below, according to an accident report prepared by the federal Mine Safety and Health Administration (MSHA).

It filled the mine's tunnels with fallen coal and caused so much dust that the miners couldn't find an escape route.

The agency's report said the size of the coal pillars in the mine "were ideal for causing bounces" because they "were neither large enough to support all of the load nor small enough to yield gradually." The agency cited the mine for a number of violations and ordered it to submit a revised

roof-control plan.

In the report, federal mining engineer David Elkins wrote that miners "heard severe pounding noises in the roof and noticed bolt heads breaking off and top coal falling" as they removed coal from a pillar. Soon after, "the bounce occurred without warning and caused the roof and ribs (walls) to fall and the coal floor to heave in numerous locations throughout the working section of the mine."

The miners were 4.3 miles from the mine's main portals.

Elkins' report said other miners who were near the roof fall, but not trapped by it, called for help, shut off power to the working section of the mine and began to restore ventilation to the part of the mine where the workers were trapped.

The mine's vice president and the foreman tried to reach the trapped miners, but the way appeared to be blocked by fallen coal, Elkins wrote. "Audible alarms on their gas detectors indicated that the oxygen level was below 19.5 percent at this location."

He praised the efforts of the mine's vice president and the foreman and the mine crew to re-establish ventilation to the trapped miners and reduce the

amount of suspended dust.

After the dust cleared, the vice president and the foreman noticed an opening where coal had fallen, but hadn't blocked the tunnel. "As they began to travel through the opening," They "could see the trapped miners walking toward them. ... The miners walked through the opening, were quickly checked for injuries and were transported to the surface." Three had severe shortness of breath and were treated and released.

In a subsequent letter, MSHA district manager John Kuzar commended the vice president and the foreman and the second crew of miners. He also praised the trapped miners: "Considering the frightening conditions, including pounding noises in the roof, roof and rib falls, explosive methane levels, low oxygen levels, no visibility due to the suspended dust and the assumption that they were totally trapped by roof falls, it is truly remarkable and commendable that these men were able to remain relatively calm and make prudent, rational decisions," he said.

Reprinted from the Business Section of the Sunday, August 24, 1997 edition of the Denver Post.

October 3, 1911; Drifton Colliery, Freeland, Pa.; 5 Killed

(From Reports of the Inspectors of Coal Mines of the Anthracite Coal Region's of Pennsylvania, 1911, p. 394)

On the evening of October 3rd, at the Drifton Colliery, a serious and unexpected accident occurred, by which five men lost their lives. After the breaker had quit work for the day, the breaker foreman was instructed to take down an old stack that stood over an air shaft and was partly surrounded by the refuse bank. The intention, and the instruction given the foreman, was to take the plank off from the top down,

but when they arrived at the stack the men refused to go up on the ladder to begin at the top. After some discussion, it was decided to cut the stack around near the bottom, which was done, cutting the stack about two feet above the edge of the bank so as to avoid a rush of the bank into the shaft. After the cut was completed the men got on the north side of the stack to push it over. When it was pushed over, the

plank about six feet below the edge of the bank gave way and allowed the bank to rush in, sweeping the men into the air shaft, and before they could be rescued from below they were all dead from suffocation. The rest of the party, on the east side and west side of the stack, escaped when they felt the material going from under their feet.

Reprinted from the 1963 Bureau of Mines Bulletin 616 edited by C.M. Keenan.

Attitude vs. behavior: the debate continues

By John Cheeseman, ONRSA Education Specialist



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If a worker uses the correct lockout procedures, is he reflecting good attitudes about safety, or is he responding to strategies that modify his behavior?

During the past few years, more and more articles have appeared in the safety literature extolling the virtues of behavior-based safety management programs. These programs aim to improve health and safety by changing workers' behavior. Traditional approaches try to influence workers' attitudes, through training and education, one-on-one safety talks, safety meetings, videos, posters, and incentives. Advocates of the behavior-based approach denounce traditional attitude-based strategies as being out-dated and ineffective. Improvements in safety performance, they insist, can best be achieved using techniques to modify behavior. For example, "supportive" feedback is provided for desired behaviors and "corrective" feedback is provided when at-risk behaviors are observed. The most important assumption underlying this approach is that behavior is controlled by consequences (events that follow behavior). In other words, we tend to repeat behaviors that have positive consequences and resist repeating those with negative consequences.

Behavior-based safety management is not concerned with directly influencing employees' attitudes towards safety. The focus is on identifying and changing at-risk behaviors by conditioning workers to act a certain way. The key to improving safety performance is to design a system that provides positive consequences for safe behaviors.

The traditional approach most of

us are familiar with attempts to influence behavior indirectly by raising "safety consciousness" and changing attitudes and beliefs. Typically, training is provided to raise awareness about workplace hazards and the ways to control them. Training is followed by such things as visible management commitment, daily safety talks, monthly safety meetings, incentive programs, posters and personal appeals to individual accountability and family responsibility. All of these strategies are intended to influence attitudes and beliefs in the hope that subsequent changes in safety-related behavior will follow.

This approach is based on two key assumptions. First, because attitudes are learned, they can also be relearned using specific interventions. Second, attitudes exert a powerful influence over behavior. Workers who hold positive attitudes about safety are likely to engage in safer behavior. Let's examine the validity of these assumptions.

What are attitudes?

Behaviours are observable acts. Attitudes on the other hand, are internal dispositions or states of mind. Social scientists have formal and precise descriptions for what constitutes an attitude. Generally, they believe that:

- attitudes are learned;
- attitudes are relatively long-lasting

(they do not turn on and off like a light bulb); and

- attitudes influence the way we behave (but to what degree is not always predictable).

An attitude is said to be a tendency to judge some object, activity or person either favorably or unfavorably. It is also a tendency to act in a particular way. Attitudes are made up of three different components. First, in order to have an attitude we must hold a particular belief about an object, activity, or person (cognitive component). Second, we have an emotional attachment or feeling towards that object, issue, or activity (affective component). And third, we act or behave in a certain way that expresses our attitudes (behavioral component). For example, a mechanic may say that he believes in always locking out the electrical panel before repairing conveyors (cognitive component). He may feel very strongly that this course of action is clearly a matter of good common sense (affective component). And, whenever he is required to repair conveyors, he has been observed to use the company's lockout procedure (behavioral component). All three are indicators of a person's attitude. The attitude itself is not directly observable, but its existence is inferred from listening to a person's conversation and observing their behavior.

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What is the relationship between attitudes and behavior?

Attitudes have many different functions, one of which is to make sense of the world and help guide our thoughts and actions. Think of an attitude as an inner tendency (state of mind) to act a certain way towards some object, activity or issue.

Whenever that object, activity or issue is present, it activates this inner tendency (attitude). For example, the need to repair a defective conveyor system activates a person's attitude toward the company's lockout procedure. In this case, the function of an attitude is to guide appropriate behavior. Many believe that attitudes exert a powerful influence over our behavior. This may be true in certain situations but not in others because attitudes are only one of many variables that influence behavior.

Other important factors include:

- the strength of past behaviors (habits);
- anticipation of a positive consequence (reward);
- anticipation of a punishing consequence (avoidance conditioning);
- what others expect us to do (social norms);
- our moral values (sense of right and wrong);
- how strongly we feel that the attitude is a relevant guide in the specific situation; and
- the strength of competing attitudes.

Do attitudes accurately predict behavior?

For years behaviorists have insisted that consequences, not attitudes, predict behavior. This explains why traditional methods of persuading workers to change their attitudes (e.g., training, safety talks, meetings, incentives, etc.) have been largely ineffective. The common sense approach is to provide positive, immediate and predictable consequences (feedback) in order to

encourage workers to act in accordance with company policies and procedures. Traditionalists can take comfort in knowing that research is now demonstrating that attitudes can be reliable indicators of related behavior. An attitude may not predict a single behavior, but it can suggest with a high degree of probability that a person will engage in a range of behaviors tied to that specific attitude. For example, if a worker has a positive attitude about the company's lockout procedure (as evidenced by conversation and observed behavior), this is an accurate predictor that some combination of the following behaviors will occur:

- wearing PPE while locking out;
- standing off to the side of the electrical panel when disengaging power;
- pressing the stop button prior to pulling the handle on the disconnect switch;
- applying a personal lock to the operating controls;
- correctly filling out a tag and placing it with the lock; and
- insisting that his/her partner(s) repeat these steps whenever more than one person is working on the same job.

Unfortunately, the presence of a positive safety attitude is no guarantee that at-risk behaviors will be avoided. Every situation is different. An attitude may have a powerful influence one day and some other factor(s) may be more influential in the same situation the next day. For example, a bonus miner rushing to load a round near the end of a shift may neglect to scale the face as thoroughly as he usually does. People will always be vulnerable to competing situational factors that influence our behavior.

The fact that a general attitude towards safety (e.g., lockout) can predict a range of related behavior provides some justification for traditional safety management approaches.

Which method of safety management is the right choice?

The debate continues between both schools of thought. Behavior-based safety advocates steadfastly hold to the opinion that behavior modification is the answer. Workers who perform job tasks safely should receive tangible rewards and praise to reinforce their behavior. Traditionalists continue to employ a mix of persuasive safety education, incentives and disciplinary action to change attitudes and behavior. They claim that offering praise when safe behaviors are observed is no guarantee that workers will not be tempted to take short-cuts after supervisors have left the work area. People have to value safety. By holding positive safety attitudes in relation to job tasks, workers have internalized something that will help guide appropriate responses when supervisors are not there to provide feedback. A growing number of safety professionals are convinced that the best course of action is to borrow the best from both worlds. Acknowledge that many different factors influence human performance and include all of the following in your safety program:

- well-trained supervisors who know how to provide supportive and corrective feedback on a consistent basis;
- managers who visibly participate in the health and safety process and show their sincere commitment to the well-being of their employees;
- employee orientation programs that recognize how strategically important it is to guide the development of trainee attitudes and behaviors;
- training programs that teach everyone how to recognize, assess and control hazards;
- health and safety education programs that persuade employees that safety is in their best interests, and that of their family and co-workers; and

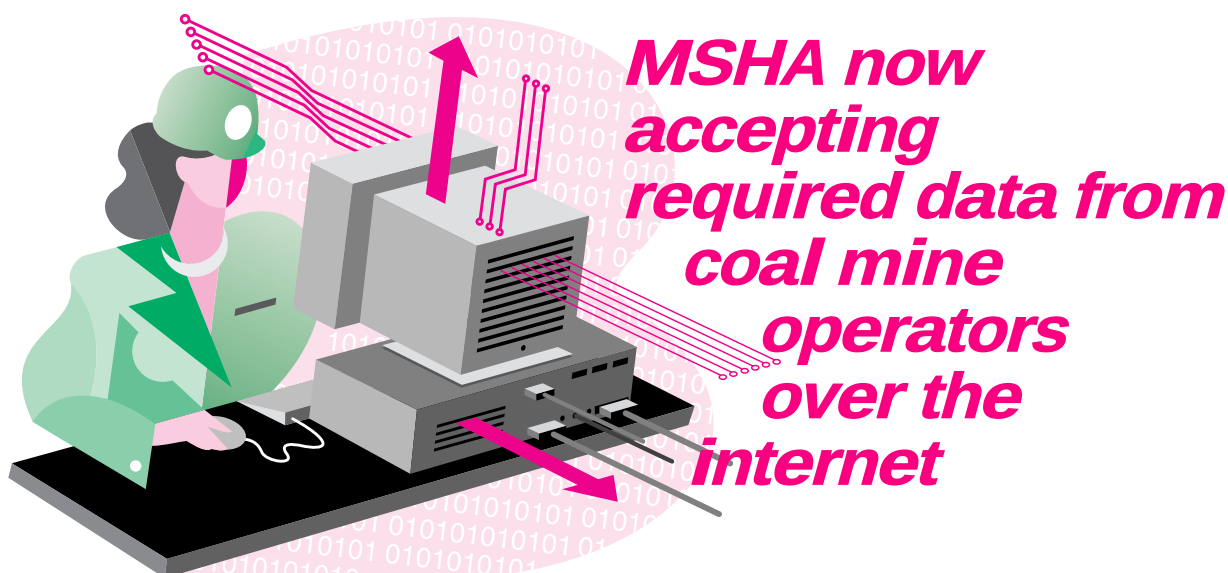
- program evaluation that continually measures and monitors the effectiveness of efforts to prevent injury and occupational illness.

Safety professionals and industrial psychologists will continue to debate the pros and cons of behavior-based safety and criticize attempts to influence attitudes till the end of time. But there comes a point in the

debate when we have to ask ourselves what service this debate is providing to the safety community. The solution to our safety performance problems requires a mix of strategies. The important point is that these measures be evaluated in order to either fine-tune their implementation or stop using them if they fail to achieve the results expected. Looking

for a single approach to safety is probably searching in vain!

*Reprinted from the November/December 1997 issue of the Ontario Natural Resources Safety Association's **Health & Safety RESOURCE***



The Labor Department's Mine Safety and Health Administration (MSHA) recently set up a new service which gives mine operators and independent contractors the option to electronically file employment and coal production information over the World Wide Web.

Federal mining regulations require mine operators and contractors to submit information on employment and coal production to MSHA on a quarterly basis, using specific forms provided by MSHA. As of Jan. 2, the form may be completed and submitted electronically to MSHA directly over the Internet using MSHA's homepage at <http://www.msha.gov> under "Forms" or through the Department of Labor's homepage at <http://www.dol.gov> under "elaws." Users are prompted to follow instructions provided on the screen.

"This new service will remove some of the 'red tape' encountered in complying with many government regulations and will allow mine operators to focus more effort on preventing accidents and injuries at their work place," said Davitt McAteer, assistant secretary of labor for mine safety and health.

The system guides mine operators and contractors through the reporting process, taking into consideration the type of mining operation reporting. The system advises users to print a copy of the completed form, MSHA Form 7000-2, for company files. This copy will document compliance on the part of the participating mine operator with MSHA reporting requirements. Companies filing electronically will also receive electronic mail (e-mail) confirmation that the required information has been received by MSHA.

Currently, the system is designed for initial filings of required information only. Amended filings that correct information previously filed must continue to be mailed to OIEI, PO Box 25367, Denver, Colo., or telefaxed to (888) 231-5515. As in the past, initial filings may also be filed through the mail or by telefax.

MSHA will continue development of electronic filing systems and will develop a similar system for submission of the Mine Accident, Injury, and Illness Report (MSHA Form 7000-1) later in 1998. For further information on electronic filing of required MSHA data, contact Jay Mattos at MSHA in Arlington, Va., on 703-235-8378 or through e-mail to jmattos@msha.gov.

*Reprinted from MSHA news release No. 98-0114 of Thursday, January 14, 1998
Contact: Rodney Brown
Phone: (703) 235-1452*

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Metal/Nonmetal accident summary **Fatal powered haulage accident**

General information

A 36-year-old truck driver, with 5 weeks total mining experience, was fatally injured when he was run over by a load, haul, dump (LHD).

The accident occurred at an underground borate mine. The mine, operated three 8-hour production shifts per day, five days a week. There were 55 employees, 52 underground and 3 on the surface.

Borate ore was mined by cut and fill. Ore was loaded on haul trucks by LHD's and transported to the shaft. The ore was then hoisted to the surface where it was trucked to a mill for further processing.

Description of accident

On the day of the accident the victim began work at 3:00 pm, his regular starting time. The mine foreman assigned the victim and a loader operator to muck out the heading in the work area. They had finished with the third load shortly before the accident.

The loader operator normally loaded the truck and waited for it to empty its load and return, which usually took about 20 minutes. The LHD had an under-inflated rear tire so he followed the truck to the shaft station to inflate the tire. After the tire was inflated the loader operator noticed the running lights were not functioning properly, so he returned to the shop and had a loose wire fixed on the lights. The LHD, which ran over the victim, was a Wagner, Model ST 3-1/2, powered by a 155-HP diesel engine and was equipped with a 3-1/2 cu. yard bucket. The loader was six feet, five inches wide and weighed 37,333 pounds.

The victim drove his truck, an Eimco 8-ton haul truck powered by a 185-HP diesel engine, to the work area to wait for the loader operator to return. The victim positioned the

truck near the intersection facing towards the station—the normal location to wait until summoned to be loaded. The truck was parked about 11 feet from the rib on the station side of the intersection in the work area. Above it was a ventilation fan which was running with a measured noise level of 101 dBa, with the fan running the noise in the area made it difficult to hear the approaching LHD. He then got off his truck and sat or lay on the floor of the drift across from his truck. He had removed his left boot, suggesting that it had become warm from the truck exhaust or he was clearing foreign material from it. The victim had failed to take either his miner's belt and light with him when he left the vehicle.

The loader operator returned about 40 minutes after having gone for repairs, driving past the truck on his way to the heading for another load. With the limited visibility to the right side of the LHD, it's unlikely that the loader operator could have seen the victim lying on the floor. The drift at the work area where the accident occurred was 22 feet wide, 14 feet, seven inches high and was mostly straight and level. The only traffic in the area consisted of an LHD unit and a haul truck. Lighting came from the LHD along with the lights from the truck which were on and directed toward the on-coming LHD, thus producing a glare for anyone approaching from that direction. The LHD operator also had restricted visibility on his right side when seated. Due to the LHD configuration in front of the operator and the restricted view to the right side, it was estimated that a person lying prone on the ground would not be seen out to a distance of approximately 100 feet in front of the LHD.

After filling his bucket, he

returned to the intersection intending to load the victim's truck. The truck did not move into position so the loader operator got off his vehicle to check on the victim's whereabouts. He found the victim lying in the drift, run-over by the LHD. The loader operator ran to other miners in the area for help. The victim was checked by the foreman, and a trained EMT, who determined that the injuries were fatal.

The coroner's autopsy report revealed that the cause of death was from massive abdominal bleeding due to a crushing injury. The report also indicated a blood alcohol content of 0.229.

Conclusion

The accident occurred when the victim was struck by a load, haul, dump vehicle. The victim was in the drift at a location used by vehicles to move mined material. He was not wearing a cap lamp, and could not be seen by the LHD operator who struck him. The accident was caused by the unsafe location of the victim, and the failure to utilize a cap lamp which would have illuminated the victim's position. All lights on both of the vehicles were operational and in use at the time of the accident.

The mine foreman did not notice any influence of alcohol at the beginning of the shift. A partially consumed bottle of vodka was found in the victim's lunch cooler in the cab of the truck.

The victim's blood alcohol level also contributed to his inability to remain attentive to the traffic in the area.

Summarized (1/29/98) by the editor from an MSHA Accident Investigation Report.

Coal accident summary

Fatal machinery accident

General information

The victim had about 5 years total mining experience (all as an excavator operator), with 1 year and 2 months at this mine.

The mine is a surface coal operation producing 700 tons of coal daily from the Coalburg, Stockton, and 5-Block coal seams. Contour-type mining is being performed. The coal is transported from the mine to a centrally located processing and shipping point. Employment is provided for 18 persons, 16 of which are employees of an independent contractor providing labor and a foreman to the production operator. Coal production is performed on the day shift and maintenance is performed on the evening shift.

Description of accident:

On the day of the accident the day shift began work at the regular time of 7:00 am. The superintendent started his shift at 5:30 am and conducted the preshift examinations. Prior to the beginning of the shift, the victim, an excavator operator, informed the superintendent that the hydraulic pumps on the excavator were squalling. The superintendent instructed the mechanic on how to correct the condition.

The pit foreman arrived at the pit about 6:05 am and started loading trucks with coal about 6:15 am. About 10:00 am, the pit foreman met with the superintendent to examine the spoil where the victim was working. When the pit foreman and the superintendent arrived at the spoil, the excavator was being repaired. After examining the spoil area, the pit foreman went back to load trucks and run a dozer over the haulage road. The superintendent went to the office to report the condition of the spoil and gather parts. The conditions required that

the loose rocks be buried.

The dozer operator started working in the production pit at 7:00 am. He worked the shot area in the pit until 2:30 pm, then drove to the spoil area where the victim was working. The victim motioned for the dozer operator to come down to his location where he was constructing a road across the spoil in order to secure and bury any loose rocks that were lying on the spoil. The victim asked the dozer operator for his opinion on how he might cut the road around the slope. After talking with the victim, the dozer operator went back to the top of the spoil. He observed that the victim was having difficulty getting the excavator—a Caterpillar 215C—to tram forward or backward. Large rocks were lying in front of and behind the excavator. The dozer operator stated that the upslope-side track of the excavator was on top of three large rocks—measuring about 5' x 2-1/2' x 2'—which were lying behind the excavator. The excavator at that time was teetering with the counterweight positioned downslope. The victim attempted to grab the ground with the bucket on the upslope of the spoil. The dozer operator stated that when the bucket contacted the ground, the excavator continued teetering, overturned, and slid to the bottom of the downslope—a distance of about 60 feet. The excavator came to a stop about 60 feet below the location where the victim had been working.

The dozer operator contacted the loader operator by CB radio for help and then went over the slope where the excavator was lying on its top. The dozer operator observed the victim lying under the cab of the excavator. He then turned the excavator off and, after looking around, climbed back to the top of

the spoil where he met fellow workers coming to help. The pit foreman received word of the accident about 3:15 pm, and proceeded to the site. The superintendent picked up first-aid equipment and traveled to the site. The superintendent checked the victim, who was underneath the cab of the machine, for vital signs and found none. The victim was removed from the site via stretcher and was then lifted to the top of the slope by ropes. The victim was transported to the hospital where he was pronounced dead on arrival.

Conclusion:

The accident and resultant fatality occurred when the victim trammed the excavator onto large rocks in the road which caused the excavator to cant toward the downslope. The victim then lowered the excavator bucket to the uphill slope which caused the excavator to overturn. The victim may have unbuckled the seat belt and attempted to jump, or was thrown, as the excavator slowly overturned and was crushed between the cab and the ground. The superintendent and fellow workers stated that the victim was known to be an avid seat belt wearer. Examination of the belt revealed that it was in good working order and was frequently used.

Post accident examination of the excavator, after removal from the accident site, did not reveal any safety defects that may have contributed to the accident. However, the excavator was extensively damaged as it was being recovered from the accident site. Excavators are not required to have roll-over protection.

Summarized (1/29/98) by the editor from an MSHA Accident Investigation Report dated October 16, 1997.

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Colossus of coal

Massive 14 million pound stripping shovel begins new life in New Indiana Reserve

The “deadhead” journey in July of a massive, 14-million-pound stripping shovel through Southern Indiana began a new era for Peabody Coal Co.’s Lynnville Mine.

A large crowd of sightseers equipped with binoculars, video cameras, and lawn chairs was on hand in searing heat as the behemoth successfully ended its journey—on schedule—moving across a barricaded Indiana State Route 61 and into a new reserve.

The massive shovel traveled a distance of 7.2 miles. The move began Tuesday, July 8, and ended 13 days later on Monday, July 21.

“You could not have asked for it to have gone any better,” said Terry G. Traylor, Lynnville/Squaw Creek Business Unit Manager. “Everybody did a fantastic job. A lot of people put in a lot of long hours.”

In addition to the crowds, local media covered the event, and interviewed Lynnville personnel. “Retirees were in the crowd and they had a chance to come up on the machine,” Traylor said. “Some had worked on the machine in prior years. It brought back some good memories.”

Old shovel for new era

The successful “deadhead” of the shovel was important to the local

The shovel is going to a new area of the Lynnville Mine that could add as much as a decade to the mine’s life. That’s 10 years’ work for approximately 300 people, Traylor said.

In 1996, the Lynnville/Squaw Creek Business Unit payroll contributed approximately \$25 million to the local economy. The business unit also purchased approximately \$25 million in local goods and services, and paid \$2 million in taxes to local municipal, county, and state governments.

A difficult undertaking

Due to its enormous size, the move of the shovel generated much public interest. The shovel—used to remove overburden above a coal seam—weighs approximately 14 million pounds, or 7,000 tons.

The Model 5900, the first of only two ever built, was put in operation at Lynnville in November 1968. Boom length is 200 feet, and each of its eight crawler sections is 34 feet in length. Its maximum cutting height—the highest point to which the huge 112-cubic yard bucket can rise—is 177 feet, the height of a 17-story building.

On July 8 the massive unit started its journey, literally digging its way through and out of the existing

economies because it symbolizes Peabody Coal Company’s commitment to the continued use of Indiana’s energy resources and to the productivity of its employees.



surface mine pit, and later creating its own ramp, to rise 90 feet from the bottom of the pit to ground level.

Because of its weight, the giant shovel could not be supported on either topsoil or subsoil. Once out of the pit, the machine dug its own path. As it moved across mine property, topsoil was removed by mobile support equipment such as scrapers, dozers and motor graders. The shovel then removed the underlying clay down to bedrock.

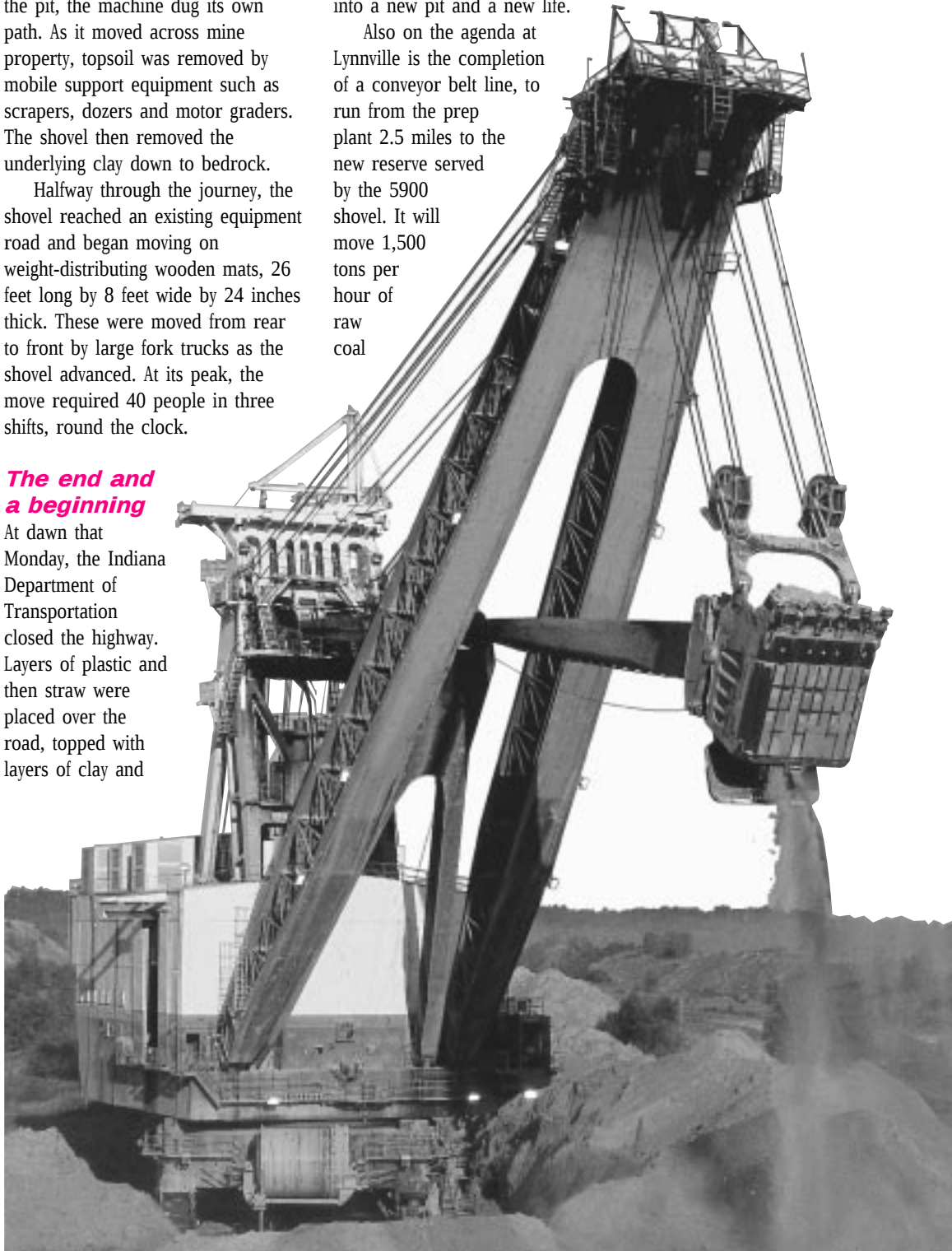
Halfway through the journey, the shovel reached an existing equipment road and began moving on weight-distributing wooden mats, 26 feet long by 8 feet wide by 24 inches thick. These were moved from rear to front by large fork trucks as the shovel advanced. At its peak, the move required 40 people in three shifts, round the clock.

The end and a beginning

At dawn that Monday, the Indiana Department of Transportation closed the highway. Layers of plastic and then straw were placed over the road, topped with layers of clay and

then shale, so that the shovel could move without damaging the highway. Less than two weeks from the day it started, and to the cheers of spectators, the immense shovel lumbered across the road and into a new pit and a new life.

Also on the agenda at Lynnville is the completion of a conveyor belt line, to run from the prep plant 2.5 miles to the new reserve served by the 5900 shovel. It will move 1,500 tons per hour of raw coal



from the reserve, and will substantially reduce hauling times. "It's a good move for the mine, and will

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Disposal of coal combustion byproducts in underground coal mines

Thomas A. Gray, Timothy N. Kyper, and James L. Snodgrass, GAI Consultants, Inc.

Introduction

Approximately 90 million tons of coal combustion byproducts (CCB) are generated annually by the electric utility industry in the United States. The major byproducts include fly ash (~54%), bottom ash (~16%), boiler slag (~7%), and flue gas desulfurization sludges (~23%). Of the amount generated, about 19 million tons are beneficially used, primarily fly ash as a Portland cement replacement in concrete and concrete products. The remaining, about 71 million tons, is disposed of in impoundments and landfills. The costs for these disposal methods continue to increase due to more stringent environmental regulatory requirements and rising material, labor, and site development costs. As such, these increasing disposal costs are causing the electric utility industry to pursue other disposal and utilization alternatives.

One alternative to the typical disposal methods is the return and dispose of the byproducts in underground coal mines. This alternative could be economically beneficial to both the coal mining industry and the electric generating industry as well as provide environmental benefit. Since the U.S. Environmental Protection Agency (EPA) determined coal ash to be nonhazardous, this alternative disposal method, which can have numerous benefits, would be consistent with EPA's hope to assist the industry in finding uses for coal ash and promoting resource utilization in lieu of disposal. This article provides an overview of the concept and history of disposal in underground mines, briefly discusses

currently allowed practices in several key coal mining states, presents several (but by no means all) key design considerations and environmental concerns/benefits, and discusses several areas for further investigation and research that may result in increased disposal in underground mines.

History

The coal industry routinely slurries fine-coal waste from coal preparation and sludge from acid-mine drainage treatment facilities to underground mine workings in lieu of surface impoundment disposal. Therefore, it is not hard to conclude that injection of coal combustion byproducts into underground mines is technologically feasible. One successful project is Duquesne Light Company's hydraulic disposal of fly ash into an abandoned mine located near their Cheswick Power Station to the northeast of Pittsburgh, Pennsylvania. Since 1970, 350 tons per day of fly ash have been slurried into the mine.

In addition to this project, several smaller projects document the interest in the concept of disposal in underground mines. For example:

- American Fly Ash has hydraulically injected fly ash into the deep mine workings of Peabody Coal Company's #10 Mine near Springfield, Illinois.
- Dravo Lime Company has disposed of kiln dust waste in deep mine workings at their Cabin Creek lime plant in Maysville, Kentucky.
- The Maryland Department of the Environment is conducting a project to demonstrate the

feasibility of disposing coal combustion byproducts in abandoned deep mine workings.

- A permit for injection of CCBs into the mined out areas of an active deep mine has been issued to Mettiki Coal Corporation by the Maryland Department of the Environment.
- In West Virginia a coal ash grout injection project to reduce acid mine drainage from an abandoned deep mine by filling the mine voids is expected to be completed soon. The project is sponsored by the West Virginia Division of Environmental Protection and is partially funded by Allegheny Power, Anker Energy, OSM, EPRI, and Consol.

Practices currently allowed

The complexity of the many federal, state, and local regulations concerning not only mining, but also solid and residual wastes, offers a significant barrier to planning and implementing a project involving the disposal of coal combustion byproducts in underground mines. In addition, the opinions and perceptions of regulatory personnel can also influence potential projects. To gain an understanding of currently allowed disposal practices, the authors polled the state mining and solid/residual waste authorities in the states of Illinois, Indiana, Kentucky, Maryland, Ohio, Pennsylvania, Virginia, and West Virginia.

Although the majority of the states polled indicated that underground injection is allowed, the practice of disposing in underground coal mines is not prevalent. This could be

attributed to high disposal costs or to prohibitive regulations or perceptions by regulatory personnel. For example, state agency personnel may perceive underground injection as disposal (and the respective solid/residual waste regulations may not allow "disposal" in unlined sites) and not beneficial use; however, the benefits could be seen in subsidence mitigation and acid mine drainage control.

Design considerations

The economics of large volume disposal in underground mines versus continued disposal in impoundments or landfills will obviously dictate future courses of action. Some key design considerations are presented below:

- Proximity of the mine (disposal site) to the generation source will determine the transportation cost for the byproduct.
- Conditions of the mine voids will determine the potential storage capacity of the disposal site. Abandoned room and pillar mines offer better opportunities than longwall mines.
- The current by-product handling systems at the source may require modification to prepare the materials for shipment.
- The flowability of the material must be such that it can fill the mine voids. Some byproducts may require modification to improve flowability.
- Large volumes of water are needed for the slurry in hydraulic disposal.
- The depth of the mine and the local hydrogeology will determine the extent of a designed containment.

Environmental concerns/benefits

Although the EPA determined that coal ash is nonhazardous, environmental liability remains a key issue. Modification to mine drainage patterns may occur and could affect

adjacent property owners. In addition, there is potential for modifying or degrading local groundwater conditions and if dewatering a mine void area prior to filling with coal combustion byproducts is required, subsidence may be induced. However, there are some benefits to underground disposal that should be highlighted.

- Disposal underground reduces the number of surface disposal sites and the environmental, health, safety and social problems associated with them.
- Disposal underground improves mine support and reduces potential for subsidence.
- Alkaline coal combustion byproducts may help to neutralize existing acid mine drainage, provide mitigation of acid mine seeps, and may work to improve groundwater quality.
- Filling the voids in acid producing seams can reduce groundwater contact and acid production.
- Groundwater flow may be impeded, thereby reducing the volume of acid mine seepage.
- Underground disposal may help prevent/control mine fires.

Additional studies/research needs

The technical feasibility of disposing coal combustion byproducts in underground mines has been proven and the selection of this disposal alternative will be decided based primarily on cost and regulatory compliance issues. As such, additional research on the technical issues of injecting coal combustion byproducts or coal combustion byproduct slurries should only be needed in limited special circumstances. On the other hand, more research into the chemical aspect and the interaction of the coal combustion byproducts, mine water, local geology, and groundwater is needed to assess the environmental impact of coal combustion by-product mine

injection. Also, many new coal combustion byproducts are being generated and are presenting challenges for surface disposal, let alone for disposal underground. For example, many electric utilities have installed FGD scrubbers to meet the requirements of the 1990 Clean Air Act Amendments. These byproducts are different both physically and chemically from fly ash and require additional research. A pilot study of fixated scrubber sludge injection into an abandoned underground mine was recently performed by the Indianapolis Power and Light Company at their Petersburg Station. No degradation of groundwater was found following the injection at this project.

Summary

Although the disposal of coal combustion byproducts in underground coal mines is not widespread, the mine injection disposal alternative has many key attributes. The injection into underground mines reduces the surface area required for disposal sites (landfills and impoundments), eliminates the potential for surface water pollution, eliminates the potential for fugitive dust emission and associated air pollution, reduces the potential for subsidence, and improves the aesthetics of the local area. Also, in acidic coal seams, the injection of coal combustion byproducts can have the additional benefit of reducing the acidity of the mine water. Finally, the concept of waste haulback and disposal in the mine workings may benefit coal companies that can tie these issues into long-term coal contracts.

*Thomas A. Gray, P.E. is Director of Business Development and Timothy N. Kyper, P.K. and James L. Snodgrass, P.E. are Engineering Managers at GAI Consultants, Inc. Reprinted from the Vol. 8, No. 6, 1997 issue of the University of Kentucky's **Energeia**—a publication of the Center for Applied Energy Research—CAER.*

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Choose your behavior; choose your consequence

One of the terms used to describe non-prescriptive legislation is “enabling legislation” which describes the outcomes without saying precisely how to do it and does not limit duty of care.

Along with enabling legislation, goes enabling behavior. An unfortunate difference between the two is that it is just as easy to enable negative behavior as it is to reinforce positive behavior. If that sounds like

double speak, look at these examples of negative behavior reinforcement, and the impact they may have on your work practices and systems of work.

THE PROBLEM

Failure to clarify work expectations. (tasks, standards)

Getting someone else to do a job an employee didn't finish.

Blaming everyone for the actions of a few.

Keeping discussions about poor performance “off the record”.

Ignoring signs of declining performance.

Waiting for the problem to solve itself, or for someone else to do it.

Allowing deviations from the system of work to get the job done.

THE MESSAGE RECEIVED

I'm doing the right thing.

I can do this again.

My attempts to do the right thing are punished, so why bother?

It's not important.

My work standard is OK with the boss.

What problem?

I'm a hero.

RESULT

Behavior continues. (Reward)

Behavior continues. (Reward)

(Positive behaviors may stop)

Any change may be temporary. (Reward)

Behavior continues and may worsen. (Reward)

Behavior continues. (Reward)

(Personal) Shortened life expectancy.
(Company) Explaining your logic to a judge.

As these are just examples, they don't recognize any circumstances that may apply. Even then, what sort of unusual circumstances are acceptable in a defined system of work and work practices? The “Lone Rangers” on your machine who work with their own set of rules because their prowess on the machine protects the investment? Under this legislation, their rules are your rules, to say nothing of the message about double standards given to the vast majority of “Tontos”.

When you reinforce (reward) (enable) positive behaviors, you increase the number of times the behavior will be repeated. The same goes for enabling negative behaviors unfortunately, and those are the ones that you will have to justify under your system of work.

Your system of work needs to have documented performance standards so that you can measure behaviors against that standard. Introducing those standards is the responsibility of the Employer—

following them is the responsibility of all employees who can then be held accountable for the consequences of their behaviors. Without the standards, the onus of responsibility and the consequences can be viewed as a deficiency in the system of work, which is the responsibility of the Employer.

Reprinted from the December 1997 issue of Western Australia's Dept. of Minerals and Energy's MINESAFE.

Jog/Stop switch assemblies cannot be relied on to deenergize equipment

A recent fatality that occurred when a conveyor drive motor inadvertently restarted while a miner was installing a connector link in the conveyor belt drive sprocket chain has prompted MSHA to issue a warning on jog/stop switch assemblies.

The miner who was killed relied on a spring loaded jog/stop switch with a mechanical latching device that was used to deenergize the belt conveyor drive motor. However, the jog/stop switch was improperly positioned so that it slipped out, releasing the stop switch which allowed the belt drive motor to inadvertently restart. The restart could not have occurred had the main power conductors been deenergized by the use of either a main circuit breaker or by the use of a visible disconnect.

MSHA said that opening one conductor of a control circuit does not prevent the restart of the equipment when a ground fault occurs between

the control circuit wiring and the energized main power conductors.

Moreover, ground faults in the control circuit (ungrounded control circuits) can bypass the jog/stop switch and either allow equipment restart or prevent the equipment from being stopped.

Under these circumstances, the only means of deenergizing the equipment is to open the main power conductors.

Mine operators using jog/stop switches provided with mechanical latching devices are reminded that the jog portion of the switch is to momentarily start the equipment to check for defects or position the equipment in preparation for mechanical maintenance. The stop portion of the switch is to shut down the equipment during idle periods.

However, when servicing or performing maintenance on stationary surface or underground equipment, the main power conductors that supply

electric power to the equipment must be completely deenergized by opening a visible disconnect or by opening a main circuit breaker. MSHA regulations prohibit the use of control circuit switches to deenergize equipment to perform mechanical maintenance.

In the case of large mobile surface mining equipment, it is unnecessary to completely deenergize the equipment where the motion of the operating equipment does not pose a hazard, and means are provided on the equipment to deenergize that portion of the main power circuits serving that portion of the equipment when mechanical maintenance is to be done.

If you have any questions contact Robert Phillips, Coal Mine Safety Division at (703)235-1915 or Elio Checca, Metal and Nonmetal Safety Division at (703) 235-8647.

Mine Safety and Health News - January 9, 1998. Copyright 1998 by Legal publication Services.

KCMEC releases coal multimedia library kit

The Kentucky Coal Marketing and Export Council (KCMEC) announces the release of a new Kentucky Coal Education Multimedia Library Kit (the kit). The Council is also initiating a new Coal Education Program for 4th and 5th graders in Kentucky to compete for eight higher education Savings Plan Trust accounts totaling a minimum future value of \$6,579.50 (\$5,000 present value). Electric power producers within Kentucky are KCMEC's promotional partners of the Coal Education Savings Plan Trust Competition.

The kits contain a video tape

containing three classroom videos, print material, and an interactive multimedia, role-playing CD-ROM game for 4th to 5th graders and up. The videos and CD were developed by Western Kentucky University's Public Broadcasting Services in conjunction with KET, the Kentucky Network, and KCMEC.

The kits are being sent to public elementary, middle, and public/county libraries within Kentucky. One 4th or 5th grader will be chosen from each of the eight Ky. Dept. of Education Service Center Regions as the winner of the Savings Plan Trust. Only one

student from each school can enter the regional competition. Entries must be postmarked by May 30, 1998. For further information contact the school's teacher, librarian, or principal. County librarians should also have a kit available for individual use.

The scholarship application form is available online at <http://www.coeducation.org> or by mail from the KCMEC (phone 606-246-2500).

For further information contact Judy Hower of the Kentucky Coal Association, 340 S. Broadway, Suite 100, Lexington, KY 40508 or phone 606-233-2103—FAX 606-233-4745.

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FINAL FOUR—Coal miners fading from the scene

By Pattie Mihalik, Times News Staff

Twice this year, they stood in a Panther Valley cemetery laying small pieces of coal on top of a casket. The four men, each carrying bits of coal from the Number 9 mine, formed the coal into a cross.

That graveyard ceremony is a sad yet revered ritual for members of the Last of the Panther Valley Deep Coal Miner's Club which was formed during the final dying gasp of King Coal. When the Number 9 Mine closed in 1972, it was the last of its kind—the last deep coal mine in the once thriving anthracite coal fields of Pennsylvania.

Because the miners knew that they, too, were “the last of their kind,” they started the club to continue their close camaraderie and to honor the memory of those who sacrificed their lives in the mines.

The day the mine closed, each miner took home a lump of coal and made a pact to chip off some of the black gold whenever a miner died. Since then, they have carried out the graveside tradition of approaching a casket one by one, shaping a cross from their pieces of coal.

Now, 24 years after the last mine closed, there are few remaining miners to carry out that ritual. Mike Sabron, Paul Paslawsky, Michael Sotak, and Stanley Stanek are the only surviving miners in the Last of the Panther Valley Deep Coal Miners Club.

“The final four” Sabron calls them, trying for a bit of levity in the true miner's tradition of finding humor in every situation. “There's one thing about miners “they know how to laugh and have a good time,” he says. “Even when we faced the daily dangers of the mines, we knew

how to have fun. There was a daily contest to see who could pull the most outrageous trick.”

When the Final Four meets with friends and supporters for their annual banquet, inevitably someone starts telling stories about the humor that was as much a part of life for miners as was the danger that lurked in the mines.

They talk of the day “Long John” Matyka lugged a department store dummy to the mine, partially burying it in a pile of coal. When another miner saw what appeared to be the body of a woman sticking out of coal, his screams could be heard throughout the mine. The only thing louder was Long John's laugh.

And they still laugh about how Michael “Tarzan” Lukas cured a miner from eating meat on Friday, a practice that, at the time, was against the laws of the Catholic Church. “Even a mule isn't dumb enough to eat meat on Friday,” Lucas told his meat-eating miner. The miner said if Lucas could prove the mule wouldn't eat meat, he “would never do it again.”

When the miner tried to feed his ham sandwich to the mule, the animal spit it out. What he didn't know was that mules never eat meat. Lucas and his buddies laughed for years over that one.

Few gatherings can match the story-telling sessions that happen every time the miners get together. Surprisingly, they don't talk about the deaths and injuries or the daily danger they faced each time they went underground. “What we remember most is the fun we had,” says Stan Stanek, president of the club.

“What about the time we pulled one over on “Tarzan?” he says, gearing into a story-telling mode. “Someone, I won't say who, killed a deer and positioned the head in the face of the mine so the eyes would shine when a miner's lamp hit them. When Tarzan crawled up the chute, he saw two eyes staring at him. The eyes seemed to follow his every move. He started yelling, “There's an owl after me!”

“Ha!” laughs Mike Sabron. “I did it! Matyka and me were always playing jokes. Things like putting Limburger cheese on the heater of the mine car motor so it would stink... and throwing snow on someone taking a shower.”

Those stories are disappearing along with the men who proudly called themselves miners. The merry mischief-makers have thinned in rank and the “baby” of the Final Four, Stan Stanek, is 77. At 85, Paul Paslawsky finds it hard to walk while Michael Sotak, 83, and Mike Sabron, 82, wonder how much longer they will be around.

Yet, they all remember a time when it was impossible to believe miners would fade from the scene. “Panther Valley was once nothing but miners and their families,” says Sabron.

According to archivist Michael Knies, company records from Lehigh Coal and Navigation Co. list 27,500 miners employed from 1900 to 1954. Thousands more worked in other company mines or in independent “bootleg” operations. Few remain. One by one, each miner's lamp has gone out for the last time. Often, all that is left as testimony to their days in the mine is one line in their

obituary.

There are those who are determined that the world will never forget the work of the anthracite miner. Ed Gildea, who publishes *The Valley Gazette*, says he includes plenty of stories and pictures about the mines because people across the country are fascinated with the tales. And few have done more to perpetuate the memory of the Anthracite miner than photographer George Harvan who has spent decades documenting the lives of Panther Valley miners. Many of his pictures now hang in universities and

museums, including the Panther Creek Valley Foundation Mining Museum.

That Lansford museum, which will eventually include a tour of the old Number 9 Mine, is dedicated to preserving the memory of anthracite miners who built much of what is still called "the coal regions."

Equally determined to preserve the memory of those miners are the honorary members of the Last of the Panther Valley Deep Coal Miner's Club. While they, like the miners themselves, are lacking in number, there is no lack of ambition and

enthusiasm in their goal. According to Jack Yalch, who emcees the annual banquet, the miners knew years ago that others would be needed to keep their story alive. That's why some were invited to become honorary members of the miner's club.

"Don't worry," says Yalch, "We won't let the world forget the sacrifices of the anthracite miner. We'll keep the miners' lamp lit."

<http://www.tnonline.com/online/coalcracker/finalfour.html>
[accessed 2/10/98]

The story of the blind miner

James L. Newman, or Roy as he was called, was born October 4, 1893, in Holladay, a son of pioneer homesteaders of the area.

On April 8, 1929—a spring afternoon—Roy and his brother were mucking ore from rounds fired the previous day. There had been a misfire, and Roy said he thought he had better blast that miss before he quit for the day.

Somehow, he got mixed up with the cap in the hole and the charge blew up in his face. With a cut artery in his hand, face bleeding and sight gone, he staggered with the aid of his brother from the property near the old Maxfield Mine in Big Cottonwood Canyon.

After a year or so of inaction, Roy said he decided to go back to work on the claims.

There were a few months at first when he hired a man to work with him, but gradually he learned to solve the many difficult problems facing the blind, particularly when they live alone.

"Even cooking becomes a task when you can't read the labels on the cans," he said.

Roy is a wonder to the mining engineering profession. As U.S.

Mineral Surveyor Andrew R. Shelton, American Fork, relates, his tunnels have a perfect engineering grade for draining and haulage. They are so straight you can stand at the face of the tunnel and see the light of the portal.

Roy explains that he is able to drive such tunnels because although both his eyes were destroyed by the blast, a tiny area at the bottom of my left eye about a half inch below the pupil was still intact although the rest is completely covered by scar tissue. "Through this small window, I get a faint sensation of light," he said. Thus when he checks the tunnel bore for straightness, he sets up a lighted carbide lamp in the middle of the track about 300 feet from the face.

"I then move up to within 15 feet of the face and stand up a pick with handle erect in the center of the track. These two objects thus mark the center of the tunnel," he related.

Roy then backs up to the face, sights down the tunnel and then moves his body to the right or the left until the light is obscured by the pick handle. When this happens, he knows his head is in the center of the tunnel.

With this point located it is an

easy matter to measure to the right or left to see if the face of the tunnel is on line.

He tells the difference between country rock and ore by weight and formation change by the ease with which the drill sinks into the rock.

Although without sight, Roy performed each task of mining including mucking, tramming, drilling, blasting, sharpening drill steel, laying rails on grade, keeping the tunnel in line and timbering.

Despite his apparent handicaps, Mr. Newman had the basic optimism all miners must possess. He believed the big bonanza was just ahead. "I like the challenge that Mother Nature presents the miner who searches for her secrets," he said.

But, for the last year, terminal cancer forced the miner to quit active mining and finally on April 1, 1974, he died. He was 80 years of age.

[Ed. Note: the illustration accompanying this article on the net was too poor to enable printing but, in my humble opinion, Roy looked very much like Clint Eastwood with eye patches.]

URL: <http://www.uen.org/Centennial/13MinerB.html> [accessed 2/10/98]
Curator: Kathleen Webb e-mail: <webb.k@suu.edu> Last updated: 1/24/98

22

CONGRATULATIONS! Texas 1996 Sentinels of Safety Award Winners



The following are Southcentral District Metal and Nonmetal Sentinels of Safety winners:

Alamo Cement Co. Ltd., 1604 Quarry & Plant, San Antonio
APG Lime Corp., New Braunfels
Austin Sand & Gravel, Plant #1, Austin
Brauntex Materials, Inc., New Braunfels

Capitol Aggregates, 1604 East Plant, 1604 West Plant, Capitol Crushed Stone, Hoban Pit & Plant, Pit & Plant #4, Austin

Capitol Aggregates, Inc., Capitol Cement Plant, San Antonio

Colorado Materials Co., Hunter Plant, San Marcos

Franklin Industrial Minerals, Texas Aggregate Division, Belton

G. R. Damron Sand & Gravel, Acuff Pit, Slaton

Gifford-Hill & Co., Inc., Perch Hill Quarry & Plant, Bridgeport

Jobe Concrete Products, East Loop 375 Sand Plant Toro Quarry, El Paso

Jones Brothers Dirt & Paving, Crusher #2 Crusher #3, Odessa

King Ready Mix Concrete, King Sand & Gravel, Athens

Lattimore Materials, Coleman Rock Crushers, McKinney

Mike Arnold Trucking, Ellinger Plant Plant #2, Columbus

Morton Salt Co., Grand Saline Operations, Grand Saline

Osburn Materials, Inc., San Antonio

Phipps Sand & Gravel Co., Grand Falls

Pioneer Concrete of Texas, Brazos Material, Brookshire

Pioneer Concrete of Texas, Burnet Quarry, Burnet

Pioneer Concrete of Texas, Chico Stone Quarry, Irving

Pioneer Concrete of Texas, Stafford Plant, Altair

R.E. Janes Gravel Co., Plant #3, Austin

Sanco Materials Co., Robert Lee Plant, San Angelo

Seven Points Sand & Gravel, Seven Points

Simpson's Sons, Simpson Pit, Jarrell

Smith Crushed Stone, Tehuacan Pit, McKinney

Texas Industries, Inc., Bridgeport Stone Plant, Paradise Plant, Tin Top Sand & Gravel Plant, Waurika Sand & Gravel, Dallas

Texas Lehigh Cement Co., Texas Lehigh Cement Plant, New Braunfels

Trinity Materials, Inc., Decatur Sand & Gravel, Valley Firm Plant, Beaumont

United States Gypsum Co., Sweetwater Quarry, Sweetwater

Vulcan Materials Co., Uvalde Quarry, San Antonio

Western Sand & Gravel Co., Tascosa Plant, Amarillo

Wright Materials, Inc., Nason Plant, Realitos Pit & Plant, Robstown

Reprinted from the Winter 1997-98 edition of the Texas Mine Safety Update—a publication of the Univ. of Texas at Austin.

At left, the symbol of the national mine safety competition has been the bronze Sentinels of Safety trophy sculpted in 1925 by Begni Del Piatta, who said: "Let the worker carry around with him a mental picture of wife and child, whose happiness depends upon his safe return after the day's work, and

those loved ones become his surest sentinels of safety." The safest mine in each of six categories is awarded the traveling trophy for a year. The competition is sponsored by the Mine Safety and Health Administration and the American Mining Congress.

Safety in the sunshine state

The Joseph A. Holmes Safety Association (JAHSA), the Holmes Safety Association (HSA), the Mine Inspector's Institute of America (MIIA), and the National Association of Safety Mine Inspection Agencies (NASMIA) will hold their annual business meetings at the Hyatt Regency Tampa in Tampa, Florida on June 21-24, 1998. The agenda includes important safety and health topics which will be of great interest to participants. Mark your calendars and plan to join us in the Sunshine State. The traditional golf outing will

be held on Wednesday (a separate registration fee of \$50, which covers greens fees, cart, lunch & prizes).

Lodging at the Hyatt will be \$72 Single/Double and \$92 Triple/Quad. Make your reservations directly with the Hyatt by calling (813) 225-1234. It is recommended that all reservations be guaranteed either by advanced deposit of one night's lodging or by credit card. We have reserved a block of 200 rooms which will be held until May 15, 1998. When you register, be sure to indicate you are attending the

Holmes Safety Association Meeting.

The \$100 registration fee (a Spouse/Guest fee is \$75) includes a reception and dance Monday evening, a Tuesday luncheon, and **either** the MIIA banquet on Tuesday evening or the HSA banquet on Wednesday evening. If you would like to attend both, please add \$35 to your total registration fee and be sure to check the appropriate boxes on your registration form.

PROPOSED TOPICS*

Accident Investigation Roundtable
Abandoned Mines Safety
Back Safety
Behavioral Attitudes: Supervisors/
Employees
Benchmarking
Contractor Safety
Degraded Image Hazard Recognition
Electrical Grounding

Ergonomics and Mining
Explosives Safety
Heat Stress
Lightning
Magic Of Fire
Mine Rescue (Surface & Under-
ground)
Mining Professional for the Next
Millennium

MSHA Health Initiatives
Safe Work Attitudes
Shift Work
Silicosis
Supervisors and *The Act*

**Some programs will be repeated to enable everyone to attend desired sessions, which will be running concurrently Tuesday and Wednesday.*



REGISTRATION FORM (LATE REGISTRATION FEE—AFTER APRIL 18, 1998—\$125.00)

Name: _____ Telephone (include area code): _____

Company: _____ Address: _____

City: _____ State: _____ Zip Code: _____

Meeting Registration Fee of \$ _____ is enclosed for _____ persons (@ \$100.00 per person)

Guest Fee of \$ _____ is enclosed for _____ persons (@ \$75.00 per person)

I will be attending: ☐ MIIA Banquet ☐ HSA Banquet ☐ Both Banquets (add \$35 per person)

Number of Attendees _____ @ \$100 ea. = _____

Number of Spouses/Guests _____ @ \$75 ea. = _____

Number of People attending BOTH Banquets _____ @ \$35 ea. = _____

TOTAL (don't forget extra \$35pp **if** you are attending BOTH banquets) = _____

☐ I plan to participate in the Golf Outing on Wednesday. (Golfers send separate registration fee of \$50 to Dave Putman, P.O. Box 2000, Mulberry, FL 33860) _____ Handicap or Ave. Score _____

Return registration/payment to: Cathy Whitworth, Pickens Technical Institute, 100 Pickens Tech Dr., Jasper GA 30143

Checks for registration must be made **payable to: Holmes Safety Association**

24

Your home comes from a mine ***An eastern city boy is introduced to mining***

By Joshua Scandlen

While mining may seem an antiquated activity with little usefulness in today's high-tech society to some urbanites back East, it is imperative to inform the general public about the necessities mining has on all aspects of our economy. It matters not if one

lives in Miami, Arizona or Miami, Florida. The simple fact is without mining, our lives would be vastly changed, and for the worse.

As a newly-arrived Easterner,

coming from Washington D.C. of all places, it was easy for me to dismiss mining. "Mining," I would say, "is a dying industry. It has no relevance in today's technology-driven industry. It has no relevance in today's technology-driven world." Unfortu-



nately, my reasoning came out of nothing more than sheer ignorance. After all, why should I have had familiarity with mining? I lived in a big, urban city (I wonder if there are others in D.C. also misinformed about mining).

However, as I looked around Phoenix to buy a house, the facts about my reliance on mining for my home and for everyday life became obvious. Mining, in fact, is about as important to my life as the food I eat because without it, I would have nothing. My home would not be built, my computer would not work, my car would not start, my cavities would not be filled. The importance of mining to our society is simply amazing and for this one, no-longer-ignorant person I am grateful to have finally been informed.

Now, as I watch my new house beginning to take shape, I am excited to think of all the memories my young family will have there. I hope the house will be as integral a part of my children's memories as the house I grew up in was. I also think of that miner, who without even knowing it,

is helping my family lay its foundation. To him mining may only be a job and to some folks back in D.C. it may seem an unnecessary job. As I get ready to move into my new house, though, I will realize mining is more than a simple way for some to earn a living. Mining allows us to live.

Here is a small example of the extent your house comes from mining:

The **Foundation** is probably concrete (limestone, clay, shale, gypsum, and aggregate mining)

The **Exterior Walls** may be made of brick (clay mining), stone (dimension stone mining), or cement block. The **Insulation** in the walls may be glass wool (silica, feldspar, and bona mining) or expanded vermiculite (vermiculite mining)

The **Interior Walls** are usually wall board (gypsum mining)

The **Nails and Screws** to hold the house together (iron ore and zinc mining)

Sewer Piping is made of clay or iron pipe (clay mining or iron ore mining)

Electrical Wiring (copper or

bauxite mining)

Sanitary facilities are made of porcelain (clay mining)

Plumbing Fixtures are made of brass (copper and zinc mining) or stainless steel (nickel and chrome mining)

The **Paint** is manufactured with mineral fibers and pigments from minerals obtained by mining.

Windows are made of glass (bona, sand, and feldspar mining)

Doorknob., Locks, Hinges are of brass or steel (copper, zinc, and iron ore mining.)

Finally, your mortgage is written on paper made from wood or cloth fibers, but filled with clay (clay mining).

Reprinted from the January 1998 edition of the Minnesota Mine Safety Association newsletter—a state council of the Holmes Safety Association.

The Minnesota Mine Safety Association promotes the safety and health of all engaged in Minnesota's mineral industries through advocacy and education. Edited by Al Simonson of MMSA at (507)-625-9084 or P.O. Box 2073, North Mankato, MN 56003.

This list was originally published by the SMG Foundation for Public Information and Education, Inc.

NMA announces excellence in mining education awards

NMA Chairman Douglas C. Yearley announced that the NMA would recognize the extraordinary efforts of its member companies in fostering education in their local and regional schools by establishing an annual Excellence in Mining Education award.

The first awards will be presented at the annual NMA Mining Convention to companies representing the NMA's major categories of membership: coal, hardrock, manufacturers and services, and state associations.

"The NMA recognizes the necessity to teach our future citizens

the importance of coal and minerals to society, so that they can make the vital decisions of a democratic country based on knowledge, not biased misinformation," said Yearley, who is chairman, president, and CEO of Phelps Dodge Corp. In addition, he said the industry, should "foster the overall level of education our children receive, particularly in scientific disciplines."

Factors that will be considered in judging the nominations will be participation in the NMA Mineral Education for Your Community

program, maintaining other adopt-a-school programs or business/education partnerships; creation of unique materials demonstrating the production and/or use of minerals, environmental stewardship, etc.; fostering public education through mine tours, visitors' centers, community days, etc.; encouraging employee volunteerism in the local schools; and sponsorship of educational programs through charitable donations.

Reprinted from the August 1997 issue of Coal Age magazine

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THE LAST WORD...

It will generally be found that men who are constantly lamenting their ill luck are only reaping the consequences of their own neglect, mismanagement, and improvidence, or want of application.—Samuel Smiles

Man must go back to nature for information.—Thomas Paine

Human kindness has never weakened the stamina or softened the fiber of a free people. A nation does not have to be cruel in order to be tough.—Franklin Delano Roosevelt

It never occurs to fools that merit and good fortune are closely united.—Johann Wolfgang von Goethe

Life is not a static thing. The only people who do not change their minds are incompetents in asylums, who can't, and those in cemeteries.—Everett M. Dirksen

Genius is entitled to respect only when it promotes the peace and improves the happiness of mankind.—Lord Essex

Money often costs too much.—Ralph Waldo Emerson

Nature creates ability; luck provides it with opportunity.—François de La Rochefoucauld

Contemporaries appreciate the man rather than his merit; posterity will regard the merit rather than the man.—Charles Caleb Colton

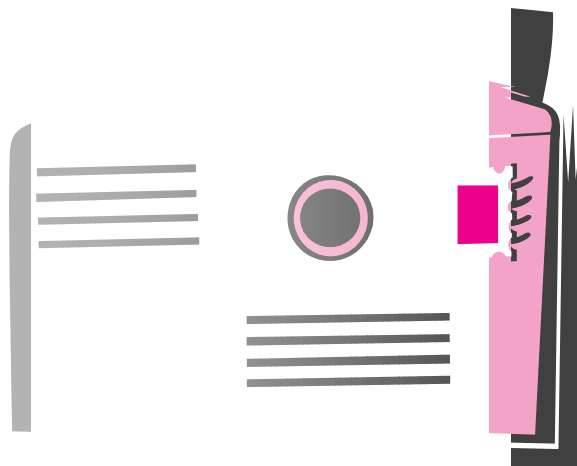
NOTICE: We welcome any materials that you submit to the Holmes Safety Association Bulletin. For more information visit the MSHA Home Page at www.msha.gov. We **DESPERATELY** need color photographs suitable for use on the front cover of the **Bulletin**. We cannot guarantee that they will be published, 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).



Holmes Safety Association Officers and Executive Committee 1997-1998

<i>Officer</i>	<i>Name</i>	<i>Representing</i>	<i>State</i>
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First Vice President	Gary Moore	Mgmt.	NM
Second Vice President	Steve Lipe	Supplier	AZ
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Secretary-Treasurer	Robert Glatter	Federal	VA

<i>Name</i>	<i>Representing</i>	<i>State</i>	<i>Name</i>	<i>Representing</i>	<i>State</i>	<i>Name</i>	<i>Representing</i>	<i>State</i>
Jesse Cole	Federal	WV	Bill Holder	Mgmt.	NM	William Garay	State	PA
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Leland Payne	Federal	KY	Greg Oster	Mgmt.	MN	Bonita Stocks	State	AR
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Jim Dean	Mgmt.	WV	Marino Franchini	State	NY	Harry Thompson	Emeritus	PA
Chuck Gessner	Mgmt.	AZ	John Franklin	State	KY	Tom Ward, Jr.	Emeritus	PA
Matt Hindman	Mgmt.	PA	Larry Frisbie	State	WA			

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.

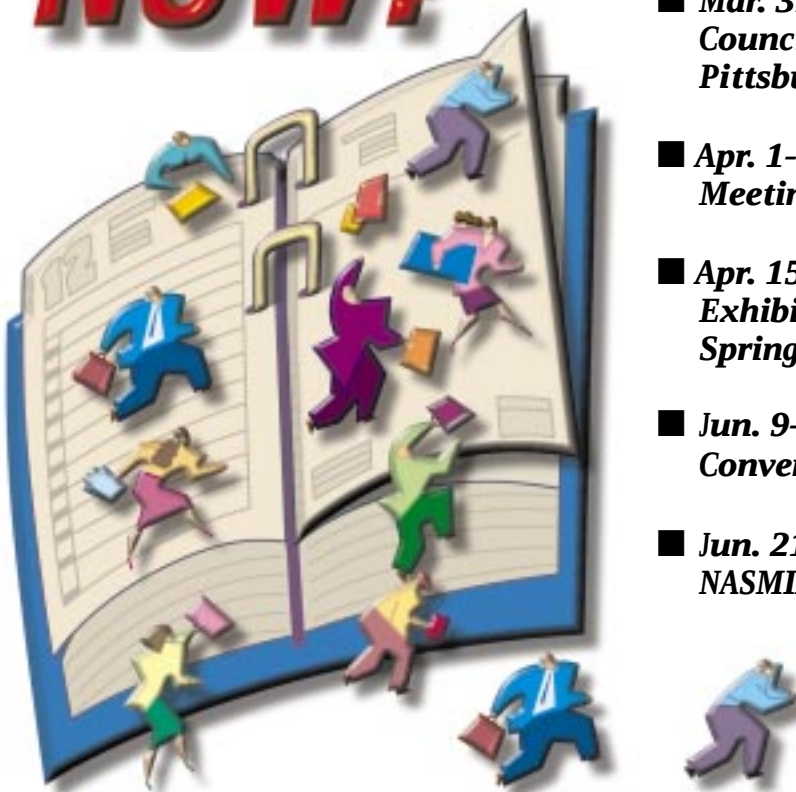
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Upcoming events:

- ***Mar. 31-Apr. 2, W. Pennsylvania Safety Council 73rd Annual Safety Conf./Exhibit, Pittsburgh Expo Mart, Monroeville, PA***
- ***Apr. 1-3, Virginia Mining Assoc. Annual Meeting, Holiday Inn, Norton, VA***
- ***Apr. 15-18, 101st Natl. Western Mining Conf./Exhibit, Broadmoor Resort, Colorado Springs, CO***
- ***Jun. 9-11, Longwall USA '98, Lawrence Convention Center, Pittsburgh, PA***
- ***Jun. 21-24, 1998 Natl. Jt. Meeting—HSA/NASMIA/MIIA, Tampa Hyatt, Tampa, FL***