

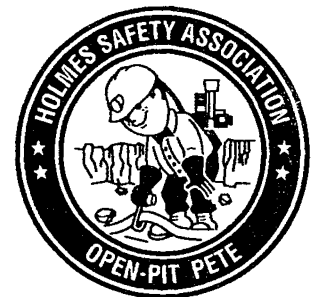
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# **BULLETIN**

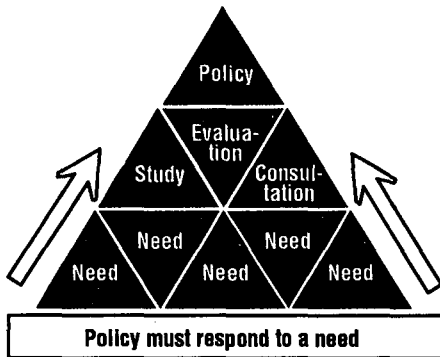
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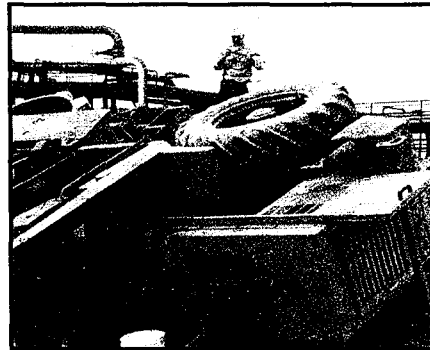
**September 1994**



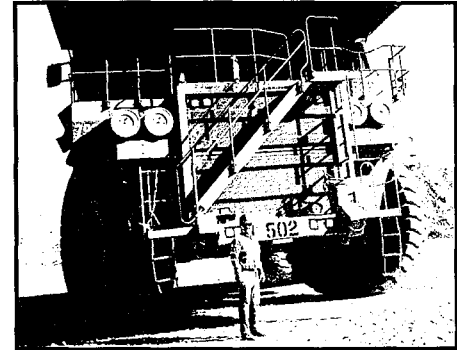
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**Please note:** The views and conclusions expressed in HSA Bulletin articles are those of the authors and should not be interpreted as representing official policy of the Mine Safety and Health Administration.

## KEEP US IN CIRCULATION

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.

# JOSEPH A. HOLMES SAFETY ASSOCIATION

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**President**  
J. Davitt McAteer

**Secretary/Treasurer**  
Robert A. Glatter

Dear Holmes Safety Association Members:

I would like to take this opportunity to deliver a personal message to the members of the Holmes Safety Association (HSA). Your commitment to improving mine safety and health is evident by your affiliation with the HSA, and the work you are performing is to be commended. I am proud to be part of this great organization and share your quest to improve mine safety and health. As the Assistant Secretary for Mine Safety and Health and as the President of the Joseph A. Holmes Safety Association, I pledge my support and will do everything possible to help fulfill the goals of the HSA.

Congratulations to the recently elected HSA officers. Your election is earned tribute from your colleagues and is recognition of the outstanding work you have done for the HSA. Best wishes for a successful year.

- Harry Tuggle .....President
- John Shutack .....1st Vice President
- Steve Walker .....2nd Vice President
- Fred Bowman .....3rd Vice President
- Gary Moore .....4th Vice President
- Robert Glatter .....Secretary-Treasurer

I extend my appreciation to each of you for your willingness to accept new and difficult challenges which will continue to make the HSA an even better organization. My appreciation extends to all the HSA officers and to those members who work behind the scenes to accomplish the HSA's objectives. Your efforts, through your participation, make a significant contribution to mine safety and health.

The message that I have to offer is a simple one. We have to continue moving forward to enhance safety and health and reduce accidents and fatalities in our Nation's mines. When the HSA started in 1926, our country averaged 3,102 fatalities in coal and metal and nonmetal mining. In 1993, we had a total of 98 fatalities. Although this is a tremendous improvement, one fatality is one too many.

Once again, I would like to thank you for your efforts to improve mine health and safety, and I look forward to working with you and the HSA.

Sincerely,

J. Davitt McAteer  
President  
Joseph A. Holmes Safety Association

# Holmes Safety Association monthly safety topic



## Fatal fall of person accident

**GENERAL INFORMATION:** A 61-year old electrician was fatally injured sometime around 4:30 p.m. when he fell through a floor opening in the primary crusher building and landed nearly 14 feet below on a concrete floor. The victim had more than 41 years of mining experience, all as an electrician at this operation.

The operation was a limestone quarry and crushing plant operating two 8-1/2 hour shifts, 5 days a week. The plant normally operated two 12-hour shifts, 7 days a week and employed 150 people.

**DESCRIPTION OF ACCIDENT:** On the day of the accident, the victim reported for work at 2:00 p.m., his normal starting time for weekend work. He spoke to the electrician he relieved, and about 3:00 p.m., he talked to an off-duty lime plant equipment operator who came onto the property. At about 4:30 p.m., the victim contacted the No. 5 kiln operator, to inform him that he would be out of radio contact for a period of time. He told the victim he would pass that information onto the next shift coming in at 6:00 p.m. The victim said that it would not be necessary as he would be out of the radio blackout area by that time. No further contact was attempted.

After talking with the No. 5 kiln operator, the victim proceeded to the lower level of the primary crusher installation to work on the metal detector project. After completing the project, the victim

apparently fell through the center grate opening where he and the grate landed on the floor below.

When the second shift electrician came on shift at midnight, the victim was not at the time clock area. The second shift electrician searched for the victim and found his truck parked at the primary crusher. He proceeded down through the installation where he found the victim about 12:45 a.m., lying on the concrete floor. He stated that the victim was cold to the touch. He then proceeded to the crusher's control room and summoned the local rescue squad and county coroner. The victim was pronounced dead at the scene by the coroner.

Since there were no eyewitnesses, the victim's activity at the time of his fall could not be precisely determined. He could have been attempting to properly seat a floor grate when he fell, or he could have stepped on an improperly seated grate while walking through the area.

**CONCLUSION:** The cause of the accident was the failure to provide safe access to the work area on the 267-floor elevation. A possible contributing factor to the severity of the accident was the fact that the victim was out of contact with others for an extended time and was not discovered until 45 minutes into the next shift.

The accident occurred in a lower portion of the primary crusher area known as the "W-1

area" and designated as the 267-floor elevation by the crusher operators. The floor, constructed of metal, was located almost 14 feet above the concrete floor in the crusher installation. Near the center of the floor were three removable grates covering an opening 5 feet wide by 8 feet long. Across the center of the opening was a 4-inch recessed I-beam used to support the three grates. Each of the three grates were 64-3/8 inches long by 32-1/4 inches wide. Small (1- by 1-inch) angle stops were also welded to each end of the grates to prevent them from shifting. Each grate weighed about 105 pounds.

It was noted during the investigation that the center I-beam which supported the grating had been raised by a 1/2-inch stone lodged underneath it which prevented the three grates from seating properly. The grates were also bent raising two corners from 1 to 2 inches. Illumination in the area was adequate for safe travel.

At the time of the accident, the victim was working on a long-term project which consisted of installing a metal detection system on a belt conveyor under the primary crusher.

At the time of the accident, the crusher and conveyor at the accident site were not operating. The electricians carried portable radios for communications but they were inoperable in the lower levels of the crusher area. A phone was provided on the bottom level of the crusher installation. **HSA**

# Safety incentive strategy guide

[This article is offered ONLY as a guide and does not represent a position advocated or adopted by MSHA nor, is MSHA underwriting the use of the C.A. Short Co. Inc.—HSA]

A truck driver suffers a concussion in a collision. A crew member is maimed by heavy equipment. A construction worker falls and breaks his back. There have been absolute horror stories in recent years about the number and type of accidents in the American workplace. Many of these could have been prevented if proper safety measures had been in place.

"It's shocking to learn about the lack of concern, whether intentional or through negligence, that some companies exhibit toward creating a safe working environment for employees," says Ed Minor, vice president of marketing for C.A. Short Co. Inc., an incentive company in Shelby, N.C., whose

## Wellness makes a workplace safer

Faulty equipment and poor work habits aren't the only hazards employees face: What about Jack's overly ample girth? Or Evelyn's two packs a day? Or Carl's fondness for the corner bar? Or even Miriam's sedentary desk job? If you think those problems are their problems, you've got another thing coming: Employees who are debilitated physically, mentally and emotionally by the lives they lead are a major cause of accidents, injuries, absenteeism and violence in the workplace.

Statistically, if there are 100 people in your company/department...

services include creating and fulfilling safety award programs.

Fortunately, this lack of concern is not representative of the industry in general. As a matter of fact, more and more companies are recognizing the relationship between a good safety program and better employee morale, increased productivity and reduction in workers' compensation premiums.

## Going to the source

In past years, *Incentive* [magazine] has covered some of the problems facing corporate management when it comes to creating and administering a successful safety recognition and awards program. This year, to get to the heart of the workplace safety matter, we're going "straight to the horse's mouth" to get first-hand answers and experience: straight to C.A. Short.

One of the best sources of

- 60 don't get enough exercise
- 50 don't wear their safety belts
- 35 are overweight by 20 percent or more
- 30 smoke
- 27 have cardiovascular disease
- 10 drink heavily (more than two drinks of beer, wine or liquor a day)...

which costs the company thousands of extra dollars a year in medical and insurance benefits.

## Their lifestyle IS your business

According to a 1992 study, the leading reason 64 out of 80 companies implemented a wellness or health promotion program was to prevent job hazards and injuries. They did this by sponsoring ongoing programs that include

information regarding safety award programs is a company that's been directly involved, for many years, in motivating employees and creating an awareness of safe and proper working habits. For the past 50 years, the C.A. Short Co. has earned an excellent reputation for designing, administering, tracking and fulfilling successful safety award programs.

## Safety is an attitude

"We believe strongly that safety is indeed an attitude. We know a good safety record is not going to happen by accident—pun intended," says Minor. "In order to achieve your safety goals, you first have to get employee attention using some form of motivation. Then it's simply a matter of natural progression."

This is the concept: Once you've motivated employees, you have

workout facilities, seminars and more healthful cafeteria meals. Other benefits of a well workplace:

- Reduced use of health benefits and workers' compensation
- Reduced sick leave and absenteeism
- Improved productivity, morale, loyalty and decision making capabilities.

For more information on this subject, contact the Wellness Councils of America (WELCOA), Community Health Plaza, Suite 311, 7101 Newport Ave., Omaha, Neb. 68152. Phone (402) 572-3590. Fax (402) 572-3594.

their attention. When you have their attention, you create safety awareness. With awareness comes safer working habits. From safer working habits and conditions evolves a better safety record. From an improved safety record comes a reduced insurance premium—which results in more corporate profits. All this, plus better morale and a noticeable improvement in production.

### Corporate commitment

For some reason there are many companies with a poor safety record who still have not made the connection between a good safety record, improved job performance, company commitment and reduced insurance premiums. You'd be surprised to learn that many companies don't even have a formal safety budget. And these are generally the ones who need help the most! "While you wouldn't dream of using a Band-Aid on an amputation, unfortunately some companies take this approach towards solving their safety problems," as Minor says.

Before you take any steps towards improving company safety, however, the very first step to take is to adopt a corporate commitment—of time and finances—in direct relation to the challenge you face.

Once this is accomplished, you're well on your way to achieving your safety goals. Then and only then can the remainder of the steps be taken in order to set your program in motion.

### Use available resources

We readily agree that management is busier than ever before. Time itself is a premium. A working knowledge of the intricacies of establishing a successful safety campaign is even more of a pre-

mium. A smart idea is to turn to someone with a proven track record to help you get started. The C.A. Short Co. and other incentive companies have the know-how and the resources to produce a successful program.

For example, the C.A. Short Co. rolls up its sleeves and partners with company safety managers to dig into problem areas—a good incentive company won't offer canned solutions, but a consultative approach. From these efforts, a program is designed that meets the specific needs of the client and the client's budget.

If you decide to do it yourself in part or in whole, an eight-step guide to planning and running a safety award program follows. Use what you can and leave the rest: Every problem is unique, and so is every solution.

### Goals that work

While the overriding goal of most safety incentive campaigns is to reduce workers' compensation premiums or other insurance, here are some typical safety objectives that address the causes behind the premiums:

- Properly using safety equipment and clothing
- Using tools and vehicles without damaging them
- Eliminating chargeable driving accidents
- Correctly storing tools and light machinery
- Properly lifting and carrying boxes and objects
- Safely handling hazardous materials and waste
- Making sure exits, halls and floors are clear
- Replacing old or faulty fixtures and equipment
- Establishing safety training programs

### Step 1: Set goals

An analysis of the safety situation needs to be made before setting goals. Collect data from a variety of sources showing the bottom-line costs of safety and awareness problems: these will help clarify the problem, and therefore the goals.

Collect data from insurance providers, personnel records, employee health services and employee surveys, as well as managerial anecdotes, to get figures on absenteeism and turnover, workers' compensation and life insurance premiums, hospitalization and outpatient medical claims, physical and mental disabilities.

If research turns up medical claims related to repetitive use injuries, respiratory ailments, allergic reactions, etc., you may also want to hire specialists in ergonomics, medicine or chemistry to expose hidden workplace problems.

Once your goals are clear, it's time to put them into words. Make sure your stated goals are:

**Specific**  Goals should state four essential points:

1. The desired activity;
2. The units of activity that will be measured;
3. The expected performance level;
4. The time allotted to achieve that performance level.

**Simple**  Focus on one or two goals and word them in everyday language to make them easily understood by all participants; for example, "Complete three consecutive months without a chargeable accident" or "Reduce lost-time injuries among employees by 50 percent next year."

**Attainable**  Don't get in over your head, because a number of factors may be out of your control. The level of achievement will be affected by the number of participants, the conditions of the work-

ing environment, the financial support committed, the time dispensed for training before the launch, etc.

**Measurable**  Base your goals on performances or activities that can be quantified—so many days without a driving accident, so many months without a spill, etc.

**Acceptable**  Run the goals past top management as well as the managers and supervisors of the target audience, in case the goals happen to conflict with a corporate policy or are not really quantifiable.

**Step 2: Strategize**

This step is based on two factors: when and how long to run the program. *When:* Safety programs should be in synch with peaks of activity, whenever most accidents occur that might call for a yearlong maintenance campaign or a three-month sprint prior to a holiday rush. *How long:* Successful programs should run at least six months to allow participants to absorb their education or training, and turn it into changed behavior.

Whether the program will spur individuals or teams to reach the goals depends on the people involved. Many safety participants are team oriented; even so, every individual who hits the mark should get appropriate awards and peer recognition.

If you go with a team format, bear these points in mind:

Be sure that individual achievement within teams will be rewarded, so each worker puts in the effort to reach the goal for the sake of "number one."

Even if the team misses the mark, make sure that anyone who stands out is properly rewarded, whether as part of the team or in an individually-targeted support program like a safety suggestion contest.

Keep team size to six to eight people, and set teams at different risk levels, each team consisting of workers and supervisors who face the same hazards on the job.

The next step is to write out the rules, remembering to state everything in clear, specific and plain language. Be sure the statement lists:

- Program dates (effective when to when)
- Eligible employees (how many of which division)
- Structure/Rules (what behavior will win awards)
- The awards (what is awarded at each level)
- Grounds for disqualification.

Run a test read among a sample

**The toll of trauma**

Occupational deaths and injuries on the American workplace have severe mental, emotional, social and financial repercussions in families and companies. The most quantifiable damage—financial costs—is presented below. Figures are taken from the 1993 edition of Accident Facts, published by the National Safety Council. (The 1994 edition is available in August.)

**Total cost in 1992 ....\$115.9 billion**  
(Includes wage and productivity losses, medical costs, administrative expenses and various employer costs; also damage to motor vehicles and fire losses.)

**Cost per worker .....\$990**  
(Value of goods or services each worker must produce to offset the cost of work injuries—not the average cost of an injury.)

**Cost per death .....\$780,000**

**Cost per disabling injury ... \$27,000**  
(Includes estimates of wage losses, medical expenses, administrative expenses and employer costs; excludes property damage costs except motor vehicles.)

group of your audience. If any part of it is unclear, it has to be reworded—or rethought—until it's perfectly understandable.

**Step 3: Budget**

All too often a safety incentive budget has to be scared up from management, especially the first time around. Ideally, a company should have it inked in based on past experiences—not only a financial commitment, a commitment of time and talent, too.

But if it's a matter of having to make a presentation for the funds, project your budget by tallying these factors:

- Any managerial financial support whatever;
- Number and types of program goals;
- Number of participants;
- Award demographics of potential winners;
- Length of the qualification period;
- Cost and intensity of training;
- Frequency of announcements and updates;
- Rate of employee turnover;
- Inherent risks of the tasks performed.

Once you know the budget you're working with, it's time to divide it among four major categories: awards, training, promotion and administration.

Experts suggest this ratio per item:

**Awards:** 60 to 70 percent of budget, ideally the value of each prize worth 2 to 5 percent of an individual's annual income, whether awarded in a lump sum or in increments.

**Training:** 10 to 20 percent, depending on the number of participants and the difficulty of the new information.

□ Promotion and administration: about 10 percent each.

#### Step 4: Do tracking

The bridge that gets a winner from here to there in any incentive campaign is the measurement system—that which quantifies achievements and turns them into awards. Measurement systems should always be objective, easily quantifiable and fair.

And even if a program runs all year long, be sure to punctuate it with regular award opportunities, because that will ingrain the one thing that you really want to achieve with a safety campaign: awareness. It is absolutely critical to encourage the new safety awareness in the workplace by rewarding it regularly (and doing spot-check education and training when necessary, to turn new skills into new work habits).

It can be as simple as awarding \$50 in cash to a machinist if he goes 90 days without an accident; a \$100 gift certificate for the next

quarter he goes accident-free; a merchandise premium worth \$150 for the next safe quarter, etc.

Another popular way to track and reward achievement is through a point structure: For example, to each team member who goes one quarter without a lost-time accident, a company awards 3,000 points, redeemable for a \$100 gift certificate. If lost-time accidents do occur, members can still cash in whatever points they have earned on a points-per-dollar system, 30 points equal to \$1, as long as they have met a bottom-line safety standard or quota.

Often a company that employs workers at different levels of risk will set up a tiered measurement system; workers are divided into teams, the most dangerous jobs placed at Level 1, the next most dangerous at Level 2, etc. Level 1 workers would then be eligible for higher rewards—12,000 points equivalent to \$400 for each team quarter without a lost-time accident, compared to Level 2, where

workers would receive 9,000 points equivalent to \$300.

#### Step 5: Choose the awards

There are five basic categories to choose from for safety awards: recognition, merchandise, travel, gift certificates or cash.

Recognition awards include plaques, trophies, certificates, rings, items in the company newsletter, special parking lot spaces, a dinner or picnic in honor of achievers, a special posting from the company president. This type of award should be part of all safety incentive programs, along with other awards, because workers want the honor and praise that awards represent as well as the awards themselves.

Merchandise catalogues are a sure-fire choice for the company and for achievers because they allow employees the opportunity to select the item or items that motivate them the most. After all, it is extremely difficult for one person (in this case, the safety manager) to

## Brick solid safety record

**Company:** Cherokee Sanford, Sanford, N.C.

**Promotion Agency:** C.A. Short Co. Inc., Shelby, N.C.

**Audience:** Over 600 production employees, including laborers, loaders, firemen, sawdust handlers and truck drivers, in seven plants in North Carolina and Maryland.

**Goals:** To reduce accident rates, lost-time accidents and workers' compensation costs on a yearly basis.

**Strategy:** To motivate a variety of employees at multiple plant sites, Cherokee Sanford uses two strategies—a C.A. Short Safety Stamp Program for individual and

team objectives, and a cash bonus program for plant and corporate safety objectives.

**How it works:** Each week an employee completes without a lost-time accident, he or she is awarded a CAS Safety Stamp valued at \$1; also, each employee is assigned to a team—to keep things fair, each team is a mix of people from different departments—and for every month they avoid any OSHA-recordable injury, teammates receive 12 stamps each. Stamp books are redeemed for items from a C.A. Short catalogue; the program is open-ended so people can save stamps for years to receive big

awards. Also, the company awards cash bonuses every year to employees from the safest of the seven plants; if safety objectives are met company-wide, every employee receives one.

**Results:** Cherokee Sanford has seen its accident rate reduced by 74 percent, lost-time accidents by 91 percent, and workers' compensation costs by 91 percent. The overall program cost is only 19.7 percent, and the C.A. Short Safety Stamp cost only 12.8 percent, of all the savings generated. A side benefit: Outside injuries reported as on-the-job injuries have been cut down—teammates discourage it because it reduces awards.



## Safety hits the mother lode

**Company:** Niagara Stone Corp., N.Y.

**Promotion Agency:** C.A. Short Co. Inc., Shelby, N.C.

**Audience:** A 50-man dolomite quarry crew involved in heavy machinery, drilling and blasting operations.

**Goals:** To eliminate or drastically reduce lost-time injuries every quarter, aiming for 12-month periods accident-free; and instill safety awareness over the long term.

**Strategy:** Niagara Stone uses a C.A. Short annual award program, distributing the award catalogue in the beginning of the year to key employees in a goal oriented

and safety-aware frame of mind. It also gets the homefront invested in safety, because family members are involved in the selection process of the gift 75 to 80 percent of the time.

**How it works:** The C.A. Short annual award program is used in several ways. For every 12 months workers chalk up a record with no lost-time injuries, each gets to choose a gift from a range of name-brand products in the C.A. Short catalogue. To keep up interest and awareness, three or four safety drawings are held every quarter for all who have completed the quarter without injury; there are usually two winners, who each receive a

weekend for two in Toronto. There are also milestone awards, such as a watch or piece of luggage, for five or more consecutive years of accident-free work.

**Results:** The year prior to calling on C.A. Short, Niagara Stone recorded 16 lost-time injuries. Since instituting the program, lost-time injuries have been reduced to zero for six consecutive years. During the same time, the U.S. Department of Labor, Mine Safety and Health Administration recorded more than 46 incidents per year in the average quarry in the United States.

try to find one item that will motivate a broad segment of the work force.

For example, the C.A. Short catalogue offers a wide range of merchandise items sure to motivate almost everyone; categories include sports equipment, household items, outdoor equipment, electronics, personal care items and more.

Plateau or point programs are another way to award merchandise. For price points ranging from \$10 to \$500 or higher, a company can offer specific merchandise such as caps and tee-shirts, electronics, steaks and chops, hand tools, power tools, fire safety products, vacuum cleaners—often rugged or practical items that match the nature of the workplace.

Apparel is good for reinforcing a logo, theme, or team name: caps for meeting first quarter goals, tee-shirts second, sweatshirts third and jackets fourth, all embossed or embroidered, so at the end achievers have an outfit that advertises their success.

One thing about merchandise is that it takes stock space and administration; suppliers such as C.A. Short offer customer-direct ordering and shipment.

However merchandise awards are distributed, make sure it's done quickly and accurately. Having to wait or getting the wrong size or item can take the shine off employee goodwill.

Travel is very motivating, but group travel is usually reserved to award top producers in sales incentive programs; it's usually beyond the budgets of most safety incentives. Even so, there are quite a few airlines, hotel companies and incentive houses, such as C.A. Short, that offer the less-expensive but very appealing option of individual travel awards: flight credits, for example, or a weekend for two at a nearby mid-priced resort.

Cash, while offering somewhat of the same appeal and selection of a merchandise programs, falls into an entirely different category.

A cash program is simple to administer, but does not provide the "trophy" appeal of merchandise and travel, or a lasting, positive connection with the company that's awarding the cash.

Gift certificates are somewhat the same as cash in that the program is simple to administer; but also similar in the way that recipients usually spend the certificate on a regular outing to the retailer for day-to-day items, and may lose the connection between the acquisition and the company that made it possible.

On the other hand, certificates from department stores, catalogue retailers, travel suppliers and incentive houses have a number of attractive qualities: chiefly flexible price points and freedom of choice.

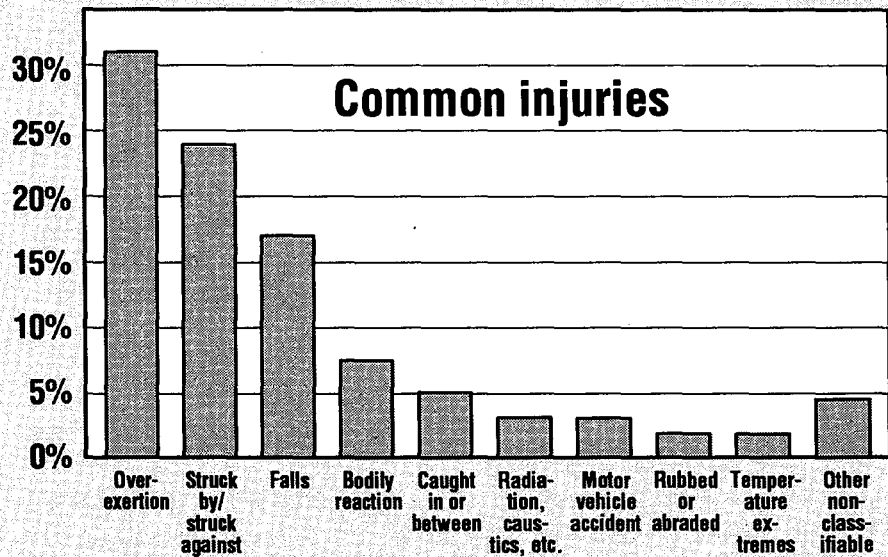
### Step 6: Promote

Now it's time to send the message out to the targeted workforce. An advantage of a safety incentive is that the message is clear: Nearly everyone can relate to hazards or

The following lists by percentage the injuries involving disabilities in all industries, based on a recent analysis of 1,047,055 cases.

Overexertion .....	31.3%
Struck by/struck against ....	24.0%
Falls .....	17.1%
Bodily reaction .....	7.6%
Caught in or between .....	5.2%
Radiation, caustics, etc. ....	3.1%
Motor vehicle accident .....	3.1%
Rubbed or abraded .....	2.0%
Temperatures extremes .....	2.0%
Other, nonclassifiable .....	4.6%

Source: Bureau of Labor Statistics  
Supplementary Data System



danger on the job. To keep up continuity, however, it's a good idea to come up with a short and simple theme: "Safety Saves Lives" or "Safety First."

Include the theme on all campaign materials and communicate with your audience every two to three weeks: at least every two weeks during three- to six-month programs. Communication materials include:

*Teaser mailings*, such as a kick-off letter from the company president stating the goal of making the workplace safer every quarter for the next four quarters.

*Announcement meetings*, first a kickoff meeting to introduce the program, then further meetings to distribute and discuss training materials and give progress reports.

*Weekly team meetings*, which keep managers and supervisors abreast of the program, refresh important training points or program rules and address any problems.

*Posters*, a way to get employees involved two ways: in the safety contest and a poster design contest. Posters can state the theme and award structure, spotlight an achiever, etc.

*Qualification mailers*, sent to participants who've met, or are close to meeting, their safety goals. Mailers should re-state goals and the award structure. Send them often: they're the best-read communication materials of any you'll distribute.

**Step 7: Administrate**

Once a safety program is planned, some companies will turn the whole thing over to an incentive house such as C.A. Short to administer. But if you decide to run the program in house, make sure you have the time and human resources committed at the very start.

**Enroll employees.** Have each participant provide pertinent information, including name, address and social security number.

**Create a database.** Create a computer file of who is involved, when they enrolled, etc. Track their progress through this file.

**Generate labels.** Use the database to create mailing labels for promotional mailings.

**Send statements.** Mail progress reports to each individual or team at least once a month, including a clear picture of where their

progress stands.

**Track awards.** Track points or credits, and regularly notify achievers of their award status.

**Report to management.** Include notes on the progress of individuals, team managers and the program in general.

**Track earnings and taxes.** At the end of the program you must provide 1099 and/or W-2 earnings data to all participants for tax reporting purposes.

**Prepare to analyze.** Create a system to gather, disseminate, and evaluate information, and get feedback from participants.

**Step 8: Evaluate**

Now is the time to discover whether the safety incentive delivered the desired results. Bottom-line results should be simple to quantify if you established clear goals to begin with and kept good track of progress.

If your company is self-insured, results can be realized by the end of the first year. If it isn't, results will take longer since the company must complete a full first year in the safety campaign, and then turn over the results to be massaged by

the insurance company.

Generally, it takes from one to three years to complete this cycle, so even though you'll see a definite improvement in your safety record, it may take a while to actually reap the benefits of reduced insurance premiums and medical claims.

As well as evaluating the program from the administrative point of view, it's also important to find out whether it met the expectations of participants. Prepare an evaluation form that asks:

1. Were the goals made clear to you at the start of the program?
2. Did you receive enough training

and management support to reach the goals?

3. Did you receive written and verbal feedback on a timely basis?
4. Did the selection and quality of the awards motivate you?
5. How would you change the structure of the program to make it a better success next time?

#### Bottom line

If there are critical or negative comments, don't let it get you down. Unless it's a blatant failure, most safety incentives will signifi-

cantly accomplish the original goals: increased safety and awareness, and savings on insurance premiums.

But even the most modest program accomplishes something great: It lets employees know that the company cares about their health and safety. And creating an atmosphere of mutual trust and appreciation is always a winning campaign. **HSA**

*Reprinted from the June 1994 issue of Incentive magazine—a publication of BILL Communications, Inc.*

## Safety Reminder—Slips + Trips = Falls

Considering that the average person takes about 18,000 steps a day, it's perhaps surprising that we don't slip and trip more often. But we do often enough that it is one of the leading causes of workplace injury. Even slips that do not result in a fall can cause injuries such as back strain.

Over half of all falls that result in injury are falls on the same level (i.e. from slipping or tripping). Trips are pretty straight-forward: an object prevents your feet and legs from moving beneath your shifting center of gravity, and down you go.

Slips occur about twice as often as trips and are a little more complicated, at least in the safety literature. Slips occur when the *coefficient of friction* (COF) between your footwear and the surface on which you are walking is insufficient to

prevent the two surfaces from moving against each other. That's a fancy way of saying "slippery." Scientists have devised over 60 ways to measure the *static* COF (i.e., when standing still), but hardly any to measure the COF when you're moving in different ways. One purpose of their studies is to discover what combinations of footwear and walking surfaces are best at preventing slips. Here's some of what they've discovered.

**Soft rubber** soles are best for dry surfaces of most types—fewer than 5% of slips occur on dry surfaces. **Neoprene** soles (a synthetic rubber) are suitable for all surfaces, wet or dry, except those that are oily or greasy. Perhaps surprisingly, **leather** soles are often best for wet or greasy surfaces, but should never be used on dry, smooth concrete, or tile. **Hard rubber**

soles are good for concrete or wood surfaces which are greasy, but not recommended for tile, wood, or concrete, wet or dry. **Crepe** soles are good on rough surfaces, but like dry surfaces, rough surfaces cause fewer slips anyway.

Footwear is only a part of the equation. Walking surfaces should be designed or modified with preventing slips in mind. If they must be wet or greasy, make them rough or put grating over them. Once the surface/footwear combination is correct, good housekeeping, sufficient lighting and not hurrying will prevent most slip or trip situations. (Avoiding winter would also help as 40% of falls on the same level in Canada are caused by ice.) **HSA**

*Reprinted from the May/June 1994 issue of the Ontario [Canada] Natural Resources Safety Association's Health & Safety Resource.*

## The "P" words:

# Making *Policies* and *Procedures* that work

by David Dehaas CPSP, Senior Education Specialist

For many people, the words "policy" and "procedure" are pretty much meaningless terms that refer to unrealistic and often incomprehensible pieces of paper posted on a bulletin board somewhere just below the notice for the potluck supper and just to the right of the sign-up sheet for the annual employees' softball tournament. That's not good.

Safety systems, the way we manage and administer safety in our workplaces, depend on policies and on procedures. It's the policies, written or not, which drive almost everything that happens in a workplace—safety included. And it's the procedures that capture our acquired knowledge of how to do things right. If our policies and our procedures seem meaningless, if they're all pie in-the-sky or if they're incomprehensible, then they're not doing the job, and we're missing out on our best opportunity to make safety work for us.

### The first problem

The first problem we run into with policies and procedures is just telling them apart, just knowing where the policy ends and where the procedure begins. We often tend to think that "policies and procedures" are the same thing simply because we always hear the terms used together, or even used interchangeably. That problem, at

least, is easy to fix. All we have to do is look at the definition of each of the terms and we'll never confuse them again.

\*A policy is a management decision.

\*A procedure is a set of step-by-step instructions for performing a task.

Of course, the reason that we always hear the two terms used together is that the two things tend to go together. Any time you see a policy, you can expect to see a series of procedures not too far behind. The policy states the general principle behind *what* will be done; the procedure spells out the specific, practical application—how it will be done. One policy might give rise to a dozen procedures. A lockout/tagout policy, for example, might lead to a written, step-by-step lockout procedure for each workstation.

### Policy

Now, in order to make policies "work" for us, we have to have good policies; and the major difference between "good" policies and "non-good" policies lies not so much in their *content*, as in their context. In other words, it's not so much what's in the policy as how it got there.

The wrong way to come up with a policy results from not being quite sure of what a policy is or how it's supposed to work. What all too often happens is that we look around and

say, "Hey, all these modern safety theories say that we're supposed to have policies and procedures and stuff. So let's write up some safety policies."

Let's look at, for example, a lockout/tagout policy that might be stated this way: "Whereas the safety of our workers is our primary concern, and whereas lockout and tagout procedures are an important element in the protection of workers from accident, it is the policy of ABC Co., Inc. henceforward to recognize all means and measures consistent with the accepted standards for the use of lockout and tagout procedures." Uh-uh.

That's not how it's supposed to work. We can't just pull a policy out of thin air. If we go off to our offices and write up some safety policies, and we put in some flowery language, a couple of "whereases" and a "here to fore" or two, and then run down the hall to post the result on the bulletin board, we will not have accomplished much. People will look at it, some of them will read it, and most of them will shrug their shoulders, say, "oh, that's nice," and continue about their business as before.

Sure, we can have the president sign the new policy; we can send every employee a copy; we can have it written out on parchment by a professional calligrapher; we can have it framed and hung at the front

# ACME MINES INC.

## LOCKOUT TAGOUT POLICY

Every person who has to clear a jam-up, make a repair, oil, grease, adjust or access any powered equipment, machine or power transmission device must first perform a full lockout.

Lockout Procedure: No. 1 Main Power Transformer

Lockout Procedure: Crusher

Lockout Procedure: No. 3 Conveyor

1. Turn off controls at operator's panel.
2. Lock operator's panel and remove key.
3. Turn off electrical power at electrical Box J-5.
4. Apply padlock at Box J-5.

▲ **A single policy can result in dozens of procedures, which are sets of step-by-step instructions for performing a task.**

door; but it will still not work.

Why not? Because we've made a number of fatal errors. First, we wrote a policy for the purpose of having a policy instead of for the purpose of resolving a problem. Second, we wrote our policy without doing any reality checks in the real world of the workplace. Third, we assumed that we'd be finished once we had the policy written, framed, and up on the wall. And fourth, we didn't make it very clear how or when the policy would be applied.

### The right way

What's the right way? In order to come up with a policy the right way, we have to first understand exactly what a policy is: a policy is a decision, a standing decision, that management has made to guide the actions of people in the workplace.

First, management, the people who call the shots in the workplace, must identify the situation that *requires* a decision. They do this by being in touch with the

workplace and in touch with their responsibilities. They have to be in contact with their safety committee, they have to get feedback through their supervisors, they have to talk to people, they have to listen to people, and they have to correctly interpret what they hear.

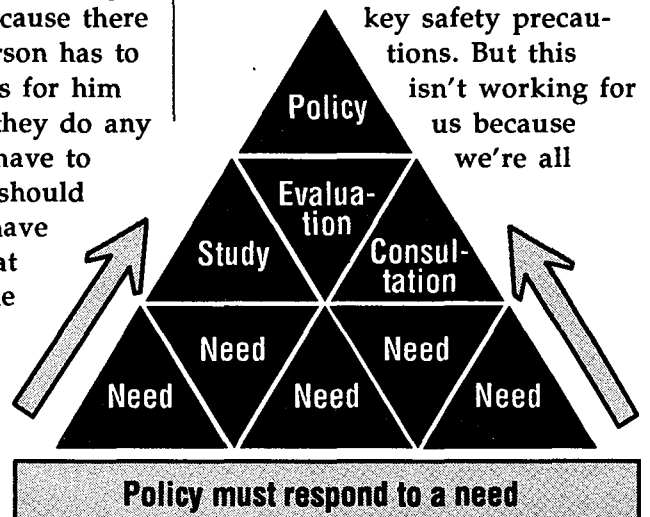
For example, let's say that we have a workplace with no lockout/tagout policy, but with numerous situations that require lockout: people clearing jam-ups in machines, adjusting equipment, oiling, greasing, making repairs and so on. Because there is no policy, each person has to make all the decisions for him or herself each time they do any of those tasks. They have to decide whether they should lockout at all. They have to decide whether that means locking just the control panel, or locking the electrical box as well. They have to decide whether to use a lock or a tag or both. They have to

decide whether or not to test the lockout. And so on.

When faced with the need to decide, some people decide to be very thorough, and some people decide to be very fast. Some people decide to go and ask their boss what to do, and some people, unable to decide at all, stop functioning until someone else comes along and makes the decisions for them. Some people are unsure of what to do. Some people are afraid that they'll get in trouble if they make the "wrong" decision but they're not sure what the "right" decision is. There is even a lot of quibbling and the occasional argument between workers who have different views on how it should be done. What we have, in other words, is a policy vacuum.

Enter management. They're in touch, they're hearing the quibbling, they've heard from the safety committee that things are not going smoothly, and their supervisors are telling them that there's a lot of little annoying holdups involving lockout. They look around and say, "Hey, wait a minute. We know lockout is required by law. We know

lockout is one of our key safety precautions. But this isn't working for us because we're all



over the map and there's no consistency. Each time a lockout situation arises, we re-invent the wheel. That's no good. Let's fix that."

They go out and talk to the people who have to do the lockouts. They bone up on the law, they talk to the electricians and the millwrights, and heck, they may even call in a professional safety consultant from, say, MSHA. They look at all the decisions that have been tried in the past, they look at the upside and the downside, they do some brainstorming and they reach a consensus on what's best.

Then they make a decision: "From now on, by order of management, every person who has to clear a jam-up, make a repair, oil, grease, adjust or access any powered equipment, machine or power transmission device must perform a full lockout." *That's* what a good policy looks like: it's written in plain language; it fills a need by answering a question that needed an answer; it leaves no room for doubt as to what is meant; it has teeth; and it is a decision that every worker in place can apply, can *use* each time he or she has to do any work on or around energized systems.

Next, management informs everyone of that decision by writing it down. They demonstrate the fact that they're serious about it by signing it. Then, to make sure it sticks, they teach people what it means and how to apply it, and they instruct the supervisors to enforce it.

A decision like that is called a "policy." It's a management decision made once and for all. It deals decisively with a spe-

cific issue. It has the force of law in the workplace, and it can make things happen.

### Procedures

Now, a policy like the one for lockout seems to be pretty clear except for one thing: what does "perform a full lockout" mean? The policy is completely useless and inoperative if that key phrase is left undefined. (One person will think that "perform a full lockout" means locking the controls and the electrical panel, while another person may think it means just turning off the controls, and so on.) If that is allowed to happen, we won't really have cleared up any confusion at all, and we won't really be any further ahead.

In order to answer that question, you have to turn to the procedure. The procedure is the step-by-step operating instructions. It brings order to the way the task is done, and it makes sure the task is done the same way—the best way—every time.

The way to generate a procedure is simple. You get the people together who know how to do it and you hash out how it's supposed to be done. You apply the principles of lockout—things like dealing with retained energy—and make sure you end up with an air-tight list for each individual work station. You make sure that it reflects the policy. You make sure it covers all the loopholes. You make sure it's practical. Then you write it down, post it at the work station and train all of the affected personnel.

But you're still not quite done. After the policy and procedures have been in place for a while, it's important to check back with workers who

have to apply them in the real world to evaluate their effectiveness. Minor tune-ups may be required. From then on, policies and procedures should be reviewed on a regularly-scheduled basis.

### So...

A policy—a *good* policy—will work for us because it is a tremendous labor saving device, a decision that gets used over and over again, each time saving a person from the need to make that decision from scratch. A good policy is a clear, practical, hands-on, shirt-sleeves-rolled-up working tool that gets used every day. A good policy is like a measuring stick that people can apply quickly and easily with reliable consistent results.

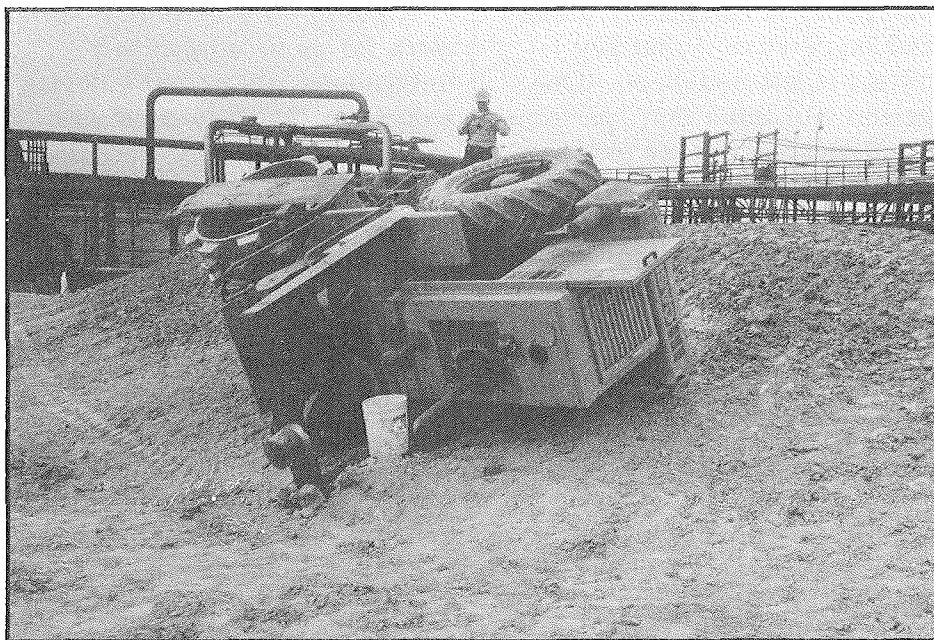
Our procedures bring simple order to otherwise complex and confusing situations. They let us work out the best way to do a job—the safest, most efficient way—and then let us do it that way every time. Together, our policies and our procedures bring clarity and consistency to the way things are done; they ensure that our best possible decisions get used every time; and they give us the chance to enjoy the finer things in life—like potluck suppers and softball tournaments. **HSA**

*Reprinted from the May/June 1994 issue of Ontario [Canada's] Natural Resources Safety Association's Health & Safety RESOURCE.*

# Seatbelt Save

Incident date: November 2, 1993, Time: 3:30 pm

Date of investigation: November 2, 1993



began to slide down the side of the tank. The machine laid over on its side at the bottom of the tank. The employee was wearing his seat belt and escaped unharmed from the accident.

During the subsequent investigation the employee stated that he was probably too far down the side of the tank at the time of the roll-over.

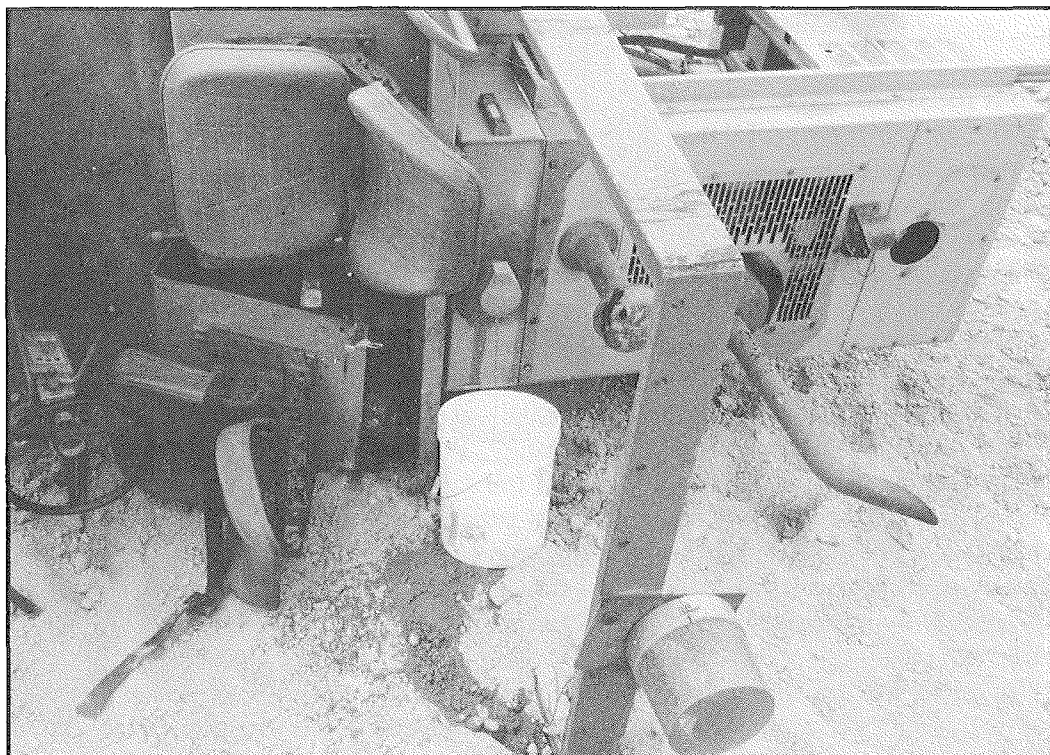
**STEPS TAKEN TO PREVENT REOCCURRENCE:** All employees operating equipment were gathered together for a safety meeting. Employees were informed of the probable cause of the accident. Operators were told to pay close attention to their surroundings and take time to make sure the job is being done in as safe a manner as possible. Employees were also told that if they were in any way unsure about a job, ask the supervisor. **HSA**

## SITE DESCRIPTION:

Work was being performed on the top rim of an earthen tank. The tank is primarily clay and is very slick. The top of the tank is approximately 10 feet above ground level.

## DESCRIPTION OF ACCIDENT:

The employee was operating a 69-inch vibratory roller on the top rim of the earthen tank. While in the process of rolling the top rim, the rubber tires on the back of the roller began to slide down the rim of the tank. The employee could not stop the machine once it



• Laborer • Electrician • Shuttlecar operator •

Miner

Miner

# CAUTION!

**NO OCCUPATION**  
is immune from fatal  
electrical accidents

Miner • Fire boss

Miner helper • Miner





*One person—one truck—240 tons per trip. Armando Abril with his new haulage truck, far removed from one man, one shovel*

## And may get even bigger

# *Ore haulage from burros to behemoths*

*By Craig Sircy and Gary Bates*

The arrival of seven new haul trucks at the Morenci Mine in 1992 was cause to wonder—"How much bigger could they get." These Cat 793B's carry a 240-ton payload at speeds in excess of 30 miles per hour, ride like a passenger car and monitor and record their own

operating systems' status.

While the U.S. mining industry is running an equipment fleet older than at any time in its history, Phelps Dodge Morenci, Inc. (PDMI), enjoys what may be the most modern fleet in the world. This is quite important during this time of low copper prices and

steadily increasing haul distances at Morenci. Our new Cat 793B haul trucks have proven to be nearly 23 percent more productive than their predecessor Cat 789, 195-ton haul trucks.

Technological advances in steel alloys, electronics, and tires were necessary to make the behemoth



***The new 240-ton mechanical-drive trucks feature a new electronic fuel injection and electronic engine and powertrain controls for greater efficiency and reliability. Benefits include increased fuel efficiency and reduced smoke, improved powertrain service life, smoother shifting and an electronic history of engine and transmission operating conditions.***

793B a reality. However, changes in the haul truck market have not been purely technological. It takes a manufacturer and supplier willing to stand behind its product to complete the package.

At Morenci, Empire Machinery parts and service personnel work side-by-side with PDMI maintenance personnel to meet operating cost and availability goals. This "partnership" approach ensures

that parts are available whenever they are needed—around-the-clock. It's interesting that Morenci is now Empire's third largest parts distribution facility.

As haul trucks increase in size, new approaches to maintenance must evolve to keep pace. Maintenance has reached an impressive milestone with the Cat 793Bs as they are equipped with the Vital Information Management System,

or VIMS.

VIMS is capable of monitoring and recording a multitude of operating parameters while the 793B is operating. Problems encountered by the operator can then be recreated in the shop, on a laptop computer, and analyzed by trained maintenance personnel. The result is quick, accurate problem diagnosis.

In the cab of the Cat 793B, a

computer display notifies the driver of the operating systems' status and "critical events." Critical events occur in three levels: Level 1 indicates that a system will need service soon. Level 2 indicates an immediate need for service and Level 3 requires immediate shut-down of the truck. Potential cost savings from preventing catastrophic failures are substantial.

Systems like VIMS will undoubtedly become more common in the future. Continuing improvements in maintenance efficiency and production planning are key elements in

our competitive industry.

Evaluation of the Cat 793B haul truck by Phelps Dodge began in 1992 when mechanical and electric-drive trucks, in the 195-ton to 240-ton class, competed head-to-head over predetermined haul profiles at the Chino Mine. Speed and fuel consumption data were collected and analyzed to determine the productivity-operating cost champion. The gold medal in this competition went to the Cat 793B, which was determined to be the most suitable for the Morenci operation.

Will haul trucks get bigger? Probably. Electric-drive haul truck manufacturers are at their drawing boards today, working to overcome the mechanical drive advantage. Look for bigger, faster competition in the future. Who knows? The next U-haul truck olympics may even be hosted by PDMI.

Meanwhile, the capital investments made in recent years have positioned PDMI to be cost competitive for years to come! **HSA**

*Reprinted from the February 1994 issue of the Morenci Copper Review.*

## Methods for safer mining designs developed, expanded

Longwall and coal pillar retreat mining methods can result in hazardous ground conditions caused by the heavy rock strata pressures they produce. The U.S. Bureau of Mines (USBM) is conducting research aimed at providing the basis for scientific, practical design for ground control during retreat mining.

For longwall mining, USBM research already has yielded a widely used coal pillar design method called "Analysis of Longwall Pillar Stability" (ALPS). More than 200 copies of the ALPS computer program have been distributed worldwide. ALPS users are found at nearly every U.S. coal company now operating a longwall mine. Most recently, the ALPS method has been expanded to include the effects of roof-rock quality and artificial support on longwall mine stability. Using USBM's new Coal Mine Roof Rating, underground geotechnical surveys were conducted at nearly 50 longwall installations throughout

the United States. Based on a statistical analysis of the data, new guidelines suggest that where the roof is very strong, ALPS stability factors as low as 0.6 may be safely employed. Where the roof is weak, however, the stability factor should be increased to 1.3, the mine entries should be narrowed to 5.5 meters (18 feet) or less, and the primary support should be strengthened.

Retreat mining by pillar extraction—also called pillaring, pillar robbing, and second mining is one of the most hazardous methods of coal extraction now in use. With this technique, pillars developed in advance are removed in a series and the roof is allowed to cave in after their removal. In 1991, more than 25 percent of the total underground fatalities attributed to roof falls occurred during such pillar extraction operations. Also, several severe air blasts resulted recently when large mined-out areas suddenly collapsed. To ensure miner safety and efficient recovery of coal reserves, pillars must be sufficiently

sized to prevent pillar squeezes, excessive mine-rib breakage and flaking, floor heave, roof falls, and other ground-control hazards.

Building upon research conducted in longwall mines, the USBM has developed the Analysis of Retreat Mining Pillar Stability (ARMPS) method. During calculations, ARMPS is unlike other formulas, since it considers the front and side abutment pressures generated during retreat mining. Four possible loading conditions can be evaluated, depending on the extent of coal pillar extraction. To date, the ARMPS formula has been applied to 43 pillar design case studies. Of 11 cases analyzed that had ARMPS stability factors of more than 1.75, all but one were successful. This shows that ARMPS will be useful in developing safer mine designs for retreat mining. Additional research, including a series of underground studies, is being conducted to further refine the program. *Christopher Mark, USBM, (412) 892-6522* **HSA**

# Holmes Safety Association monthly safety topic



## Fatal fall of roof/rib accident

**GENERAL INFORMATION:** A 31-year old miner-laborer, with 9 years of intermittent experience, was fatally injured by a fall of roof and rib while in the process of installing timber.

The operation is an anthracite underground coal mine and provides employment for 13 miners, 10 of whom work underground and 3 on the surface. The mine produces 50 tons of anthracite coal per shift, two shifts per day. Surface facilities include a hoist/change room facility, a steel structure which houses a compressor, generator, shaker screen, and a steel head frame.

Electricity at 440 Volt AC power is supplied to pole transformers at the mine. Four-hundred-forty Volt AC power is supplied to the underground to operate two 13 HP Flygt submersible pumps, one 75 HP Flygt centrifugal pump, one 30 HP Flygt centrifugal pump, one 15 HP Gould centrifugal pump, and one 84 Volt DC battery charger.

Mining operations are in the Tracy coal vein which pitches to the north 85 degrees. Average thickness varies from 5 to 8 feet. The vein carries a rock divider that varies from one-inch to twenty-four inches in thickness. The haulage slope in the Tracy vein is developed to a depth of 350 feet and intersects the 3rd level gangway at 330 feet. The mining system utilized for the development of the coal seam was gangways, chutes, headings, and breasts. Final robbing was accomplished with the use of

longhole drilling and blasting. The mine is ventilated on the east side with a Jeffrey Aerodyne Fan with a 25 HP electric motor and on the west side with a Buffalo Fan with a 15 HP electric motor.

The mined coal on the west side was transported with a hand trammed gangway buggy from the working section to the slope. The mined coal on the east side was transported to the slope by a Greensburg Battery Locomotive with several mine cars attached. At the slope the coal was transferred to a 2-ton capacity slope gunboat and hoisted to the surface.

**DESCRIPTION OF ACCIDENT:** On the day of the accident, the second shift, consisting of the victim and four other employees, began their regular work duties at 2:00 p.m.

A pre-shift examination had been conducted at 1:45 p.m., by the day shift foreman. Work duties were assigned to the miners by the 2nd shift foreman.

The five employees worked on the surface preparing their timber supplies prior to traveling underground. The second shift foreman, assisted by miner no. 1 and the victim, then proceeded underground to the 3rd level west gangway. Miner no. 2 remained on the surface to load the timber supplies into the slope gunboat. He lowered two loads of supplies. The victim and the 2nd shift foreman transferred the supplies from the gunboat into the gangway car. The

car was pushed back to the no. 8 chute where a winch was used to hoist the timber up to the monkey level. Another miner traveled up to the no. 17 breast for the purpose of drilling and blasting the face.

At about 3:30 p.m., Miner no. 2 entered the mine. The victim and the 2nd shift foreman climbed to the monkey heading. Miner no. 1 fired the face of no. 17 breast and then traveled up to the No. 1 miner heading. The miner heading was close to being connected from no. 14 to no. 15 breast.

Miner no. 1 test drilled the heading through to no. 15 breast, and found the distance to be about 9 feet. Miner no. 1 summoned the 2nd shift foreman who checked for methane. No methane was detected. Miner no. 1 started to drill the five boreholes required to blast. He asked the 2nd shift foreman to bring the explosives and detonators needed to blast the round in the heading.

The victim went up to no. 15 breast and removed the 12-inch air tubing to prevent it from being damaged by the blast.

They fired the round about 6:15 p.m. from the monkey heading. After firing, the four employees ate lunch and waited for the smoke to clear.

After lunch, Miner no. 1 and the victim traveled back to the no. 1 miner heading. The second shift foreman and Miner no. 2 remained in the monkey heading. Miner no. 1 examined the area between nos. 14 and 15 breast in the no. 1 miner

heading. Miner no. 1 and the victim began installing props and liner boards to secure the high side rib. After the high side rib was timbered and lined, Miner no. 1 observed a crack in the divider rock. He instructed the victim to install relief timber. Miner no. 1 was in the area of no. 15 breast dressing the face to install relief timber and the victim was making hitches to install supports in the miner heading midway between nos. 14 and 15 breast. The victim made three hitches in the bottom rock and was installing a timber in one of the hitches when the roof and rib fell at approximately 7:30 p.m.

The high side coal rib measuring about 15 feet in length, 30 inches

wide, and four feet high, and a section of the top rock measuring 15 feet 2 inches in length, 3 feet wide, and 11 inches thick fell burying the victim. Miner no. 1, who was positioned on the foot battery in the no. 15 breast, heard the victim yell, "Someone get me out I can't breathe."

Miner no. 1 called down to the monkey heading for the 2nd shift foreman and Miner no. 2 to come and help him. After learning of what happened, the 2nd shift foreman traveled to the gangway for tools to get the victim from beneath the pile. Additional tools were required because the tools previously used were covered by the fall. The victim was uncovered

at about 8:00 p.m. No pulse could be found. First-aid, including CPR, was given for about 20 minutes by Miner no. 1 and the 2nd shift foreman. The victim was brought to the surface where he was pronounced dead by the county coroner.

**CONCLUSION:** The accident and resulting fatality occurred because of the following conditions or combinations there of: the high side coal rib and the divider rock were not adequately supported or controlled to protect persons from hazards related to falls of the rib and roof prior to the victim traveling inby. **HSA**

## August 13, 1912; Abernant Mine; Abernant, AL; 18 killed

*(From Bureau of Mines report, by E.B. Sutton)*

The explosion at about 10:30 a.m., resulted in the death of 18 men. Six of these men were badly burned; the others suffocated. One man, after repeated attempts to penetrate the afterdamp, took refuge at the face of 14th right aircourse and came out unassisted at about 1 p.m. Immediately after the explosion, rescue and recovery work was begun. Seventeen bodies

were removed during the afternoon. On August 14, an exploring party found a man in the 14th right aftercourse, still alive, but in such a condition that he never regained consciousness. The explosion was caused by the open light of a laborer from room no. 8 on the 15th right entry when he went into the abandoned room No. 11. That room had been driven 195 feet and had only 1 crosscut into room No.

10. The mine made dangerous quantities of gas, but the continuous air current was not taken to working faces. All but heading men used open lights. Abandoned workings were not ventilated or inspected. The explosion was propagated by gas and dust over the workings inby the 14th right entry. Sprinkling was provided for but seldom done. **HSA**

*Reprinted from the Bureau of Mines' Bulletin 586.*

## The nuts and bolts of wrench safety

Hand tools are used frequently in the workplace and some have features that make them dangerous to work with. But hand tools should be convenient to use and offer efficiency to the operator with as little injury or damage caused to the tool or the worker as possible.

So always use the proper tool and style of tool for a particular job.

The safest type of wrench is one with a straight handle, especially a box or socket wrench when being used on six sided fasteners or fittings. The safest tool for a steel worker is a structural box wrench, which when damaged should be disposed of rather than repaired.

The three different kinds of socket wrenches are all different in design and hardness. These include

hand power and impact socket wrenches, which may be regular depth or extra deep. Hand sockets should never be used on power drive or impact wrenches.

Be aware of safety limitations when changing the sizes of handles and sockets. **HSA**

*Reprinted from the February 1994 issue of Nevada's Mine Safety Sense.*

## Some U.S. minerals industry growth seen possible in 1994

The domestic mineral and material industry grew in some key sectors and declined in others during 1993; overall, the industry was poised at year end for stronger growth in 1994. Metals production is expected to increase with anticipated growth in U.S. motor vehicle sales. There also may be increased demand for industrial minerals in 1994, based on anticipated domestic highway and building construction.

Industry analysts and producers remained cautiously optimistic as 1993 ended. Some producers expressed concerns about the possibility that royalties on minerals from federal lands would increase. Negotiations over expired labor contracts and those due to lapse generated additional concerns.

In terms of overall industry performance, the value of processed materials produced from minerals in the United States during 1993 is estimated to have been about \$326 billion, an increase of 5 percent compared with that of 1992. The estimated value of U.S. raw nonfuel minerals production in 1993 was \$31.6 billion, about 1 percent less than in the preceding year. The value of domestic minerals production has risen in 28 of the last 33 years.

Total U.S. minerals trade declined in 1993, mirroring weakness in the world economy. The value of raw metal imports declined more than 3 percent to an estimated \$1.1 billion, while industrial minerals imports decreased by almost 1 percent to about \$740 million. Exports experienced sharper declines—raw metal exports dropped

more than 16 percent to an estimated \$900 million, and industrial mineral exports decreased nearly 3 percent to about \$1.1 billion. Exports were expected to increase, however, as the world economy improved and as large metal exports by the former Soviet Union declined. Imports of processed mineral materials totaled about \$42 billion, while exports were about \$40 billion.

Motor vehicle manufacturing helped to support demand in 1993 among industries that consume large quantities of metal and other mineral-based materials. The motor vehicle industry is a large consumer of such materials, particularly steel, aluminum, copper, lead, zinc, platinum-group metals, plastics, and glass. U.S. motor vehicle sales rose during the year for several reasons, including pent up demand from recent years, low interest rates, and the ever-increasing popularity of light trucks—the motor vehicle segment that is overwhelmingly dominated by the “Big-3” U.S. companies. The rise in motor vehicle sales was reflected in higher shipments of domestic steel industry products during 1993.

Some sectors of the domestic construction industry also provided a stimulus for mineral production in 1993. For example, highway construction, which consumes large quantities of crushed stone and sand and gravel, increased sharply during the year following reauthorization of the 6-year federal highway and mass transit program in 1991. Powerplant construction, which had been in decline for a

decade, rose steeply in 1993.

Electric utilities consume substantial amounts of stone, sand and gravel, steel, and brick for construction of buildings; they also consume steel, copper, aluminum, and other metals for generators, transformers, power lines, supporting structures, and equipment. In addition, apartment construction—a major end-use sector for steel, stone, sand and gravel, cement, and brick—began to show signs of rebounding from its decline of recent years. In response to growth in these construction sectors, the output of stone, clay, and glass products rose slightly.

Among the key events and issues shaping the mineral and material industry during 1993 were changes to the Mining Law of 1872 proposed by both the Administration and Congress. The present statute gives U.S. citizens and businesses the right to prospect for certain minerals on federal lands where mining is not prohibited. In addition, the law currently allows citizens and businesses to file claims that permit them to mine and sell certain minerals extracted from federal lands without paying the federal government a royalty or production fee. The claimant may also apply for a patent that transfers ownership of the minerals and the land on which the claim is located from the federal government to the claimant.

Proposed Mining Law reforms include establishing a royalty on minerals extracted from federal lands, eliminating the patenting provision, and creating an abandoned mine reclamation fund

similar to that established by the Surface Mining Control and Reclamation Act of 1977, which covers coal mines.

Different Mining Law reform bills were approved by the House of Representatives and the Senate in 1993. The House bill included an 8-percent royalty that would be applied to the value of hardrock minerals produced from federal lands. Under the Senate bill, the royalty would be 2 percent. House-Senate negotiations on a compromise bill were underway in late 1993.

In order to assess royalty options, the Department of the Interior appointed a task force to analyze the implications of a range of feasible royalty alternatives, including royalty revenues estimation. The task force conducted a survey, which indicated that \$1.8 billion of domestic hard rock minerals is produced from public domain lands.

Under Mining Law reform proposals, royalties, rental fees, and other revenues would provide funding for an abandoned mine reclamation fund; between 50 percent and 67 percent of royalty revenues would go to the fund. The gross production royalty would be divided between the reclamation fund, the states, and the federal treasury.

In other developments, a major restructuring of the National Defense Stockpile, which holds many materials of minerals origin, continued in 1993. Early in the year, the Department of Defense (DOD) reported to the Congress that only the following materials were considered essential: beryllium metal, chromium metal, graphite, jewel bearings, mercury, mica, palladium, and platinum.

As part of the stockpile revision, Congress authorized the disposal of

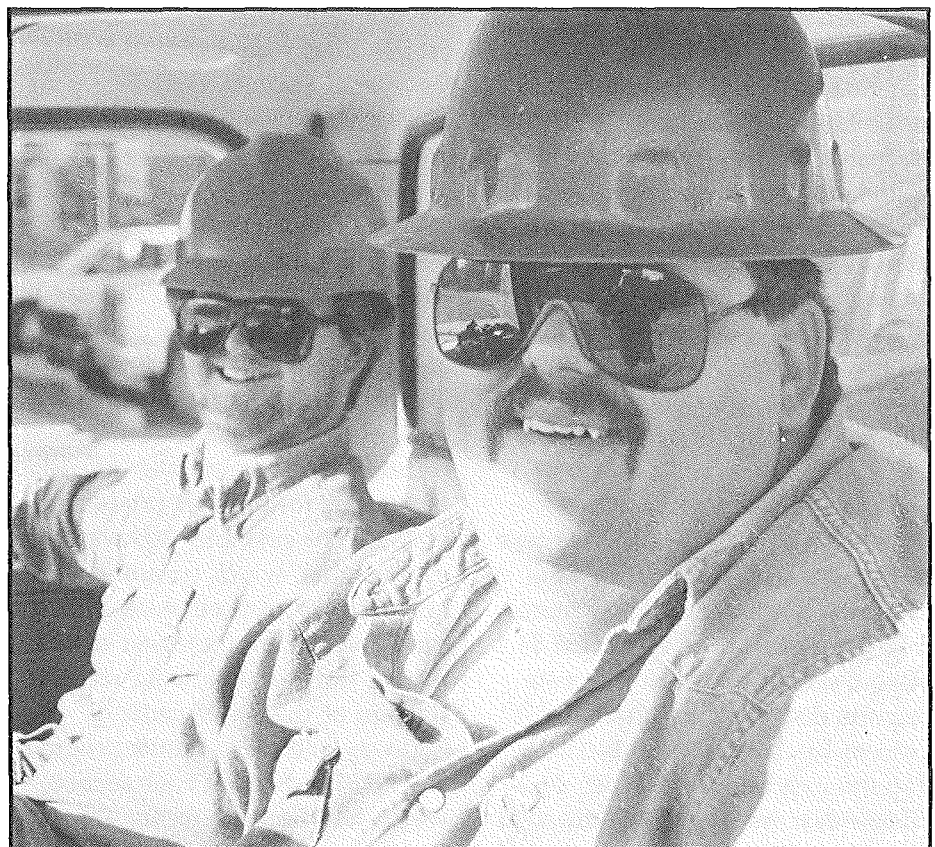
commodities valued at \$3.5 billion. In Fiscal Year 1993, from October 1992 through September 1993, DOD disposed of more than \$322 million worth of materials. The major disposals included diamonds (\$118 million), tin (\$46 million), ferrochromium (\$27 million), silver (\$25 million), and copper (\$23 million). During the same period, acquisitions were limited to \$1.5 million worth of jewel bearings.

Other legislative developments included introduction by the Senate of a comprehensive bill to reauthorize the Clean Water Act. The bill, emphasizing watershed management and pollution prevention, gives the U.S. Environmental Protection Agency (EPA) new authority to require changes in production processes, products, or raw materials in controlling the emission of toxics. Potentially large sectors of the minerals and materials industries could be affected by this legislation to reduce or elimi-

nate toxic pollutants.

Regulations to implement this mandate could take into account factors such as control techniques, age of equipment, processes utilized, process flexibility, and compliance costs in determining what is technically or economically achievable. Other provisions of the bill that may affect the minerals and materials sector include those that do not allow mixing zones for certain discharges in waters of special Outstanding National Resources areas, and those that prohibit or limit discharges for certain pollutants.

Major flooding in the Midwest in 1993 significantly impaired some mineral production and shipping. Flooding prevented the operation of locks on the Mississippi River, thus halting much mineral fertilizer traffic, notably for potash and phosphates, by barge. Production of sand and gravel dredged from riverbanks also declined as a result



of flooding in the Mississippi and Missouri basins.

Also in 1993, a Senate bill introduced to improve wetlands management by federal agencies expanded the scope of wetlands activities that could be regulated—for example, excavation, mechanized land clearing, ditching, and channelization. This expansion of regulated activities could have significant impact on mining projects in wetland areas. Reauthorization of the Clean Water Act also may address other wetlands issues important to mining, such as property rights.

The EPA continued to prepare rules for industry sources subject to hazardous air pollutant standards under the Clean Air Act, as amended. The sources, including mineral processors, are those that emit one or more of the 189 substances defined as hazardous under the act. The EPA published a list of these sources in 1992 and has begun the process of defining Maximum Achievable Control Standards that will apply to them. The process includes on-site visits and follow-up questionnaires. Although the timetable for issuing regulatory controls varies, proposed standards for most mineral industries are due by November 15, 1997.

In recent years, Congress and the EPA have been considering several approaches aimed at reducing the amount of lead in the environment and society's exposure to lead. One approach under consideration has been a tax on domestic lead production to reduce consumption, raise revenues for a lead abatement program, and encourage recycling. In 1993, legislation was introduced in Congress to tax lead production. In order to assist the Congress and the EPA in their decisionmaking, the

Department of the Interior assessed the minerals-related implications of a tax on U.S. lead production and imports.

### North American Exploration

A preliminary evaluation of 1992 survey responses from 36 Canadian and 25 U.S. mineral companies operating in the United States suggests that the average corporate exploration budget was reduced by more than half from 1991 levels, with most funds going to precious- and base-metal targets. This information is derived from an annual Mineral Exploration Statistics Survey conducted and interpreted by the Minerals Exploration Statistics Committee of the Society of Economic Geologists. The survey and supplemental research indicate the current level of international hardrock mineral exploration by Canadian and U.S. companies.

The survey indicated that all categories of exploration activities decreased between 1990 and 1991: geology, land acquisition, and airborne geophysics declined by more than 50 percent; and drilling, geochemistry, and general administration each suffered more than a 40 percent decline. These activities tend to be closely related to basic exploration programs. In addition, the amount of core and rotary drilling declined by 74 percent and 20 percent, respectively.

Base- and precious-metal exploration in the United States during 1992 appears to have decreased, on an average company basis, by more than 60 percent. Although specific gold and copper deposits continue to command attention, most U.S. programs have been curtailed. Many companies accelerated exploration programs on their existing claims in order to reduce the size of these land packages. The Bureau of Land Management

estimated that 75 percent of these claims were dropped during 1993.

The number of companies that have shifted portions of their exploration budgets to Latin America continues to grow. More than 250 companies, about 10 percent of the North American exploration industry, are now active in Latin America. Mexico and Chile are the principal countries of choice. However, a major gold discovery during 1992 in Venezuela and continued success of some companies in Bolivia also make these countries attractive. The privatization of world-class mineral deposits by numerous Latin American governments has created a wealth of new opportunities, each contributing to the transformation of U.S. mining companies from a U.S. mineral reserve base to an international one.

### Global developments.

In 1993, the global mineral industry was dramatically affected by several diverse socioeconomic forces that have been gathering momentum in recent years:

- More liberal investment climates being created in Latin America and Asia have encouraged international mining companies to focus their attention on these regions.
- The current disarray in Central Eurasia (the former Soviet Union), wherein minerals consumption within this region has decreased significantly without a concomitant cutback in production, has meant that exports from Central Eurasia are now inundating the world's mineral markets. When combined with continued recession in Western Europe and Japan, these exports have resulted in depressed worldwide minerals and metals prices, especially for aluminum, nickel, potash, and magnesium.
- Regional trade blocs are being



developed and expanded. The European Community (EC), the North American Free Trade Agreement (NAFTA), the Association of Southeast Asian Nations (ASEAN), the Asia Pacific Economic Cooperation (APEC), and the Latin American Southern Cone Common Market (MERCOSUR) will all contribute to reduced internal tariffs and increased intraregional mineral trade.

• An unprecedented trend toward privatization of previously nationalized or centrally planned mineral industries is occurring throughout the world.

Privatization of mineral companies is occurring at an accelerated pace in Western Europe, particularly in France and Italy, and throughout Latin America, Central Eurasia,

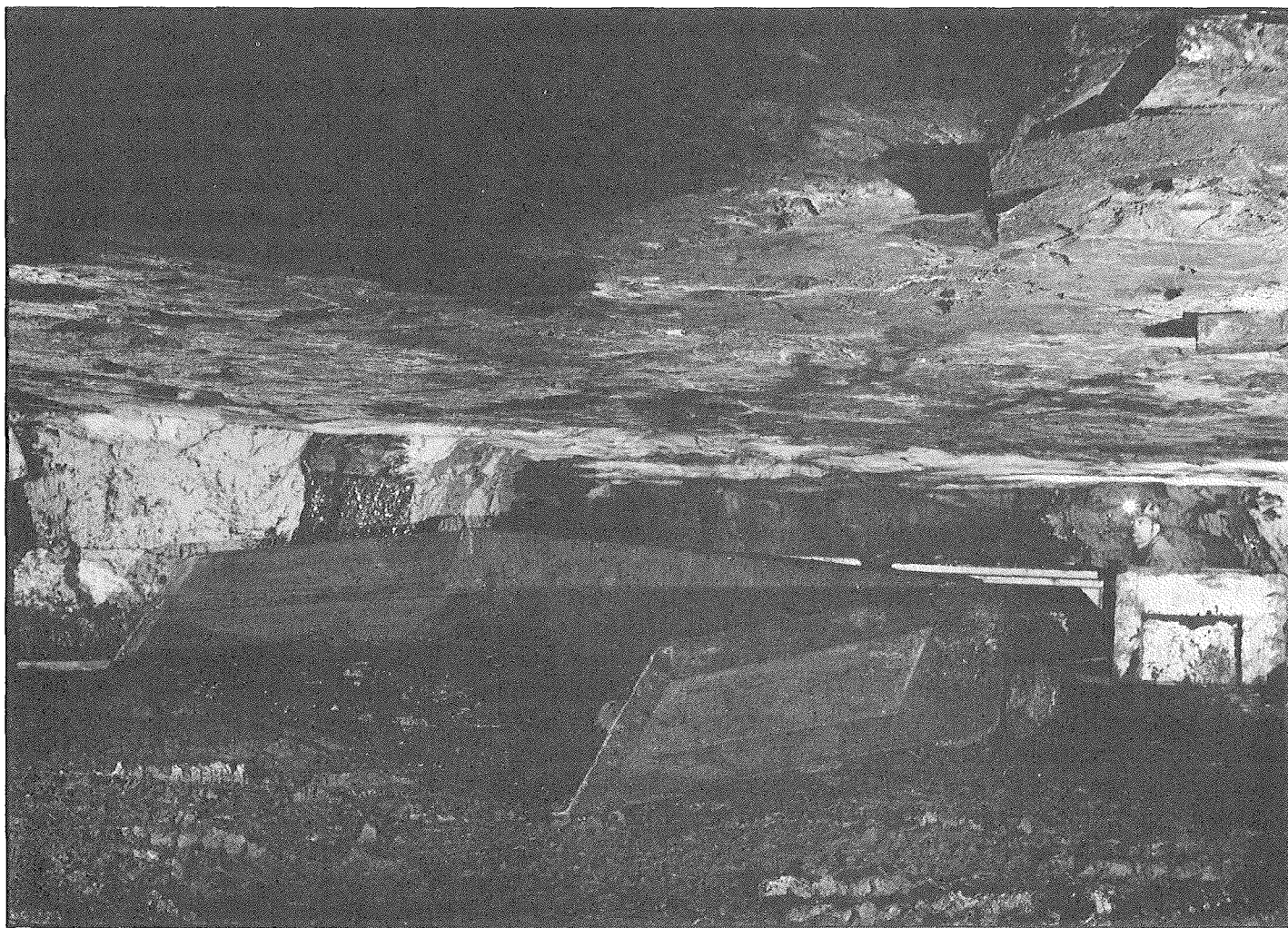
Eastern Europe, Asia, and Africa. The reasons for privatization may vary among regions and countries but the trend appears to be worldwide.

#### Europe and Central Eurasia

The breakup of the world's most prolific minerals producer, the former Soviet Union, has resulted in a redirection of the trade patterns of some of the newly independent states (NIS) that had comprised the U.S.S.R. Russia, in particular, is now exporting a far higher amount of aluminum, magnesium, potash, titanium, nickel, and other minerals to Western Europe and the United States than it did before the breakup. This is due to reduced internal consumption in the

NIS and the inability of both domestic and former East European customers to pay hard currency for these raw materials. For example, aluminum exports to countries outside those formerly in the Council for Mutual Economic Assistance (CMEA) have increased five-fold in the last few years, to an estimated 1.6 million metric tons in 1993.

Coming in the wake of recessions in Western Europe and Japan, these increased exports have caused disruptions in international consumption patterns, helped reduce worldwide minerals prices, and, in general, helped perpetuate the general international economic malaise. In the case of aluminum, the EC established a limit on Russian exports



to EC countries of 60,000 metric tons over a 4-month period. This caused strong reaction on the part of U.S. aluminum producers who had sought to minimize the effects of extra Russian material by cutting back on their own production. As a result, meetings were held between the United States, the EC, Russia, and other major producers of minerals and/or metals in an attempt to minimize some of these disruptions.

The trend toward privatization has proliferated in Eastern Europe and the states of the former Soviet Union, and is also prevalent in France, Italy, and other EC countries. In 1993, France announced a privatization program involving 21 large state-controlled enterprises. Italy also plans to privatize several state-controlled companies. In Spain, the country's largest chemical, fertilizer, mining, and explosives company is in the process of being privatized.

With regard to Eastern Europe, modernization, rationalization, and restructuring as well as privatization are ongoing.

Germany is continuing to spend on the order of \$100 billion per year to modernize and integrate the eastern German states into a greater Germany. In the process, much of the minerals and metals production in the former East Germany, which went in part to supply former CMEA needs, has been cut back significantly. In particular, the steelworks at Brandenburg and the potash and lignite mines in eastern Germany have been greatly affected. The Czech Republic, Hungary, and especially Poland have attracted a number of foreign investors in the metals and minerals sector.

### Latin America and Canada

Congressional approval of the

North American Free Trade Agreement (NAFTA) was a significant event in late 1993. Because most mineral commodities from Mexico already enter the U.S. market duty free or at preferential rates, NAFTA should generally help increase U.S. mineral exports to Mexico, where the average duty is 10 percent and certain items have a tariff of 20 percent.

The United States depends significantly on Canada and many Latin American countries for mineral imports. In 1993, Surinam became the 31st Latin American country to sign a "trade framework agreement" with the United States. The framework agreements create Trade and Investment Councils to discuss bilateral easing of barriers to trade and investment.

A large number of countries in the region are in the process of reducing the role of their governments in the economy through privatization of business operations. Especially notable was the action taken by Argentina to sell control of its state oil company to local and foreign investors. Company shares were made available on the New York Stock Exchange in the form of American Depository Receipts. Privatization programs were also active in Bolivia, Chile, Brazil, Mexico, and Peru.

Foreign investment in Latin America has been stimulated by more open economies and less intervention by governments, but more particularly by liberalized investment and mining laws offering incentives and equal treatment to the foreign investor. In some countries, such as Mexico, incentives include reduction in corporate taxes. Chile, Bolivia, and Mexico have been particular beneficiaries of in-

creased foreign investment. Foreign investors have targeted precious metals in their exploration and development projects. Large investments by U.S. and Canadian mining companies in Chile have enabled that country to obtain record-high gold and copper production and become the largest world producer and exporter of copper. Increased gold output in Bolivia, Uruguay, and Venezuela is also the result of foreign investment. Changes in the petroleum laws of Argentina, Bolivia, Chile, and Peru have also increased interest and exploration by foreign oil companies.

The overall change in investment climate and the new liberalized mining laws and regulations have led to an increase in mineral exploration in Latin America, especially Mexico. Since 1990, there has been an influx of more than 100 U.S. and Canadian exploration companies into Mexico. In 1993, more than 50 active exploration and development programs were ongoing in Chile.

### Asia and the Pacific

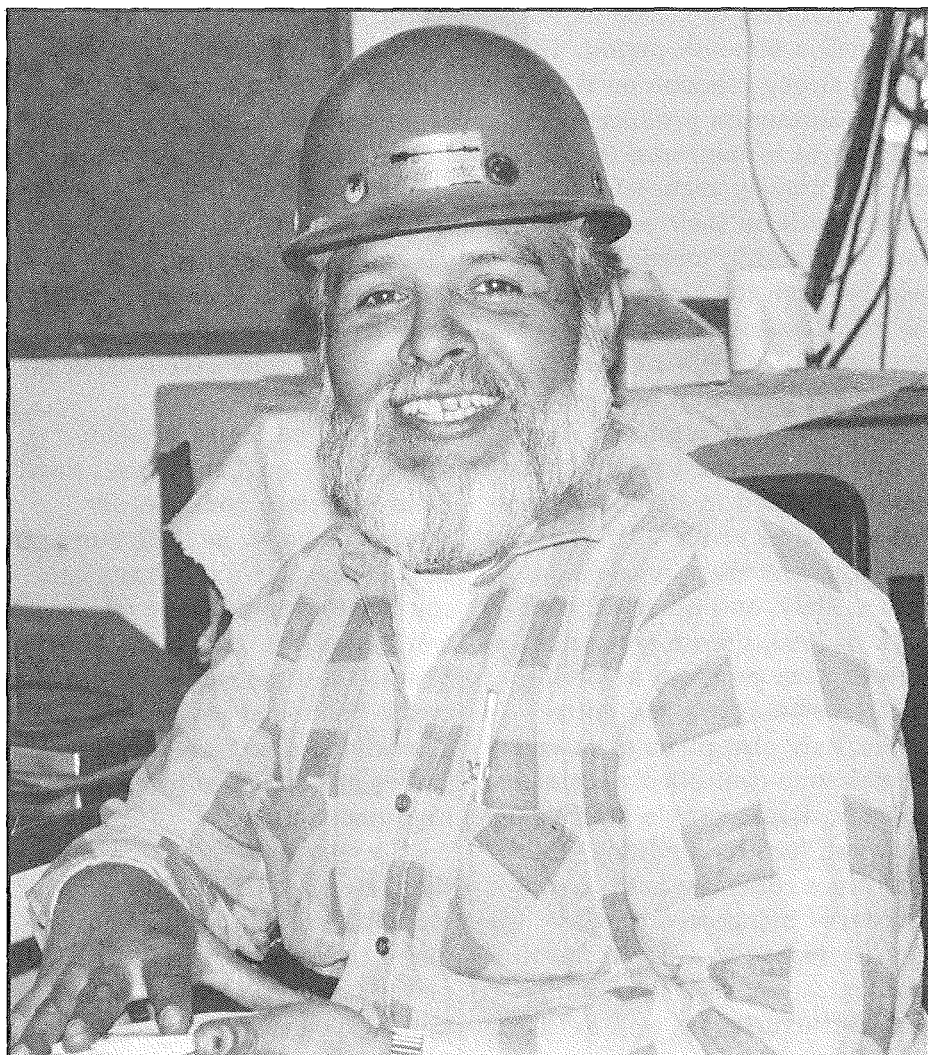
Japan, China and Taiwan, with whom the United States has large trade deficits, import large quantities of raw materials for the production of finished goods for export. Due to the strength of the yen, Japan's purchases of foreign minerals, metals, and fuels continued to cause contraction of its relatively small domestic mining sector. Japan has intensified its overseas mineral exploration and development projects for copper, gold, lead, silver, and zinc since 1992. Significant joint exploration and development projects were undertaken in Australia, Chile, China, Mexico, Mongolia, the Republic of South Africa, and the

United States. In 1992, Japan successfully launched its first geological observation satellite—with the world's most advanced sensor and radar equipment—to aid in the worldwide search for copper, gold, iron, lead, silver, zinc, and other metals. The satellite began transmitting data in 1993 covering 10 portions of the earth's surface, including 2 targeted areas in the United States.

In contrast to Japan, China is experiencing a period of rapid economic growth and consuming an increasing amount of raw materials. Thus, although China has continued to increase its minerals production significantly, it continues to import increasing amounts of copper, iron, and steel products and other raw materials, and has been one of the few regions in the world exerting a positive force on world mineral demand.

A Round Table Conference on Regulations for Foreign Investment in the Mineral Industry, organized by the Ministry of Geology and Mineral Resources, was held in Beijing in May 1993. The conference provided the opportunity for representatives of international companies to comment on proposed regulations on foreign investment and enter into discussions with high-level government officials.

India issued a new National Mineral Policy (NMP) in March 1993. The NMP repeals the ban on foreign and private investment in mining 13 mineral commodities—chromium, copper, diamond, gold, iron, lead, manganese, molybdenum, nickel, platinum-group metals, sulfur, tungsten, and zinc. The NMP allows up to 50 percent of foreign equity in joint-venture mining projects promoted by Indian companies. Enhanced



equity holdings above 50 percent will be considered on a case-by-case basis. India has considerable mineral potential that can be exploited. One NMP objective is to attract foreign investment for mineral exploration.

Australia's mineral industry was strained in 1993 by the Australian High Court's "Mabo Decision" ruling against *Terra Nullius*, the principle that Australia was legally uninhabited before the arrival of Europeans in the 18th century. The decision paves the way for a profusion of land rights conflicts and claims that could significantly affect the mining industry. Australia managed to sustain its gold output despite dire predictions of de-

creased production resulting from a 1991 gold tax.

The Papua New Guinea government's joint venture equity ownership in the huge Ok Tedi copper mine and Porgera gold mine, as well as at Lihir, the world's largest undeveloped gold prospect, was settled during the year. This followed a series of intense negotiations with major foreign investors in the country. In an action counter to the trend in most other nations, the government's equity stake increased from 20 percent to 30 percent at Ok Tedi; from 10 percent to 25 percent at Porgera and from 0 percent to 50 percent at Lihir, raising further concerns about development financing for Lihir.

In Indonesia, access to low-cost hydroelectric energy allowed aluminum and nickel operations to maintain production levels despite depressed world prices. Coal production increased 16 percent to 26 million metric tons, and coal exports increased 20 percent to 18 million metric tons because of strong demand from Asian markets. A new mine in West Irian came online, single-handedly helping Indonesia maintain its place as one of the largest copper producers in the world and substantially increasing gold output.

### The Middle East

The dissolution of the former Soviet Union has opened up vast opportunities for Turkey, Iran, and Saudi Arabia to advance their influence in the newly independent Islamic republics. Turkish private concerns and the state oil company signed agreements to help develop some of the enormous oil and gas resources in this region. Turkish interests also negotiated access to gold and other minerals as well. Iranian and Saudi Arabian interests continued negotiations on developing hydrocarbons and other minerals in the newly independent Islamic states.

Iraqi mineral production facilities damaged during the Gulf War in late 1990 and early 1991 reportedly have been restored to at least 50 percent of pre-war capacity in crude oil and natural gas and even more in petroleum and petrochemical products, phosphate, sulfur, cement, and construction material. However, production was essentially limited to what was consumed internally because of the United Nations trade embargo against Iraq.

Oil and gas provided more

than 80 percent of the Middle East's foreign exchange. Most mineral commodity production facilities, including hydrocarbons, were still under government control through various government-related companies. Although most of the governments continued to promote privatization of the sector, progress was slow.

### Africa

Political unrest dominated daily life in many African countries during 1993. Most African nations have some existing or potential mineral production and are looking for increased foreign investment. Many African governments have adopted internally painful International Monetary Fund and World Bank structural adjustment programs to facilitate foreign investments, but these programs have been slow in enticing new foreign investment to the region. In 30 of the countries with ongoing adjustment programs, only a handful, such as the Ghanaian mineral sector, have a success story.

Political instability and poor infrastructure have deterred growth in potential mining and other foreign investments. However, enhanced development of mineral resources is occurring in several African countries. Gold continued to be of international interest in Botswana, Zimbabwe, Ghana, and other west African countries, including Guinea, Niger, and Nigeria. Gold is produced in 24 African countries, led by the Republic of South Africa, which remained the world's largest producer in 1993. In Ghana, second to the Republic of South Africa in African gold production, construction began on initial components of a new gold bio-oxidation facility.

In Nigeria, the government revised investment laws to attract new investors in the oil and gas sectors, allowing joint ventures between local and foreign participants. The foreign partners are permitted to have as much as 70 percent equity. This and other policy changes have led to increased oil and natural gas reserves. In addition, the Nigerian government began rewriting its mining laws to become more attractive to foreign investors. Ethiopia's transitional government adopted new mining laws in 1993 to follow up the Investment Law of 1992. Newly independent Eritrea also drafted new mining and investment laws.

In the Republic of South Africa, a new Minerals, Mining and Exploration Act came into effect. It provides for a standard licensing regime with special provisions to promote investment by foreign and domestic enterprises in minerals exploration and extraction. Further mining legislation was introduced in the South African Parliament to increase the responsibility of mine owners to repair environmental damage and to increase the environmental planning requirements of new mines. The formal ending of apartheid laws and of economic sanctions against the Republic of South Africa during the year opens the country for renewed foreign investment. However, most investors are awaiting the outcome of elections and subsequent new policies that could impact mining investment. **HSA**

*Reprinted from the U.S. Department of Interior's Bureau of Mines' February 1994 issue of Minerals Today.*

# THE LAST WORD...

"Sometimes we forget to turn off the sound when our mind goes blank."

"It's true that we need more optimism in this old world, but that does not mean that we should blind ourselves to reality."

"If you want to become the perfect guest then try to make your host feel at home."

"The real secret to being a somebody is to work diligently at being a knowbody."

"The road to success is always under construction and you will find many detours in it."

"One of the greatest enemies that we can ever face in life is the illusion that there will be more time tomorrow than there is today."

"Too many people are willing to carry the stool when there is a piano to be moved."

"Good conversation depends as much on listening as it does on speaking."

"Hardening of the heart ages people more quickly than hardening of the arteries."

"Hatred of others does not affect their peace of mind, but it certainly can ruin ours."

"Money won't buy everything—it will buy a bed but not sleep."

"It isn't necessary to blow out the other person's light in order to let your own shine."

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