BULLETIN

November 1990

November 1990

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Please note: As with all articles printed in the Bulletin, the views and conclusions expressed in the articles are those of the author and should not be interpreted as representing official policy of the Mine Safety and Health Administration.

KEEP US IN CIRCULATION

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

To report monthly chapter meetings, please use the postage-paid report form located in the centerfold of this Bulletin and return to the Holmes Safety Association. *Please remember to fold in thirds when mailing.*

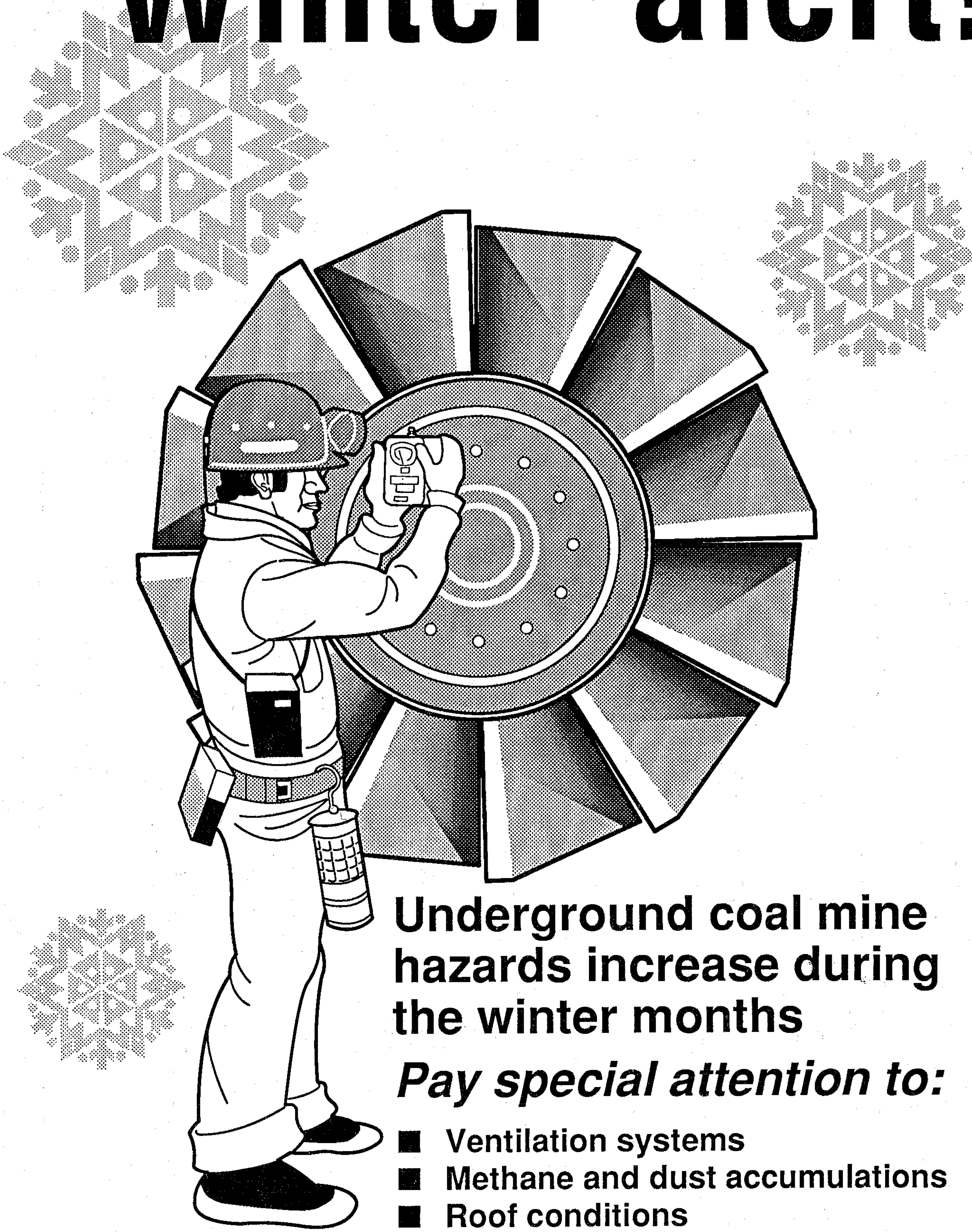
Welcome New Members

NAME	CHAPTER NO.	LOCATION
Le Sueur-Richmond Slate Corp.	9023	Arvonia, VA
Addington Inc. (Highwall Miner)	9024	Boomer, WV
Southern Anthracite Energy	9025	Mt. Carmel, PA
Lariat Energy Inc. (Lariat No. 1)	9026	Hugheston, WV
Putnamville Stone Quarry	9027	Putnamville, IN
Florida Canyon Mining Inc.	9028	Imlay, NV
Messina Trucking Inc.	9029	Romeo, MI
Pallette Stone Corporation	9030	Saratoga, NY
Jointa Lime Company	9031	Glens Falls, NY
Wolf Sand & Gravel Company Inc.	9032	Oconomowoc, WI
L & J Energy Company, Inc. (Garmantown Mine)	9033	Barnesboro, PA
Adams County Asphalt Company	9034	Middletown, PA
Deane Crabtree	9035	Castlewood, VA
Southern Trucking Corporation	9036	Grundy, VA
D & R Trucking Company, Inc.	9037	Clintwood, VA
Cripple Creek Contractors	9038	Grundy, VA
Freeman Fuels No. 3	9039	Lona, KY
M and E Coal	9040	May King, KY
TDL Coal No. 3	9041	Millstone, KY

NAME	CHAPTER NO.	LOCATION
Bias Trucking	9042	Jeffrey, WV
Eagle Nest Inc.	9043	Madison, WV
D & P Trucking Company	9044	Seth, WV
Craig Trucking Company	9045	Orgas, WV
E & S Coal Company	9046	Clarksburg, WV
Terry Eagle Coal Company (Bells Creek Mine NO. 2)	9047	Dixie, WV
Terry Eagle Coal Company (Harrison Mine No. 1)	9048	Dixie, WV
Mate Creek Trucking	9049	Matewan, WV
Leivasy Mining Corporation	9050	Leivasy, WV
Power Master	9051	Salt Lake City, UT
Longyear Eastern	9052	Wytheville, VA
Longyear Company	9053	Hibbing, MN
Longyear Nevada Western	9054	Dayton, NV
Longyear Northwest	9055	Otis Orchards, WA
Longyear Southwest	9056	Peoria, AZ
Wisconsin Test Drilling	9057	Schofield, WI
Lang Exploratory Drilling	9058	Salt Lake City, UT
Longyear Salt Lake City	9059	Salt Lake City, UT
Minera Real Angeles	9060	Aguascalientes, AGS. Ags. Mexico
Jacobs Creek	9061	Drakesboro, KY
Bremin Minerals Corp. (Clark Mine)	9062	Morgantown, KY

NAME	CHAPTER NO.	LOCATION
Bull Run Mining Company (Bull Run Mine)	9063	Beaver Dam, KY
Red Dome, Inc.	9064	Fillmore, UT
Swerdfeger Mining Company	9065	Gateway, CO
Reams Construction Company	9066	Monticello, UT
M & R Mining Company	9067	Naturita, CO
Burro Mining Inc.	9068	Nucla, CO
Lady Ann Company	9069	Grand Junction, CO
Royal Camp Bird Inc.	9070	Quray, CO
Red Mountain Exploration	9071	Quray, CO
B-Mining Company	9072	Naturita, CO
Midvalley Stripping (Wilburton #2)	9073	Columbia, PA
Southern Building Systems	9074	Charleston, WV
Sidney Coal Company Inc.	9075	Sidney, KY
DMP of South Carolina	9076	Anderson, SC
Hawks Nest Mining Company (Harewood Surface Mine)	9077	Harewood, WV
Patience Inc.	9078	Pax, WV
Mountain Minerals (Burnwell Strip)	9079	Mahan, WV
Ross Brothers, Inc.	9080	Adams Mill, OH
Mountain Mineral	9081	Kingston, WV
Carbon Ridge Mining Company	9082	Clendenin, WV

Winter alert!



Underground coal mine hazards increase during the winter months

Pay special attention to:

- Ventilation systems
- Methane and dust accumulations
- Roof conditions
- Equipment maintenance

Holmes Safety Association Monthly Safety Topic

Fatal powered haulage accident

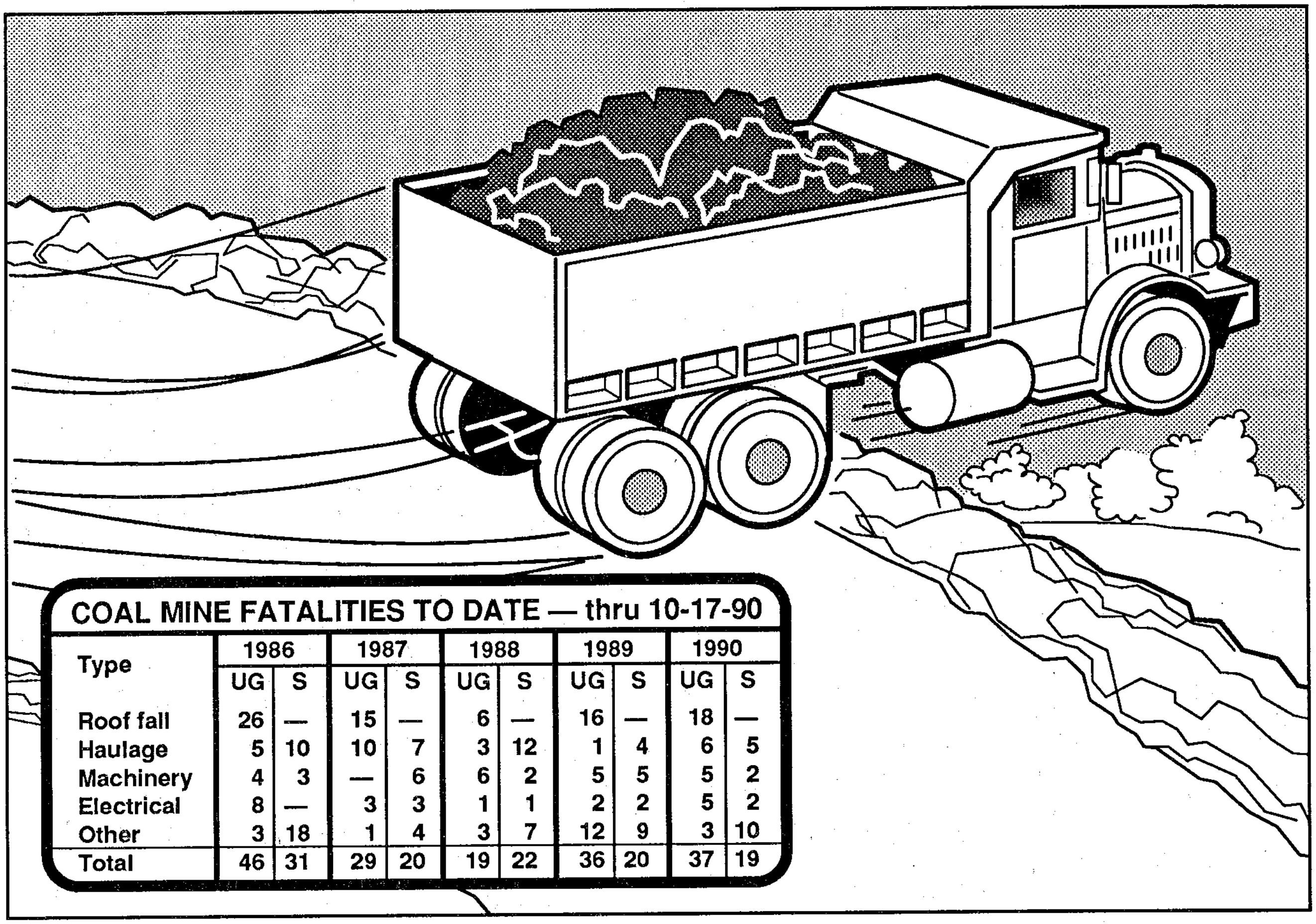
GENERAL INFORMATION: A 21-year-old contractor truck driver with two years of experience was killed when the victim's vehicle failed to negotiate a hairpin turn and rolled and fell approximately 190 feet before coming to rest at the bottom of a railroad cut.

The mining company has been in operation approximately 8 years. Coal is produced on two shifts per day, five days a week, and averages 500 tons of coal per day. Coal is loaded from a stockpile on the surface into trucks with endloaders provided by the contractor. The contractor has been in operation approximately one year.

DESCRIPTION OF ACCIDENT: Two employees were assigned the task of cleaning sumps along the haul road to the mine. Their shift proceeded without incident until 5 p.m., when the victim, a truck driver for an independent contractor, approached the area where they were working, driving a 1985 Mack DM 600 truck loaded with coal. The victim was employed on the evening shift as a truck driver for the contract trucking company. The victim had assumed his duties at 3 p.m. and had already transported two truckloads of coal to the cleaning plant without incident. The victim was descending the mine haul road with his third load when a worker who was operating the backhoe cleaning out a sump, signaled the victim to stop until the task could be completed. He stopped the truck and waited approximately 5 minutes while the backhoe was repositioned so the victim's truck could pass. The backhoe operator instructed a truck driver assisting in cleaning the sumps, to proceed to the next sump to be cleaned and park there so the victim could pass.

He then signaled the victim to pass at which time he started pulling out with the truck. It was observed that it sounded like the victim accelerated through the primary gear without incident; however, when he up-shifted, he apparently missed a gear. The backhoe operator stated that as the victim went past his location, he was raking the gears and traveling at a brisk rate of speed. As an experienced equipment operator, he knew the victim was in trouble.

The truck driver assisting in cleaning the sumps who was parked at the next sump in his dump truck, was watching through his rear view mirror and felt something was wrong as the victim passed because the rate of descent was much too rapid for the safe operation of a loaded coal truck. He stated that the victim was traveling at a high rate of speed (approximately 50 m.p.h.) as he passed the location where his dump truck was parked. He stated that he knew the victim was traveling much too fast to make the turn located about 800 feet from where he was parked. Neither worker could remember seeing any brake lights or hearing any noise to indicate that the victim was applying his service or emergency brakes.



COAL MINE FATALITIES TO DATE — thru 10-17-90

Type	1986		1987		1988		1989		1990	
	UG	S	UG	S	UG	S	UG	S	UG	S
Roof fall	26	—	15	—	6	—	16	—	18	—
Haulage	5	10	10	7	3	12	1	4	6	5
Machinery	4	3	—	6	6	2	5	5	5	2
Electrical	8	—	3	3	1	1	2	2	5	2
Other	3	18	1	4	3	7	12	9	3	10
Total	46	31	29	20	19	22	36	20	37	19

The victim continued traveling down the inclined haul road until reaching the sharp turn. He could not negotiate the turn, went over a berm 3 feet high by 4 feet wide and remained airborne for about 80 feet before impacting with the ground. The truck then rolled 100 feet before going over a 50-foot highwall and coming to rest on the dual mainline railroad tracks. The impact was heard by customers and employees of a market located approximately 500 feet from the railroad tracks and an ambulance was summoned immediately.

The two workers had followed the coal truck and upon arrival at the location where the truck left the road, they were unable to see anything. Therefore, they continued along the haul road to the bottom of the highwall where they met the ambulance. The road was blocked by a metal gate which they tore out with the backhoe, allowing access to the accident scene for the ambulance. The victim was removed from the accident site and transported to the hospital where he was pronounced dead-on-arrival.

CONCLUSION: After determining that the equipment involved was properly maintained and personnel were correctly trained, with good weather conditions and visibility, the accident and resultant fatality occurred because the operator of the loaded coal truck failed to shift the truck into a gear that would have allowed the jake brake to function properly thereby limiting the speed of the truck.

Principles of ground control

Ground control is the science that studies the behavior of rock strata in transition from one state of equilibrium to another. Imagine a cross-section of the immediate roof just above a coal seam. Before any opening is made in this coal seam, the rock strata and coal seam are in balance. Once an entry is made in the coal seam, the rock strata of the immediate roof is no longer in equilibrium, due to the absence of the removed coal. This in turn causes the layers of rock of the immediate roof above the entry to deform or sag into the opening from its own unsupported weight. The loads originally supported by the removed coal is now transferred to both ribs. The time interval between exposure of the roof and setting permanent supports is very important to preventing roof failures. If this immediate roof layer is massive sandstone, which is infrequently found, the sag may be little and the roof could stand indefinitely. The more common types of immediate roof are laminated shales which are very time dependent. The best way to maintain the original equilibrium and prevent sag and separation from the main roof is to put in rigid supports immediately after mining, so little deforming is allowed. This support is generally provided by roof bolts using the suspension, beam building or keying methods.

Roof bolts installed by anchoring in the self-supporting main roof and then tensioning the bolt to clamp the weaker layered strata against the stronger main roof is called suspension. This method works well in mines where good firm sandstone or shale is found a short distance above the immediate roof layers.

In underground coal mines where there is no self-supporting main roof within a reasonable distance above the roof line from which to suspend the incompetent immediate roof, the bolts are installed through the different layers of immediate roof strata to create a beam that is larger and stronger than any of the individual layers. The tension in the roof bolts creates a clamping force which reduces movement between the bedding planes and binds these layers together like a piece of plywood. Thus a beam is created that will support its own weight and restrict strata movement above the beam. This method of roof support is known as beam building.

In some cases the immediate roof may be weak due to natural parallel planes of fracture called joints. If they are pronounced, or if there has been any movement along the faces, miners refer to them as slips. In other cases, the fractures may be random in direction and divide the roof strata into separate pieces of different shapes and sizes. Roof bolts used to control this type of roof will intersect these fractures and planes of weakness and lock the strata tightly together. This prevents any movement or shifting of the various pieces in the immediate roof.

By holding these large or key pieces in place, a self-supporting beam is created. This method is called keying.

Roof control plans require specific lengths of roof bolts to be placed at certain intervals in the newly mined areas. These requirements are based upon information available about the coal seam characteristics in the local area and from core drilling analysis. Ensuring that these bolts are installed within proper torque range and center tolerance should provide adequate support for the normally encountered conditions.

When conditions change, BEWARE. Observing the roof strata, testing by the sound and vibration method, noting changes in the sound of the roof drill, and looking at the changes in the dust box on the roof bolting machine may be the keys to knowing when conditions have changed. Roof tests are required to be made prior to bolting the roof, even with an ATRS system. Be alert to changing conditions, install the proper support and

STAY UNDER SUPPORTED ROOF.

Your eyes – how valuable are they?

The eye is a more delicate and more complicated mechanism than the finest watch in the world. A good watch can be bought for a day's wages. A human eye that will see cannot be bought for all the money in the world, and yet thousands of men and women often expose their eye to hazards of flying particles to which they would not think of exposing the inner mechanism of a watch.

Few people would think of giving a small child a hammer and a watch to play with at the same time. Yet, at this moment, there are undoubtedly thousands of youngsters playing with sharp pointed objects, just as destructible to the eye as a hammer would be to a watch. Few of us would think of taking a watch to a cabinetmaker or plumber for repairs, but every day thousands of people try to perform minor surgical operations on their eyes by calling on a co-worker to remove particles from their eyes. According to the National Committee for the Prevention of Blindness, pocket knives, screw drivers, and manicuring files are often used on that most delicate and priceless possession, our eyes.

Despite all the publicity that has already been given to "eye protection", we still find many who are loaded with excuses for why they cannot wear eye protection. Of course, wearing goggles or safety glasses will prevent eye injuries. In spite of this fact, some miners offer the excuse that eye protection is cumbersome, reduces vision, or "fogs up". If you think wearing eye protection is difficult, try to imagine the difficulties of moving through this world with no vision—with only a white cane or a dog for assistance.

The retina of the eye is the camera for the brain. Without it we can't read, drive, or watch a ball game. To appreciate the value of your vision, conduct a little experiment. Shut your eyes for just a half a minute and with all the power of concentration at your command, try to imagine how it would feel for you to spend the rest of your life with your eyes shut. Do that conscientiously, then go to work and appoint yourself a committee of one to protect your eyes and encourage your co-workers to do likewise.

Reprinted from the Kentucky Department of Mines Bulletin, July 1990

JSA success story

With operations in three states—West Virginia, Ohio, and Illinois—American Electric Power Fuel Supply mines 12 million tons of coal annually—9 million underground and 3 million surface.

AEP Fuel Supply has been involved in job safety analysis for nearly ten years. They began the JSA Program by putting trainers in a how-to-do task analysis course taught by The Ohio State University. JSAs are developed according to the level of priority needed. High risk jobs are given first priority, followed by new or changed job processes, while all other jobs rank third. There is some variation in how the JSAs are developed and in the final products. Training people usually do the final writing of JSAs. Most JSAs are written at the operation; however, some are developed at the corporate office.

AEP uses the classic approach to JSA development; however, it has been expanded to incorporate the total job. JSAs are supplemented with illustrations where needed (usually drawings rather than photos). Illustrated operating controls is a good example.

Approximately 60-70% of all jobs within AEP Fuel Supply have JSAs. All major jobs have been incorporated into the process. Supervisors use JSAs for training and for safety observations. Copies of appropriate JSAs are given to employees.

The technique of safety sampling has been introduced into the process. Sampling of safe work procedures allows the company to use statistical methods to determine strengths and weaknesses in the safety behavior of individuals.

As one element in a larger safety approach, the use of JSAs within AEP Fuel Supply has been very successful.

[1]All I really wanted to know...

ALL I REALLY NEED TO KNOW about how to live and what to do and how to be I learned in kindergarten. Wisdom was not at the top of the graduate-school mountain, but there in the sandpile at Sunday School. These are the things I learned:

Share everything.
Play fair.
Don't hit people.
Put things back where you found them.
Clean up your own mess.
Don't take things that aren't yours.
Say you're sorry when you hurt somebody.
Wash your hands before you eat.
Flush.
Warm cookies and cold milk are good for you.
Live a balanced life—learn some and think some and draw and paint and sing and dance and play and work every day some.
Take a nap every afternoon.
When you go out into the world, watch out for traffic, hold hands, and stick together.
Be aware of wonder. Remember the little seed in the styrofoam cup: The roots go down and the plant goes up and nobody really knows how or why, but we are all like that. Goldfish and hamsters and white mice and even the little seed in the Styrofoam cup—they all die. So do we. And then remember the Dick-and-Jane books and the first word you learned—the biggest word of all—**LOOK.**

Everything you need to know is in there somewhere. The Golden Rule and love and basic sanitation. Ecology and politics and equality and sane living.

Take any one of those items and extrapolate it into sophisticated adult terms and apply it to your family life or your work or your government or your world and it holds true and clear and firm. Think what a better world it would be if we all-the whole world—had cookies and milk about three o'clock every afternoon and then lay down with our blankies for a nap. Or if all governments had as a basic policy to always put things back where they found them and to clean up their own mess.

And it is still true, no matter how old you are—when you go out into the world, it is best to hold hands and stick together.

[1] *Taken from the book* ***All I Really Need to Know I Learned in Kindergarten*** *by Robert Fulghum, Villard Books, New York, 1989.*

Analysis and characterization of electrical fatalities in coal mines since 1970

Salwa El-Bassioni
Mine Safety and Health Administration
U.S. Department of Labor

In the nineteen year period from January 1, 1970 thru December 31, 1988, there were 2,422 fatalities in U.S. coal mines. Approximately six percent (190) of these fatalities were the result of electrocutions.

The data displayed in the table below indicates a decline in the number of total fatalities from 260 in 1970 to 52 in 1988. A parallel decline has also occurred in the number of electrical fatalities and in the rates of fatalities per million employee hours. Electrical fatalities declined from 18 in 1970 to 2 in 1988 while the rates of both total and electrical fatalities per 200,000 employee hours decreased from a maximum of 0.196 and 0.014 in 1970 to a low value of 0.034 and 0.001 in 1988.

Table 1
Fatalities in coal mines
1970 - 1988

Year	Total	Electrical
1970	260	18
1971	181	18
1972	156	7
1973	132	10
1974	133	10
1975	155	14
1976	141	6
1977	139	11
1978	106	14
1979	144	12
1980	133	12
1981	153	11
1982	122	6
1983	70	10
1984	125	6
1985	68	8
1986	89	9
1987	63	6
1988	52	2

In order to derive insights about causative factors underlying electrocutions, the 190 accidents reported were screened and characterized using four categories.

1. **Equipment involved:** Repeated accidents involving the same equipment may suggest a possible need for design modification.
2. **Contact voltage:** This category includes electrocutions according to the system voltage level involved in the accident. This grouping identifies voltage levels that dominate electrical fatalities.
3. **Victim qualification:** This category reflects the experience and training of the victim, and may suggest the need for improved training.
4. **Mode of contact with hazard:** This category specifies how the accident occurred. Repeated accidents due to direct contact with energized conductors, indirect contact with energized conductors or contact with energized frames suggest a possible need for better work practices, improved installation requirements or design modifications.

Electrical fatality data was analyzed in light of these four categories. The data is broken down into four categories. The distribution of electrical fatalities according to the type of equipment involved shows that overhead lines, including trolley wires, are the dominant contributors (37), followed by trailing cables and stationary distribution equipment (33 and 29 fatalities respectively).

The distribution of fatalities according to voltage levels involved indicates that the 1040 A.C. voltage or greater category is the dominant contributor, followed by the 480 V.A.C. These two voltage levels contributed to over 70% of the electrocutions in the reported period, with a fatality rate of about 8 per year. This rate dropped to an average value of 5 per year in the last five year period (1984-1988).

The distribution of the electrical fatalities according to victim qualifications shows that the two leading groups are non-qualified personnel performing non-electrical work (92 fatalities) and qualified personnel performing electrical tasks (56 fatalities). Both categories contributed to over 80% of the electrocutions, with an average fatality rate of 7.8 per year. Evaluation of 1984-1988 data showed that the combined average for these two categories is 3 per year.

The distribution of electrical fatalities according to the mode of contact shows that over 60% of the fatalities were due to direct contact with current carrying conductors. The average fatality rate for this mode of contact over the total period is about 6.5 per year. In the last five years of the reporting period it was reduced to 4.0 per year.

In conclusion, analyses of coal mine fatality data in 1970-1988 have shown a significant improvement in safety as measured by the decline in the number of annual fatalities and fatality rates per 200,000 employee hours.

Further analysis shows that high voltage circuits and equipment (1040 V and greater) continue to be the leading source of fatalities. This may be partly attributed to the increased use of higher voltage equipment, and contact with surface overhead lines. Even though the data show a decline in the number of fatalities for non-qualified personnel performing non-electrical work, and qualified personnel performing electrical work, this decline can be further enhanced by better training, increased safety awareness, and safer practices in the mines (lockout and tagging procedures before performing electrical or mechanical tasks). Similar need is also obvious in the case of fatalities associated with handling trailing cables and working around overhead lines.

☞ **Upcoming event**

Sixth Annual Northeast Metal/Nonmetal Health and Safety Conference—February 26-28, 1991

"Cooperation - The Way to Safety and Productivity"

Details will be provided in later issues of the bulletin

Mine operators warned of potentially defective self-rescuers

The Labor Department's Mine Safety and Health Administration (MSHA) announced that it is requiring coal mining companies to return some of the breathing devices used in underground mines to the manufacturer for repair and refurbishment.

"An examination of a certain brand of self-contained self-rescuers (SCSRs) in use has shown that some of the breathing tubes were stuck together in varying degrees," said William J. Tattersall, assistant secretary of labor for mine safety and health. "A stuck breathing tube could restrict or cut off oxygen supplied by the SCSR to a miner during a fire or other underground emergency."

Tattersall explained that the matter is complicated by the fact that the SCSR's are sealed and cannot be opened without destroying the effectiveness of the canister.

He said that MSHA and the National Institute for Occupational Safety and Health (NIOSH) have notified users of Draeger OXY-SR60B self-contained self-rescuers to return these units to the manufacturer for refurbishment of the SCSR, or replace them.

All mine operators using the Draeger OXY-SR60B units will be required to take part in the program, which will be closely monitored by MSHA and NIOSH to ensure that corrective actions are taken as early as possible.

Assistant Secretary Tattersall emphasized that a method of effectively opening a stuck SCSR breathing tube has been developed and can be used during the interim refurbishing period. Users of the Draeger OXY-SR60B will be given information on training miners to use this method.

Mine operators will be allowed a reasonable period of time in which to have SCSR, equipment refitted or replaced, provided that they:

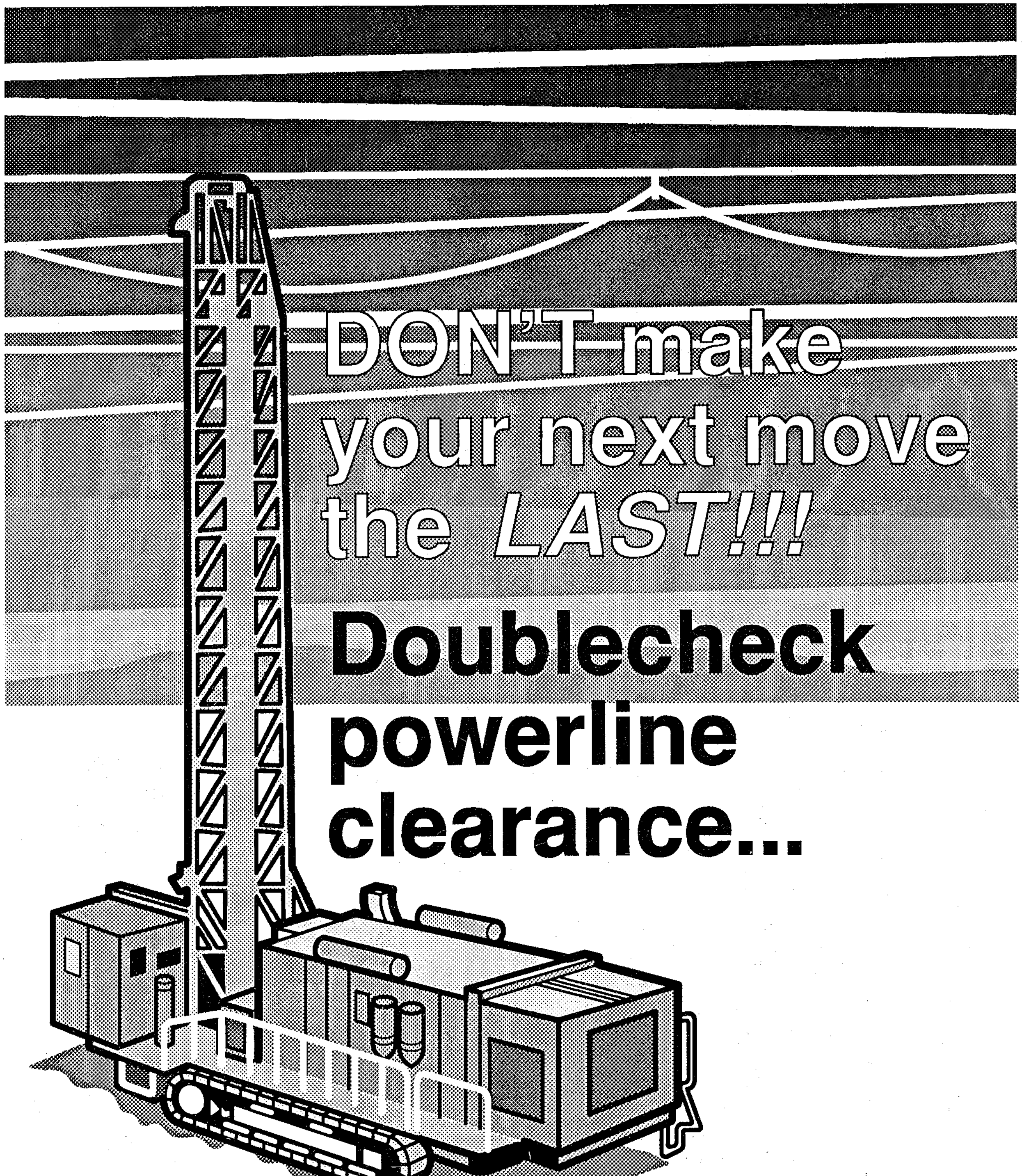
☐ give all miners new "hands-on" training of the correct way to put on and wear the SCSR, including instructions on how to relieve a stuck breathing tube;

☐ revise their mine's self-contained self-rescuer storage plan to provide additional rescue devices at each underground storage location until existing units can be refurbished or replaced, or, in the absence of a storage plan, put an adequate number of additional SCSRs at strategic locations until corrective actions can be completed; and

☐ provide documentation showing that reasonable arrangements have been made to refurbish units, or that adequate replacements have been ordered.

MSHA estimates that there are about 18,000 Draeger OXY-SR60B units at some 450 underground coal mines.

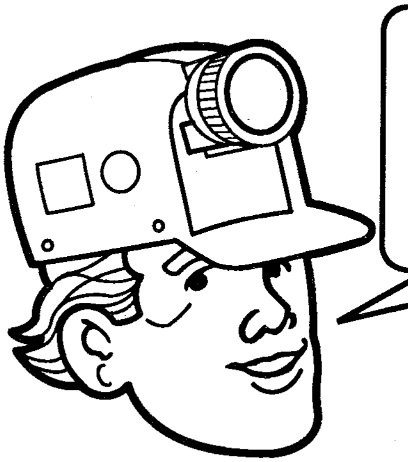
For further information, interested persons should contact Matt McCulloch, director, technical support, MSHA, 4015 Wilson Blvd., Ballston Tower No. 3, Arlington, Va 22203. (703)235-1580.


DON'T make your next move the *LAST!!!*
Doublecheck powerline clearance...

Roof Evaluation—Accident Prevention

REAP—a program developed to promote health and safety awareness in mining

Stay out of... the Death Zone



MINERS: Credit for this month's safety slogan goes to: William H. Homistek, U.S. Steel Mining Co., Inc., RD #2, Seal Road, Box 599, Valley Shaft, Eighty-four, PA 15330. Please send your suggestions to: MSHA, Educational Policy & Development, 4015 Wilson Blvd., Graphics Room 523A, Arlington, VA 22203-1984. Phone: (703) 235-1400

November 1990

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5000-22
(Rev. 12-78)

United States Department of Labor
MSHA
Mine Safety and Health Administration

Holmes Safety Association Meeting Report Form

(Please take the time to fill in the questionnaire at the bottom)

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For the month of	
TOTAL meetings this month	
TOTAL attendance this month	
Chapter number	(See address label, if incorrect, please indicate change)

NOTE: We must have your correct chapter number to give you credit for your HSA meetings

Signature	
Telephone no.	
Title	

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NOTE: Be sure our address shows on the other side

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2. Would it be helpful if you could receive additional copies? If so, how many? ______

3. Do you like the Bulletin in its present format? ______

4. Would you like to hear more from other District Councils? ______

______

5. What articles or features do you especially like? Please rank them 1-5 in order of appreciation with 1 being the highest.

☐ *A. Safety topics*   ☐ *B. Accident summaries*

☐ *C. Posters*   ☐ *D. Announcements*

☐ *E. District Council reports*

6. What articles would you like to see?

______

______

______

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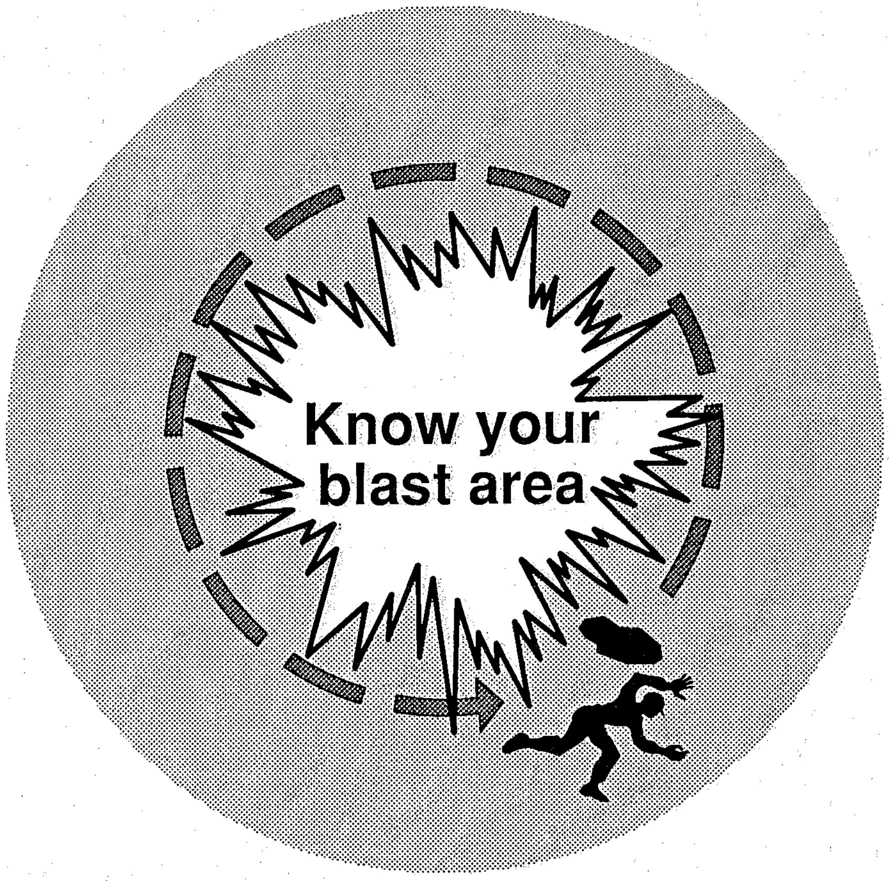


Control of flyrock

Those of you who work near population centers know that sometimes your activities can upset people – particularly when something doesn't work out the way you planned it.

On July 11, 1989, a road construction crew in Columbia, Missouri, discovered just how upset their neighbors could get when a blast sent a hailstorm of rocks, some the size of bowling balls, into a fashionable residential area 750 feet away. Damage to several homes included shattered windows, smashed-through walls, and debris reminiscent of a war zone. After surveying the after-effects of a rock that had crashed through an exterior wall and burst into smithereens against his fireplace, one homeowner said, "It looks like somebody had a 75 howitzer and shot it through there."

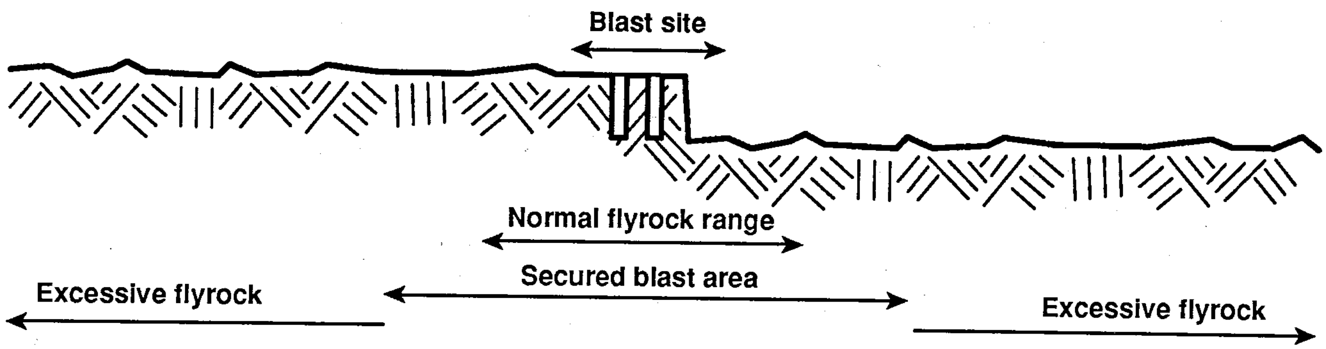
Miraculously, human damage was limited to emotional stress and a tarnished public image for the road construction firm. Operators of a quarry in Pontiac, Illinois, were not as fortunate after a blast on July 13, 1990. A piece of flyrock was thrown about 930 feet and struck a man in the head as he sat on his riding lawn mower, cutting the grass on his property adjacent to the quarry. The man died of his injuries four days later.

On July 5, 1990, at a stone quarry near Princeton, Kentucky, a blaster relayed an all clear signal to another blaster who then fired the round. The first blaster was standing in the open near the highwall about 505 feet from the shot being fired and apparently believed he was shielded by the highwall. A single rock, thrown over the 200-foot highwall, struck a fatal blow to his head.

In two similar, nonfatal accidents,

blasted rock traveled 1,000 feet before injuring a secretary at a Virginia limestone operation on April 12, 1990, and rock from an explosion at a Massachussetts quarry struck a truck driver who was guarding an access road 1,000 feet from the blast site on October 30, 1989.

Obviously, flyrock—rock that is propelled through the air during mine blasting—is a serious hazard. All blasts can be expected to generate some flyrock. The distance that flyrock travels can range from a few feet to more than a mile with poorly controlled shots. Below is an illustration of the areas affected by flyrock at a typical surface mine:



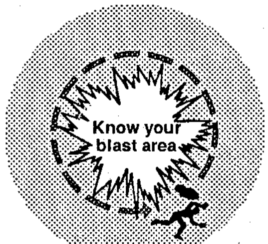
Accidents in which rocks strike persons within the secured blast area are classified as blast area security accidents rather than flyrock accidents. Injuries within the blast area occur when people fail to clear or guard the area, retreat to a safe location, or take adequate cover. Failure of the blast area security system is the leading cause of mine blasting accidents.

Flyrock projected beyond the blast area is excessive flyrock. This kind of flyrock is generated when there is too much explosive energy for the amount of burden or stemming, when the delay pattern is incorrect, or when the explosive energy is rapidly vented through a plane of weakness. Excessive flyrock is responsible for 25 percent of the blasting accident injuries that occur in surface mining.

Flyrock causes

Geology and rock conditions can exist that favor the generation of flyrock. Mud seams and fractures are planes of weakness through which explosive gases can rapidly vent and accelerate rock fragments. Cavities can become filled with too much explosive for the amount of rock burden, resulting in large flyrock distances. Blastholes can penetrate openings from abandoned underground mines to create a dangerous condition similar to natural cavities. Fracturing due to backbreak or overbreak from previous blasting can also cause dangerous planes of weakness. A ragged highwall face or an overhang can result in diminished burden along the front row of holes.

Improper blast design can also cause excessive flyrock to be generated. Any design feature that results in insufficient explosive confinement or the rapid venting of the explosive gases can create a problem. Blast design errors, such as too high a powder factor, an inadequate burden, too short a stemming region, failure to use stemming, improper delays between rows, or the wrong blasthole delay sequence can result in unwanted flyrock. A delay sequence that is too long can cause a diminished burden. Cratering and blowouts can occur when back holes fire before front holes. A very short delay can result in too much confinement and, again, cratering and blowouts.



Unsafe practices are often to blame as well when excessive flyrock is released. Carelessness during blast design, blasthole pattern layout, drilling, loading, or hooking up the initiation system can create serious situations. Overloading of holes is an especially dangerous, but common, practice. Yielding to the temptation to get rid of old product by arbitrarily stuffing it into the top of a blasthole is an open invitation to the production of excessive flyrock.

Control of flyrock

Blast Design: The control of flyrock starts with proper blast design. Since the amount of explosive energy in a hole is balanced out by the amount of rock the energy has to break, using just the right amount of burden is essential. A small burden will not contain the explosive energy, while a large burden may result in cratering or blowouts. The bench height, burden, and stemming region must promote blasted rock movement that is primarily horizontal and outward, and not upward.

In multiple-row shots, the delay between rows must be long enough to allow rock from an earlier row to move out so that the next row will have adequate relief. Insufficient relief can cause flyrock. However, the delay must not be so long that cutoffs occur and cause misfires that increase the burden on later firing holes, again resulting in blowouts and flyrock.

To provide guidance for improved blast design, researchers have identified relationships between charge diameter, burden, spacing, subdrilling, stemming region, and bench height. A good source for this information is Bureau of Mines Information Circular 8925, ***Explosives and Blasting Procedures Manual*** (available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402).

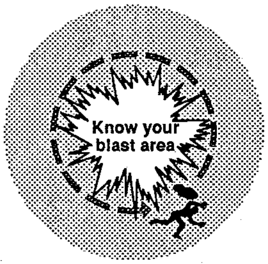
After using the relationships to make initial estimates, select the type of explosive, priming, and initiation system. Then, decide on the type of blasthole pattern (square, rectangular, or staggered), and on the delay sequence. Finally, calculate the powder factor to ensure that the quantity of explosive you plan to use is within the range that is normally used in surface mine blasting.

Professional blasters often use computer programs to assist in the design process. Initial approximations must be modified for the particular blasting situation and further modified after experience with a number of blasts.

Blasthole Layout: Before laying out the blasthole pattern in preparation for drilling, make a careful inspection of the blast site. Inspect the face for raggedness, overhangs, fractures, zones of varying competence, and amount of toe burden. Then check the blast site for backbreak, jointing, mud seams, voids, and zones of weakness. Any of these blast site features could cause excessive flyrock.

The layout of the blasthole pattern starts with the front row. If the vertical face has overhangs, is concave, or is irregular, the burden at some point may be reduced and violent cratering could occur. Faces with backbreak, open joints, weak zones, and mud seams will allow rapid venting of explosion gases with flyrock. In addition, the burden will not pull as planned, causing an increase in the burden for later holes, which results in cratering at the top of the bench.

If the face is sloped, the toe burden will be larger than the crest burden unless angled holes are used. If the normal column load is used when there is a sloped face, there will be flyrock because of the short crest burden. Also, the toe may not



pull, producing a buildup in front of later holes that could also produce flyrock.

Make adjustments in hole locations and powder columns in the front row when conditions exist near the face that favor the generation of flyrock. Once the front row is established, the balance of the shot can be laid out. Use a weighted measuring tape to ensure adequate spacing and burden distance.

Locating a blasthole close to an open fracture will provide a weak zone. The shot will break into the fracture, vent with flyrock, and produce poor fragmentation. Because the same kind of venting can occur when a hole is abandoned and a second hole is drilled a few feet away, you should always backfill the first hole. Where open fractures are present they also can be backfilled, but this is difficult and time consuming. The best way to handle fractures from previous blasting is to eliminate the cause of overbreak.

Blasthole Drilling: Accuracy in drilling is essential. Locate holes in accordance with blast design and drill at the correct angle and to the proper depth. With a high face and smaller diameter holes, take extra care to ensure that holes are drilled at the proper angle. Deviated blastholes can result in burdens much smaller or larger than planned. Keep a log of each hole that includes depth drilled, problem drilling zones, and any changes in penetration rate. This information could indicate voids or zones of weakness.

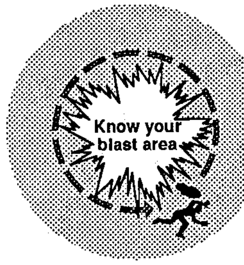
Blasthole Loading: Check all holes before loading explosives to ensure that their location and depth concur with the blast design and the driller's log. If blocked holes are undetected, the explosive column can be loaded too near the collar, leaving an insufficient stemming region. Partially blocked holes can also be a problem and may not be detected with a weighted tape. On sunny days, use a mirror to check for obstructions. Before attempting to load a partially blocked hole, consider such actions as redrilling, changing the planned explosive load, or abandoning and backfilling the hole.

Open joints and cracks can extend into a blasthole. The presence of cracks can usually be detected by a lack of drill cuttings at the top of the hole. However, unless corrective action is taken during the loading of bulk products, these open fractures can be loaded with explosives, resulting in excessive energy for the hole. There will also be less confinement of the explosive charge. This may affect the performance of some explosive products and provide a weak zone that could blow out.

Check the powder column rise frequently during loading. A slower than normal rise may indicate a void, while a sudden rise indicates a blockage. When a blockage occurs during explosive loading, place another primer and detonator in the column above the blockage to ensure that the explosive load in that area will detonate.

When a void is indicated, stop loading the hole. If the void is not too large, backfilling with stemming material will correct the problem. After backfilling, add another primer and continue loading. If the void is too large for this to be practical, you may have to abandon the hole and drill another hole nearby. Do not redrill if there is a possibility of drilling into explosives.

In some cases, the hole can be plugged. One method of blocking off a hole is to lower a stick tied to a rope into the void and then pull back on the rope. Make sure that the stick lies crosswise across the hole, and that the rope is securely an-



chored at the collar. Drop bulky material such as rags or paper into the hole and then add stemming material. Once a solid plug is formed, the explosive loading can resume. If you work at an operation where voids are common, you may need to develop a special system for borehole plugging.

Maintaining sufficient stemming is an important factor in flyrock control. Stemming lengths of 0.7 to 1.0 times the burden are commonly used. If you prime the collar, you may need to increase the stemming length because of the greater potential for violence with top priming. Crushed and sized rock is the best material to use for stemming, but drill cuttings are commonly used because of availability and economy. Large pieces of rock or other material should never be mixed with the stemming because they could become missiles in the event of a blowout. Large rocks could also cut off or damage the initiation system and cause a misfire.

Finally, make sure that the initiation system is properly hooked up and that the delays are correct.

Secondary Blasting: Secondary blasting of boulders too large for the loading equipment is required at some operations. Even though the charges used are small, secondary blasting can produce dangerous flyrock. Determining the blast area for this kind of shooting is difficult, and careful clearing and guarding are required. While secondary blasting is frequently done on shift and as needed, shooting at a standard time, such as during shift change, is best. Secondary blasting can be done at the same time as primary blasting if the same immediate area is involved. If the blasts are widely separated, there will be two sources of flyrock to guard against.

Reshooting Misfired Blastholes: Dangerous flyrock can be generated from reshot misfired blastholes when the burden is reduced and the explosive charge is confined. With reduced burden, the flyrock distances can exceed the normal flyrock range from production blasts and a larger than normal blast area is required. Shoot misfired blastholes during shift change or at the same time as primary blasts, making sure that the entire blast area is cleared and guarded.

Excessive flyrock is always unplanned for and unwelcome. Adequately clearing and guarding the blast area, providing a safe shelter for all employees, and warning people from the surrounding area that a blast is imminent remain vitally important, because no control measures can completely eliminate the possibility of flyrock being generated. Recognizing the hazard and defending yourself from the danger may save you from receiving a flying, fatal surprise.

If you have questions about additional training materials or services available, be sure to give your local MSHA field office a call. The MSHA people are always eager to help you prevent accidents.

From Cal Quarryman, Issue 21, September 1990

Notice:

The State of North Carolina, Department of Labor, has just made the following publications available: NC-OSHA Industry Guide #11, ***Radio Frequency Hazards with Electric Blasting Caps*** and an ***Industry Guide on Storage of Explosives.*** Copies are available from the Department of Labor, State of North Carolina, 4 West Edenton Street, Raleigh, NC 27601

Holmes Safety Association Monthly Safety Topic

Fatal slip/fall of person

GENERAL INFORMATION: A mechanic helper, age 31, was fatally injured when he fell from a work platform which was suspended from the load line of a mobile crane. The victim had a total of 12 years construction experience, as a mechanic helper.

The mine, an open pit phosphate operation, and plant were normally operated three, 8-hour shifts a day, 7 days a week. 175 people were employed.

The victim was employed by an independent contractor. The firm was enlisted to perform maintenance and construction activities at this and other mining operations in the area on a frequent basis. 30 people were employed, 12 at this job site.

The crane involved in the accident had been rented for this job. The crane operator and oiler were employees of the rental company.

DESCRIPTION OF ACCIDENT: On the day of the accident, the victim reported for work at 7:00 a.m., his regular starting time. The victim and a mechanic helper, were assigned the task of installing a containment plate on the underside of the boom at the point sheave on a large production dragline. The work was to be performed from a platform suspended by the rented mobile crane. After a discussion with personnel involved, the crane was positioned so that the load line could be dropped through the point sheave opening on the dragline. The work platform was then attached to the load line hook. This arrangement allowed the platform to be raised directly underneath the sheave area where the containment plate was to be installed. Leads were strung from a welding machine on the ground to the sheave area. Work progressed without incident until about 3:00 p.m. when the maintenance manager for the mining company, noticed that a support brace had been installed in a location that could allow it to interfere with the point sheave. He instructed the victim and the other mechanic helper to relocate the brace. Oxygen and acetylene bottles were raised in the work platform to remove the brace. The welding lead ground clamp was attached to the containment plate and the brace was welded in a different location.

At about 3:30 p.m., work was completed for the shift and the other mechanic's helper climbed out of the work platform onto the walkway along the dragline boom to make sure that the lubrication lines would not be damaged when the work platform was lowered. After getting onto the walkway he removed his safety belt and gave it to the victim who was to ride the platform to the ground. They had each worn a safety belt prior to this.

The victim signaled the crane operator to lower the platform slowly. After the headache ball cleared the point sheave area he gave the signal to lower at normal speed. The other mechanic's helper then noticed that the ground clamp was still attached to the containment plate and yelled to the crane operator to stop. He stated that the work platform began tilting and was momentarily held by the welding lead which created slack in the load line. When the ground clamp pulled loose the platform dropped until it was caught by the load line. The jostling of the platform caused the victim, who was not wearing a safety belt, to fall.

The crane operator, and the mechanic's helper both stated that they saw the platform rocking and the victim appeared to hang onto the high side of the platform momentarily before slumping to the floor and then fell out between the floor and midrail. He appeared to be unconscious. It was speculated that the headache ball, the gas cylinders, or the ground clamp struck him, as he received a severe face wound that did not appear to be caused by his fall to the ground.

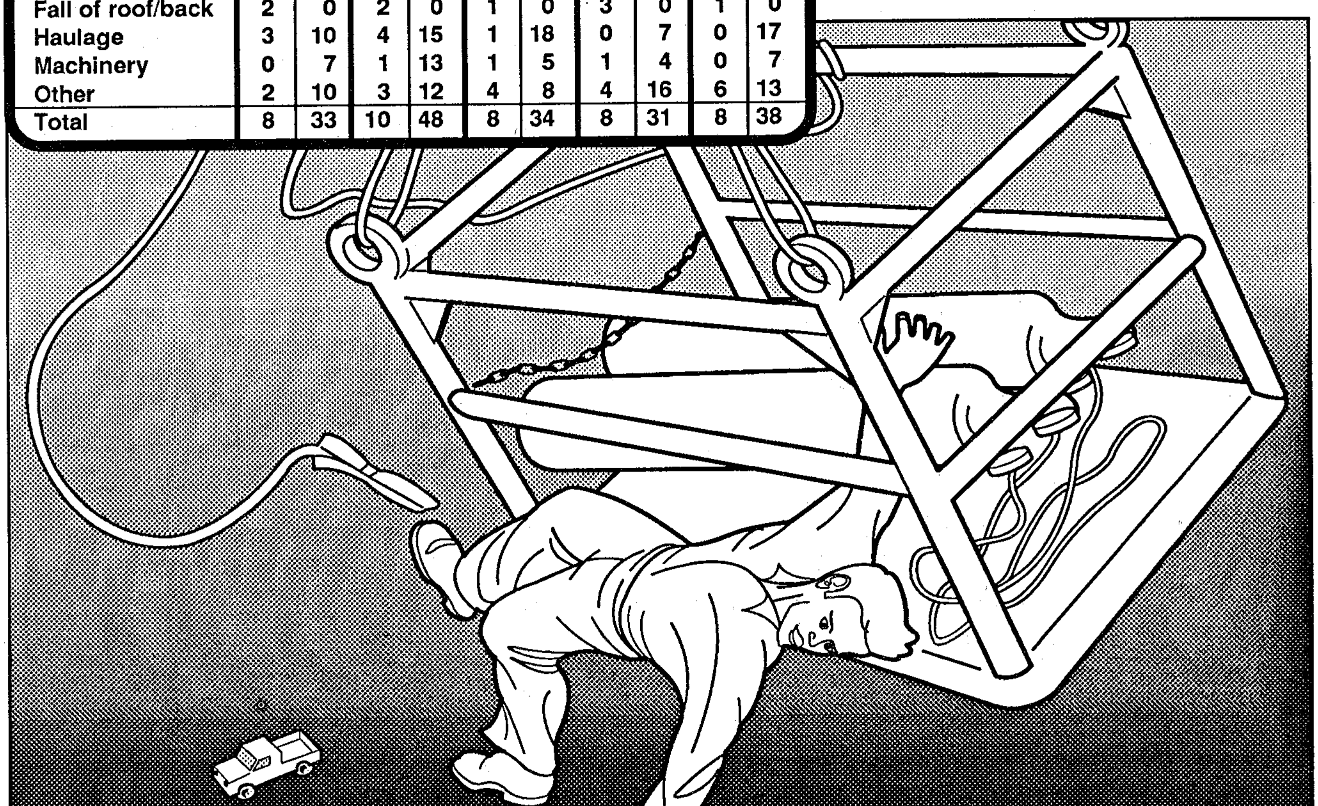
The regulators and gauges broke off the oxygen and acetylene cylinders when they either fell over or were struck. The acetylene cylinder fell from the platform at about the same time as the victim.

The crane operator ran to the victim and checked for a pulse, but could find none. The victim was pronounced dead at the scene by the county coroner a short time later.

CONCLUSION: The accident was caused by failure to remove the ground clamp before lowering the platform. It was quitting time prior to a holiday weekend and the men involved were probably in a hurry. Consequently, they failed to secure the oxygen and acetylene cylinders and the victim failed to wear a safety belt and line in the work platform all of which greatly contributed to the severity of the accident.

Metal and Nonmetal mine fatalities to date — thru 10-17-90

Type	1986		1987		1988		1989		1990	
	UG	S	UG	S	UG	S	UG	S	UG	S
Electrical	1	6	0	8	1	3	0	4	1	1
Fall of roof/back	2	0	2	0	1	0	3	0	1	0
Haulage	3	10	4	15	1	18	0	7	0	17
Machinery	0	7	1	13	1	5	1	4	0	7
Other	2	10	3	12	4	8	4	16	6	13
Total	8	33	10	48	8	34	8	31	8	38



First aid

Hypothermia

Hypothermia is a condition whereby the body's core temperature is lowered to 95°F or, in acute hypothermia, even less. One of the most dangerous aspects of hypothermia is its gradual onset and the early impairment of judgement it causes to its victims. The sooner the condition is recognized, the greater the chances are of total recovery. If the condition is allowed to worsen, the victim will become apathetic and could collapse and die. This column is too small to go into depth on the symptoms and treatment of this condition, but rather it is intended to create an awareness of hypothermia and steps that can be taken to prevent it.

Heat loss

The body loses heat in four ways:

☐ **Radiation:** heat transferred by electromagnetic waves from warm objects to cooler objects.

☐ **Evaporation:** heat loss by the diffusion of water molecules from the skin surface (perspiration turning to vapor). Perspiration occurs in cold temperatures as well as warm.

☐ **Convection:** heat transfer by molecules of air or liquids moving between areas of unequal temperature. Wind causes a tremendous amount of your body heat to be carried away. Water, as well, in the case of immersion or soaking of clothing, greatly reduces your body's ability to insulate itself by extracting the heat away from your skin.

☐ **Conduction:** heat exchange between objects in contact with each other—sitting on a cold rock, in snow, or on cold ground will literally pull the heat out of you, as will cold rain coming in contact with absorbent clothing or directly with your body.

Don't be fooled by the idea that hypothermia can only occur in below freezing conditions. Cool winds and rains can cause hypothermia even when the temperature is well above freezing. Remember that your core temperature is around 98°, and if enough heat loss occurs through any of the means described above, you are in danger.

Symptoms:

Mild hypothermia will have the following warning signs:

1. Oral temperature down to 95°F
2. Complaints of cold and shivering
3. Cold sensation and goose bumps
4. Difficulty performing complex tasks with the hands
5. Numbness of the skin
6. Withdrawal and apathy

First aid

Mild hypothermia

1. Move the victim to a warm dry environment. In a wilderness environment, search for natural shelters such as caves, rocks, or trees. Should you be unable to introduce heat externally by altering the environment, then internal heat production can be increased by exercising, such as vigorous walking in place—this is only recommended for very mild cases of hypothermia; severe hypothermia is much more complex and can not be treated with the same measures!
2. Remove wet clothing and replace with dry if possible; if not, add insulation to the wet clothing. Cover victim with a vapor barrier (space blanket, rainwear, even a plastic garbage bag) to prevent further convective and evaporative heat loss. Be sure to cover the victim's head also—up to 75% of heat loss occurs through the head.
3. Replace the victim's food and fluid level. Dehydration always results from hypothermia. Give the victim warmed fluids and food if at all possible, but only when they are coherent and able to swallow easily.

Prevention:

The best thing to do in the case of any illness or injury is to prevent it. Hypothermia can be avoided by the adequate prevention of the body's heat loss, termination of exposure to wet and cold conditions, and early recognition of the onset of the illness.

Layering and regulating your clothing will minimize evaporative heat loss thru perspiration. Wear fabrics that *wick* moisture away from your skin and insulate you when they are wet, such as wool, polypropylene, and synthetics. Also be sure to wear plenty of insulative clothing if you are more sedentary, and stop windchill with a windproof but preferably breathable outershell such as Gore-Tex. Cover the extremities with extra insulation; your hands, neck and especially your head are *very* sensitive to heat loss. Place insulation between the body and cold objects. Do not sit directly on cold equipment, ground, rocks, or snow.

Shorten your exposure by getting out of the wind and rain.

Eat *more* than you normally do, and more frequently. Consume foods that are high in carbohydrates and simple sugars for quick metabolism, and proteins and fats for longer lasting energy. Do not drink alcohol—it *increases* your heat loss.

Be alert to the symptoms of hypothermia. The victim may not realize their condition until it has advanced beyond a safe point. Don't take chances. Learn more about the dangers of this illness, particularly if you spend much time outdoors in cold weather.

Clothing

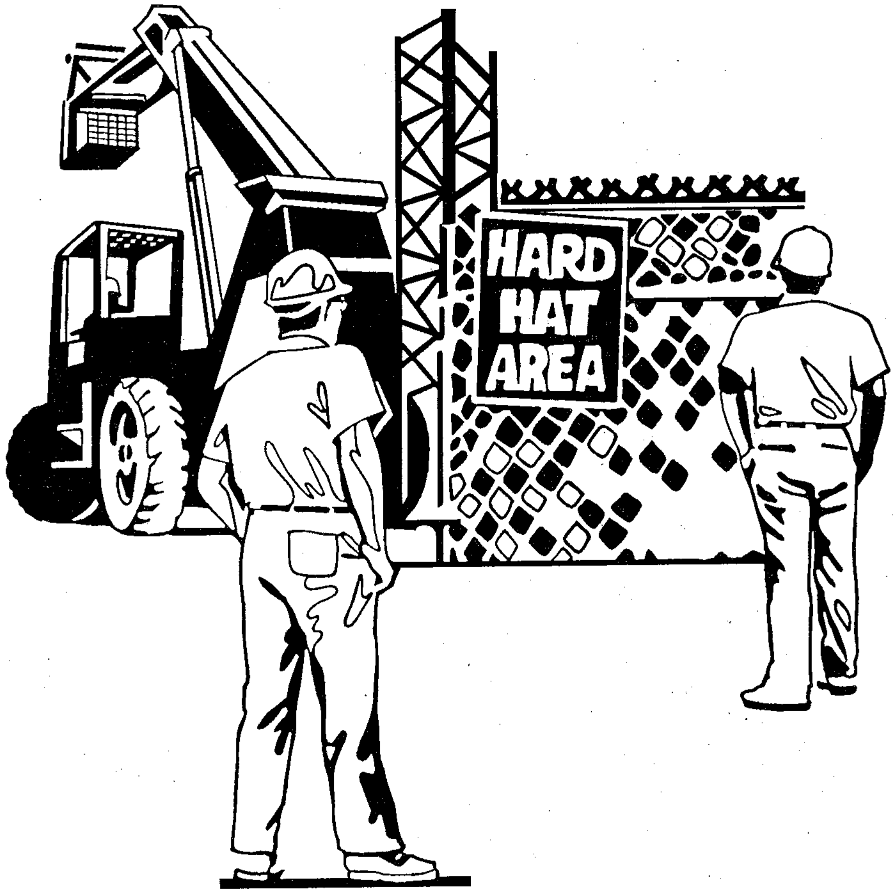
Long underwear—an absolute winter necessity. It should be of a fabric that transports moisture away from your skin to prevent chilling. Wool will do if you have a set. More recent creations such as polypropylene, Thermax and Caprilene are much better. You can get separate tops and bottoms or a single-piece "union suit." Tops and bottoms are more versatile, as you can wear tops and not bottoms or vice versa on those rare occasions when it warms up. The most important caution here is: **DON'T WEAR COTTON!** Cotton absorbs moisture and holds it close to your skin, which can chill you dangerously if your clothing gets wet.

Middle insulation—or what goes on over your underwear is another important decision in the process of keeping warm and avoiding hypothermia. Wool shirts, sweaters, and pants are a good choice here although there are a confusing variety of somewhat costly new products available such as Synchilla, Polarplus, Techfleece, Retro Pile, etc., which are much better than wool in wet conditions because they do not absorb nearly as much moisture. For that extra touch of warmth, a down or fiberfill jacket or vest will do wonders.

Shell—is the outer layer that protects you from rain, snow, and wind and should be made of one of the "waterproof/breathable" fabrics such as Gore-Tex or its imitators. The ability of these fabrics to transport perspiration vapor away from your body can be critical in the cold.

Implicit in all of this is ***never*** be without a hat in cold weather because up to 75% of body heat can be lost through the head!

Remember, it is safer to remove extra clothing than to shiver in not enough!



Human factors that cause accidents

Identify and control the human factors that cause accidents, and you've gone a long way toward cutting down accidents.

80% to 90% of all accidents–in the home, on the road, or on the job–are caused by human factors. Here are 10 of the most important of those human factors:

1) Negligence: Failure to observe safety rules or instructions; failure to maintain equipment.
2) Anger/Temper: Causes one to become irrational and to disregard common sense.
3) Hasty decisions: Acting before thinking leads to taking hazardous shortcuts.
4) Indifference: Lack of attention to the task, not alert, day dreaming.
5) Distractions: Interruptions by others while performing normal job duties or non-routine hazardous tasks. Family troubles, thinking about bad news (mental distractions), horseplay.
6) Curiosity: Doing unknown things just to see what happens.
7) Inadequate instruction: Untrained or improperly trained person.
8) Poor working habits: Cluttered floor/work area, loose clothing, etc.
9) Over-confidence: Too cocky, taking chances, macho behavior
10) Lack of planning: Two or more people, each depending on the other for something that doesn't get done.

These are factors that ought to be discussed by supervisors and employees. Watch for signs indicating that these factors exist.

Know them, and try to spot them before accidents occur. Identify people, or areas where steps can be taken to correct or improve these human factors, or where additional planning or training could help.

*From: State of Nevada, **Mine Safety ene**, Aug-Sep 1990*

The Last Word...

"Glory is fleeting, but obscurity is forever." *(Napoleon Bonaparte)*

"There are worse things in life than death. Have you ever spent an evening with an insurance salesman." *(Woody Allen)*

"Tradition is what you resort to when you don't have the time to do it right." *(Kurt Herbert Adler)*

"It is better to have a permanent income than to be fascinating." *(Oscar Wilde)*

"Though I am not naturally honest, I am so sometimes by chance." *(Shakespeare)*

"The two hardest things to handle in life are failure and success." *(Unknown)*

"The only normal people are the ones you don't know very well." *(Joe Ancis)*

"If I had known I was going to live this long I would have taken better care of myself." *(Unknown)*

"I'm trying to arrange my life so that I don't even have to be present." *(Unknown)*

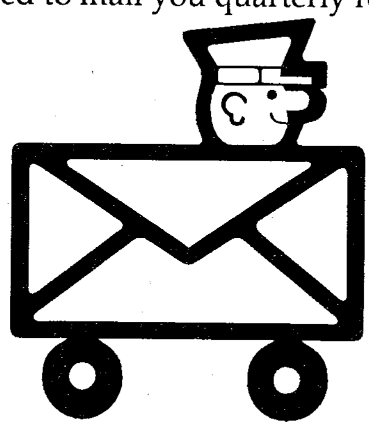
"Id•i•ot *n* : A member of a large and powerful tribe whose influence in human affairs always has been dominant and controlling. The idiot's activity is not confined to any special field of thought or action but 'pervades and regulates the whole.' He has the last word in everything: his decision is unappealable. He sets fashions of opinion and taste, dictates the limitations of speech and circumscribes conduct with a dead-line." *(Ambrose Bierce)*

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

REMINDER: The District Council Safety Competition for 1990 is underway – please remember that if you are participating this year, you need to mail you quarterly report to:

Mine Safety & Health Administration
Educational Policy and Development
Holmes Safety Bulletin
4015 Wilson Boulevard, Room 531
Arlington, Virginia 22203-1984

Phone: (703) 235-1400



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Joseph A. Holmes Safety Association Awards Criteria

Type "A" Awards - For Acts of Heroism
The awards are medals with Medal of Honor Certificate.

Type "A" - For Acts of Heroic Assistance
The awards are Certificates of Honor.

Type B-1 Awards - For Individual Workers
(40 years continuous work experience without injury that resulted in lost workdays)
The awards are Certificate of Honor, Gold Pins and Gold Decal.

Type B-2 Awards - For Individual Officials
(For record of group working under their supervision)
The awards are Certificate of Honor.

Type C Awards - For Safety Records
(For all segments of the mineral extractive industries, meeting adopted criteria)
The awards are Certificate of Honor.

Other Awards - For Individual Workers
(For 10, 20, or 30 years without injury resulting in lost workdays)
The awards are 30 years - Silver Pin and Decal, 20 years - Bronze Pin and Decal, 10 years - Decal bearing insignia.

Special Awards - For Small Operators
(Mine operators with 25 employees or less with outstanding safety records)
The awards are Certificate of Honor.

For information contact: Secretary-Treasurer, Joseph A. Holmes Safety Association (304) 256-3245

Joseph A. Holmes Safety Association

Awards Criteria--Outline

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