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Mine Safety and Health Administration

NORTH CENTRAL DISTRICT MINE SAFETY AND HEALTH NEWSLETTER

MSHA Metal and Nonmetal North Central District

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Welcome to the MSHA Metal and Nonmetal North Central District Mine Safety and Health Newsletter. This internet-accessible quarterly safety and health newsletter for miners and mine operators provides up-to-date information on MSHA regulations and mine safety and health information relating to metal and nonmetal mining in MSHA's North Central District, comprising Illinois, Iowa, Indiana, Michigan, Minnesota, and Wisconsin.

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MNM Fatal Accident Update
Summary Through 2nd Calendar Quarter of 2012

During the second calendar quarter of 2012, five fatal accidents occurred at M/NM mines. A summary of fatal M/NM mining accidents is shown below by accident category for the years 2008 through the end of June of 2012:

Fatal Accident Summary for M/NM Mines (2008 through June 2012)

METAL/NONMETAL DAILY FATALITY REPORT 2008 - 2012

FATALITIES CHARGEABLE TO THE MNM MINING INDUSTRY	2008		2009		2010		2011		2012	
	UG	S	UG	S	UG	S	UG	S	UG	S
ELECTRICAL	1	1		1		1		1		
EXP VESSELS UNDER PRESSURE						1				
EXP & BREAKING AGENTS					1		1			
FALL/SLIDE MATERIAL		3		3	3	3		1		1
FALL OF FACE/RIB/HIGHWALL					1				1	1
FALL OF ROOF OR BACK	3		1		1		2			
FIRE										
HANDLING MATERIAL		1								
HAND TOOLS										
NONPOWERED HAULAGE										
POWERED HAULAGE	3	2	1	4		7	1	3	1	3
HOISTING										
IGNITION/EXPLOSION OF GAS/DUST										
INUNDATION										
MACHINERY	1	2		4	1	2		3		1
SLIP/FALL OF PERSON		5		1		1	1	2		1
STEP/KNEEL ON OBJECT										
STRIKING OR BUMPING										
OTHER		1		1		1		1		
SUB- TOTALS	**8**	**15**	**2**	**14**	**7**	**16**	**5**	**11**	**2**	**7**
END OF YEAR TOTALS	**23**		**16**		**23**		**16**			

The following are brief descriptions of the five fatal accidents that occurred during the three months of April through June of 2012. Go to www.msha.gov for more information.

Struck by counterweight: On April 11, 2012, a 49 year-old excavator operator with approximately 8½ years of experience was injured at a sand and gravel operation. The victim was removing bolts from a counterweight on the back of an excavator when the counterweight fell and struck him. He was hospitalized and died on April 12, 2012, as a result of his injuries.

Underground haul truck out of control. On May 15, 2012, a 37 year-old haul truck driver with approximately 2½ years of experience was killed at an underground crushed stone operation. The victim was operating a loaded articulated haul truck down a slope when the truck went out of control and struck a rib. The tractor of the truck (cab) overturned. The victim was found outside of the cab and had been run over by the truck.

Excavator toppled into pond. On May 23, 2012, a 36 year-old foreman with about 9½ years of experience was killed at a sand and gravel operation. He was operating an excavator on a dike separating two ponds. The ground beneath the excavator tracks failed and the excavator toppled into one of the ponds.

Miner struck by front-end loader. On May 28, 2012, a 51-year old shift operator with 13 years of experience was killed at a cement operation. The victim was found near the plant's crane bay building after being struck by a front-end loader. He was walking from the lunchroom toward the locker area.

Customer truck looses brakes. On June 21, 2012, a 49-year old customer truck driver with no mining experience was killed at a surface stone mine. He was driving a loaded dump truck, traveling down a grade, when the truck lost its brakes and went out of control. The victim jumped out and the truck ran over him. A passenger in the truck also jumped out and was treated at a hospital and released.

Continuing a longstanding trend, the leading accident classification for fatal accidents in 2012 is powered haulage, which accounted for almost half of the fatal accidents recorded year-to-date, and over 25% of all fatal accidents in the metal and nonmetal industry since 2008. An accident is classified as powered haulage if it involves equipment such as locomotives and rail cars, conveyors, belt feeders, bucket elevators, vertical manlifts, self-loading scrapers or pans, haulage trucks, front-end loaders, load-haul-dumps, forklifts, cherry pickers, mobile cranes (if traveling with a load), etc. Powered haulage accidents are caused by the motion of the haulage unit.

Listed below are some of the "best practice" recommendations issued by MSHA following the fatal powered haulage accidents that have occurred thus far in 2012. Included are both "generic" recommendations that could apply to nearly any mine or situation, and specific recommendations that are more narrowly applicable to particular circumstances.

- Ensure that persons are task trained, they understand the hazards associated with the work being performed, and they can demonstrate proficiency in all phases of mobile equipment operation before performing work.

- Equipment operators should be familiar with their working environment at all times.
- Ensure that additional weather-appropriate safety precautions are taken if necessary (fog, rain, snow, ice, wind, etc.).

- Keep mobile equipment a safe distance from the edge of water or embankments.
- Barricade or post warning signs at all approaches in areas where health or safety hazards exist that are not immediately obvious to all persons. Warning signs shall be readily visible, legible, and display the nature of the hazard and any protective action required.
- Provide and maintain berms or guardrails on the banks of roadways where a drop-off exists of sufficient grade or depth to cause a vehicle to overturn or endanger persons in equipment.
- Monitor personnel's work activities routinely to determine that safe work procedures are followed.
- Operate equipment in a manner that maximizes visibility. Use a spotter when visibility of the work or travel areas is limited.
- Insure appropriate lighting on equipment and in working areas when working after dark.
- Conduct adequate pre-operational checks and ensure the service brakes are properly maintained and will stop and hold the mobile equipment prior to operating.
- Operators of self-propelled mobile equipment shall maintain control of the equipment while it is in motion.
- Operating speeds shall be consistent with conditions of roadways, tracks, grades, clearance, visibility, curves, and traffic.
- Ensure that equipment manufacturer's load limits are not exceeded.
- Slow down or drop to a lower gear when necessary. Post areas where lower speeds are warranted.
- Always wear a seat belt when operating self-propelled mobile equipment.
- Ensure that equipment operators maintain adequate communications.
- Train all persons to stay clear of mobile equipment.
- Be aware of the location and traffic patterns of mobile equipment in your work area.
- Wear high visibility clothing when working around mobile equipment.
- Insure informational and hazard warning signs are provided wherever needed.

- Before moving mobile equipment, look in the direction of travel and use all mirrors and cameras to ensure no persons are in the intended path.
- Sound the horn to warn persons of intended movement and give them time to move to a safe location.
- Operate the mobile equipment at reduced speeds in congested work areas.

- Ensure that backup alarms and lights on mobile equipment are maintained and operational.
- Post signs to warn persons in areas where mobile equipment travel.
- Know the equipment's capabilities, operating ranges, load-limits and safety features.
- Operating speeds shall be consistent with conditions of roadways, tracks, grades, clearance, visibility, curves, and traffic.
- Do not attempt to exit or jump from moving mobile equipment.
- Provide adequate site specific hazard training to all customer truck drivers.

The length and level of detail of the above listing may appear excessive, but it highlights a critical aspect of powered haulage safety. There is no simple “quick-fix” solution that will prevent all powered haulage accidents. Powered haulage equipment, applications, and operating environments vary too widely from mine to mine, and even within the same mine, to apply a one-size-fits-all approach. To achieve success in preventing powered haulage accidents, a comprehensive strategy is needed that fully accounts for all of the variables that could contribute to accident causation and severity, including the equipment itself, the workplace environment, the operator, and the ways in which these factors can interact.

For more information on powered haulage safety, check MSHA’s internet web site at:

www.msha.gov

MSHA’s Educational Field Services staff and MSHA Safety Training Grant Recipients can also assist you in developing and implementing an effective powered haulage accident prevention program at your mine.

North Central Regional First Aid Contest for Surface Mines

First aid is the initial care provided to an injury victim. It is usually performed by non-expert, but trained personnel, often “first responders,” but sometimes Emergency Medical Technicians (EMT’s), on an injured person until definitive medical treatment can be accessed. The goals of first aid can be summarized as:

- **Preserve life**: the overriding aim of all medical care, including first aid, is to save lives

- **Prevent further harm**: also sometimes called prevent the condition from worsening, or danger of further injury, this covers both external factors, such as moving a patient away from any cause of harm, and applying first aid techniques to prevent worsening of the condition, such as applying pressure to stop a bleed becoming dangerous.

- **Promote recovery**: first aid also involves trying to start the recovery process from the illness or injury, and in some cases might involve completing a treatment, such as in the case of applying a plaster to a small wound

No one knows when or where mining industry first aid contests started. But it *is* known that in the early years of the 20th century, as public interest in mine safety grew and as a nationwide mine safety "infra-structure" emerged (mining company safety departments with full-time safety directors, state mine safety agencies, the federal Bureau of Mines), a few mining companies began to stage first aid contests. Mines usually competed against other mines owned by the same company, but sometimes, intercompany contests were held.

By 1910, interest in first aid among state and federal mine officials, mine operators, and miners led to a number of public first aid contests in various States. Soon, such contests were being held annually as regular events.

For the second year in a row, MSHA's North Central District held a first aid contest for first responders from surface and open pit mines, quarries, mills, and plants in the upper Midwest region. The contest was staged in the Duluth Federal Building on May 17. A total of six teams from four mining operations participated in the contest. Teams entered in the contest were (in alphabetical order):

- Badger Mining Company, Taylor Plant, Hixton, Wis.
- Cliffs Natural Resources, Hibbing Taconite Company, Hibbing, Minn. (2 teams)
- Cliffs Natural Resources, Northshore Mining Company, Babbitt and Silver Bay, Minn. (2 teams)
- 3M Company Wausau Plant, Wausau, Wis.

The contest consisted of four separate events; a written examination, a CPR station, and two patient assessment/treatment/transport stations. Administering the contest required the assistance of 20 MSHA personnel; 19 from the North Central District plus one person from Educational Field Services.

Joe Baregi from the 3M Wausau Plant ponders a written examination question

The contest rules were largely derived from the rules for the first aid component of a mine rescue contest, with a few significant differences. Rather than the three-person first aid teams used in a mine rescue contest, teams for the surface first aid contest consisted of two persons in an effort to attract smaller mines. Two-rescuer CPR was added to the CPR station, and unlike a mine rescue contest where the teams need to solve a single patient assessment/treatment/transport problem, this contest included two such "hands on" problems.

The full-day contest ran smoothly, with all teams participating in all events. Several of the team members said they learned a lot, and many expressed the desire to return and compete again next year.

The team from Northshore Mining Silver Bay treats patient Jim Peck, who has an impaled object in his left forearm

Trophies were awarded to the first and second place teams in each event, and to the overall champion with the best combined scores in all events. The Northshore Mining Silver Bay team placed first in the written examination, followed by Cliffs Natural Resources Hibbing Taconite Team #2. The CPR event was won by the Cliffs Natural Resources Hibbing Taconite Team #1, followed by the Northshore Mining Silver Bay team. The team with the best combined scores at the two patient assessment/ treatment/transport stations was Hibbing Taconite Team #2, followed by Cliffs Natural Resources Hibbing Taconite Team #1. The overall champion was Cliffs Natural Resources Hibbing Taconite Team #1.

The two teams from Cliffs Natural Resources – Hibbing Taconite and Northshore Mining – show off their trophies

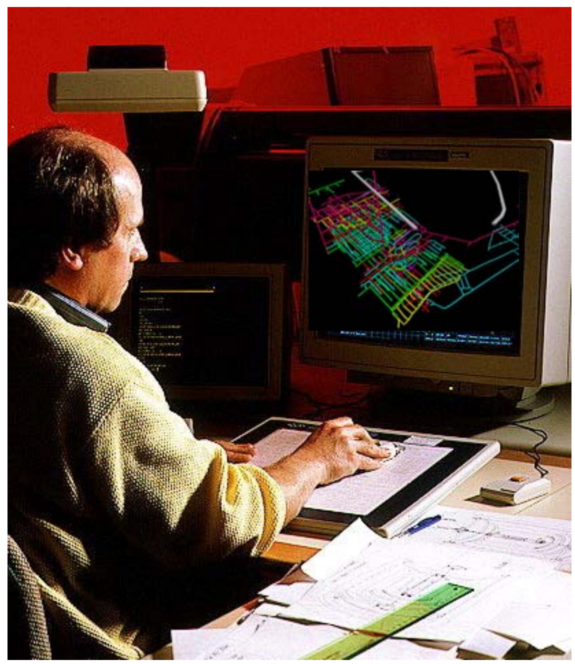
Computer Program Aids U/G Mine Fire Emergency Planning

Specialized computer simulation programs are widely used for designing and managing underground mine ventilation systems. These programs were first introduced in the 1970's, and over the years, they have become more powerful and easier to use, and they have also been enhanced with the addition of more and varied features and capabilities. A sub-category of mine ventilation software that is particularly useful for fire emergency planning includes programs that account for interactions between ventilation systems and fires. Such interactions, including throttling of airflows, airflow reversals, creation of recirculation paths, and the time-dependant spread of heat and combustion products, can be highly complex and are often counter-intuitive. Without the assistance of a ventilation and fire simulator, it would be difficult or impossible to predict the effects of an underground mine fire with any reasonable degree of confidence. Use of such programs removes much of the guesswork from ventilation system design and fire emergency planning.

The MFIRE ventilation and fire simulator, developed by the US Bureau of Mines and Michigan Technological University, has been a mainstay for decades for modeling fire and ventilation system interactions and spread of contaminants. It is used in the U.S. and internationally to simulate fires for planning and response purposes. It is a dynamic, transient-state, mine ventilation network simulation program that performs normal ventilation system design calculations. It can also be used to analyze ventilation networks under thermal and mechanical influence such as changes in ventilation parameters, external influences such as changes in temperature, and internal influences such as a fire.

The program traces its roots back to the early 1970's. Although "state-of-the-art" when it was first released, the program used language and architecture that are considered antiquated by current computer standards. Until recently, the program had never been updated to take advantage of advances in personal computer operating systems, effectively limiting the use of the program. In addition, the original program was not compatible with Graphical User Interface (GUI) simulation tools that are widely used in the mining industry today.

The original MFIRE was a stand-alone program that ran to completion without pause, based on user-specified input parameters. Because of this, it was difficult to use its ventilation and fire modeling capabilities within larger simulation projects, as it was not possible to collect and process intermediate results. To overcome this limitation, The National Institute for Occupational Safety and Health's (NIOSH) Office of Mine Safety and Health Research (OMSHR) recently completed a major redesign and restructuring of MFIRE.



The program was split into a front-end with a simple graphical-user-interface (GUI), and the MFIRE computational "engine" back-end. MFIRE 3.0 was rewritten as a discrete event simulation library so it can be used to simulate the progress of mine fires over time, under the control of user inputs through the GUI. MFIRE's outdated programming language was replaced with an object-oriented C++ approach for ease of future enhancements, updates, and maintenance. A key aspect of the redesign was that third party developers can obtain ventilation network data from the common memory rather than the default MFIRE data output files. This allows developers to use their GUI's to display the progression of changes to the mine ventilation network.

Finally, other improvements to MFIRE were made to increase the size of mine ventilation networks that can be modeled, improve capture and processing of runtime errors, add the ability to report results in both imperial and metric measurement units, and to utilize more user-friendly names for data structures.

The modernized MFIRE is now available with an updated programming language and many new features to improve its usability and functionality. It can be used as a stand-alone tool for mine ventilation professionals and/or it can be integrated into other ventilation simulation tools.

MFIRE 3.0 is available for download on the NIOSH Web site at:

http://www.cdc.gov/niosh/mining/products/product204. htm

With its new design, a future step may be to interface MFIRE 3.0 with warning and communication systems, interactive graphics displays, and real-time atmospheric monitoring input, to provide a comprehensive solution for fire detection, alarm, and response.

For more information on MFIRE 3.0, contact Alex C. Smith (ASmith@cdc.gov) or the Health Communications Coordinator (OMSHR@cdc.gov), NIOSH Office of Mine Safety and Health Research, P.O. Box 18070, Pittsburgh, PA 15236-0070.

IARC Re-Classifies Diesel Exhaust As a Human Carcinogen

On June 12, 2012, after a week-long meeting of international experts, the International Agency for Research on Cancer (IARC) issued a statement declaring that diesel engine exhaust has been re-classified as a Group 1 human carcinogen (see below for definition of Group 1 human carcinogen), based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

The International Agency for Research on Cancer (IARC) is part of the World Health Organization. Its mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The Agency is involved in both epidemiological and laboratory research and disseminates scientific information through publications, meetings, courses, and fellowships.

In 1988, IARC classified diesel exhaust as a Group 2A probable human carcinogen (see below for definition of Group 2A). An Advisory Group which reviews and recommends future priorities for IARC had recommended diesel exhaust as a high priority for re-evaluation since 1998.

There has been mounting concern about the cancer-causing potential of diesel exhaust, particularly based on findings in epidemiological studies of workers exposed in various settings. This was re-emphasized by the publication in March 2012 of the results of a massive study by the US National Cancer Institute/National Institute for Occupational Safety and Health (NCI/NIOSH) of occupational exposure of underground metal and nonmetal miners in the U.S. to diesel exhaust emissions, which showed an increased risk of death from lung cancer in exposed workers.

The scientific evidence was reviewed thoroughly by IARC and overall it was concluded that there was sufficient evidence in humans for the carcinogenicity of diesel exhaust. IARC found that diesel exhaust is a cause of lung cancer (sufficient evidence) and also noted a positive association (limited evidence) with an increased risk of bladder cancer.

Within the IARC lexicon, Group 1 refers to agents that are carcinogenic to humans. This category is used when there is sufficient evidence of carcinogenicity in humans. Exceptionally, an agent may be placed in this category when evidence of carcinogenicity in humans is less than sufficient but there is sufficient evidence of carcinogenicity in experimental animals and strong evidence in exposed humans that the agent acts through a relevant mechanism of carcinogenicity.

Group 2 includes agents for which, at one extreme, the degree of evidence of carcinogenicity in humans is almost sufficient, as well as those for which, at the other extreme, there are no human data but for which there is evidence of carcinogenicity in experimental animals. Agents are assigned to either Group 2A (probably carcinogenic to humans) or Group 2B (possibly carcinogenic to humans) on the basis of epidemiological and experimental evidence of carcinogenicity and mechanistic and other relevant data.

The terms probably carcinogenic and possibly carcinogenic have no quantitative significance and are used simply as descriptors of different levels of evidence of human carcinogenicity, with probably carcinogenic signifying a higher level of evidence than possibly carcinogenic.

Agents categorized as Group 2A are probably carcinogenic to humans. This category is normally used when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals. In some cases, an agent may be classified in this category when there is inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals and strong evidence that the carcinogenesis is mediated by a mechanism that also operates in humans.

Exposure to diesel particulate matter (DPM) in underground metal and nonmetal mines is regulated by MSHA under §57.5060(b)(3). In accordance with this standard, a miner's personal exposure to DPM in an underground mine must not exceed an average eight-hour equivalent full shift airborne concentration of 160 micrograms of total carbon per cubic meter of air (160_{TC} $\mu g/m^3$). IARC's re-classification of diesel exhaust emissions from Group 2A to Group 1 will not result in any change to MSHA's enforcement of its DPM rule.

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