

Summary of 2011 Fatal Accidents at Metal/Nonmetal Mines with Preventative Recommendations

In 2011, 16 miners were killed in accidents in the metal and nonmetal mining industry.

Four miners were killed as a result of **powered haulage** accidents. Three miners died in **machinery** accidents, three died in **fall of person** accidents, and two died in **roof falls**. One miner died from **sliding material**, another from **explosives**, one from **electrical** and one from **other** types of accidents. Four (25%) of the fatalities were **contractors**.

Action is needed to prevent additional fatalities. A detailed investigation report on each fatality is posted on the MSHA website at <http://www.msha.gov/fatals/fab.htm> when completed.

Here are brief summaries of these accidents:

Four miners died when they were involved in powered haulage accidents.

An equipment operator was killed at a sand and gravel operation when he was cleaning a tramp metal magnet on a belt conveyor when the belt started without warning.

A skid-steer loader operator was killed at a sand and gravel operation. He accessed an elevated platform near an unguarded head pulley and became entangled in the operating conveyor system.

A muck haul leadman was killed in an underground platinum mine. He was operating a 4-yard loader in a drift when the loader struck the left rib and a spiling (rebar anchored in the rib for ground control) that was protruding from the rib penetrated the front side window, entered the cab, and struck him.

A crusher operator was killed at a surface stone operation. . A front-end loader was being used to lift a conveyor to place a set of wheels on it. The loader bucket suddenly dropped, allowing the frame of the conveyor to strike one of the tire assemblies, which shifted and struck the crusher operator.

Three miners were killed working near or inside machinery.

A grader operator was killed at a phosphate rock operation in a staging area where equipment operators inspected their equipment before the shift. The operator was talking with a coworker when he was struck by a grader that was backing up.

An owner/crusher operator was killed at a surface crushed stone operation when slipped or fell into the operating jaw crusher while he was attempting to dislodge material from the vibrating feed hopper.

A laborer was killed at a surface stone operation, when he fell into an operating jaw crusher.

Three miners died in fall of person accidents.

A mill operator was killed at a surface gold operation. He was sweeping the floor in a crusher building and fell through an opening approximately 60 feet to the floor below. The cover for the opening was not secured in place.

A plant operator was killed at a sand and gravel operation while changing a screen in the plant when he fell approximately 56 feet to the ground below. He was standing on a steel rail that had been placed between the midrail of the protective rail surrounding the screen deck work platform and the screen structure.

A contract underground miner was killed when he was engulfed as he and a coworker were attempting to dislodge muck in a bin. Additional muck started to flow into the bin where they were standing. Although the victim was wearing a safety harness attached to a self-retracting lanyard, the lanyard extended and did not lock before he became engulfed.

Two miners were killed by roof falls.

A miner was killed at an underground silver operation when a fall of back approximately 90 feet long struck him while he was wetting a muck pile in a stope.

A drill operator was killed at an underground crushed stone operation when a slab of roof, approximately 5 feet wide by 6 feet long by 10 inches thick, struck him as he was walking in a crosscut.

One miner was killed by falling/sliding material.

A contract superintendent was killed at a phosphate rock operation when he was struck by a pipe that slipped while he was attempting to join two ends of 24-inch diameter pipe that were being positioned in the saddle of a pipe fuser by two excavators.

One miner killed by a flying rock during a blasting operation.

A miner was killed at an underground gold mine while on a ramp waiting for a blast to be initiated. When the round was initiated, small rock and debris traveled through a 3-inch diameter diamond borehole, striking him.

One miner died in an electrical accident.

A miner was killed by a fatal electric shock at a portable sand and gravel operation when he opened the 480 volt feeder box at the motor control center and started to remove the leads.

One miner was killed in another type of accident.

A contract tire repair technician was killed at a surface gold operation when he was working in a shop repairing a haul truck tire. He was applying adhesive inside the tire and was completely out of view. He was not wearing respiratory protection.

Best practices

Fatalities are not inevitable in mining. They can be prevented. Effective safety and health management programs save lives. Workplace examinations for hazards can identify and eliminate hazards that kill and injure miners. Effective and appropriate training will help ensure that miners recognize and understand hazards and how to control or eliminate them.

While some of the specific circumstances of these accidents remain under investigation, here are some best practices that can be used to prevent accidents like these in the future:

Powered Haulage Accidents

These deaths can be prevented by following well-known precautions:

- Maintain control of mobile equipment while in motion.
- Maintain safe operating speeds consistent with conditions of roadways, grades, clearance, visibility, traffic, and the type of equipment used.
- Place controls in the park position and set the parking brake when mobile equipment is left unattended.
- When parked on a grade, chock the wheels of mobile equipment or turn them into a bank.
- Barricade or post warning signs at all approaches to areas where health or safety hazards exist that are not immediately obvious.
- Inspect and maintain powered haulage equipment for operational reliability.
- Assure backup alarms and horns function.
- Sound alarms and horns before starting or moving equipment.
- Stay clear of mobile equipment.
- Lock Out and Tag Out equipment before performing maintenance.
- Communicate miners' locations.
- Assess risk where miners work in confined spaces.
- Avoid pinch points when working around mobile equipment.
- Install proximity detection/protection systems.

Falling/Sliding Material

This death can be prevented by following well-known precautions:

- Establish safe work procedures and identify and remove hazards before beginning a task. Follow the equipment manufacturer's procedures for the work being performed to ensure that all hazards have been addressed.
- Train persons to recognize the hazards associated with performing a task.
- Repair broken or damaged equipment immediately.
- Block material against motion to assure energy cannot be released while the task is performed.
- Do not place yourself in a position that will expose you to hazards while performing a task.
- Monitor personnel routinely to determine that safe work procedures are followed.

Machinery Accidents

These deaths can be prevented by following well-known precautions:

- Establish policies and procedures for safely clearing plugged material in a feed hopper. Evaluate design modifications or use auxiliary equipment to reduce the risks associated with clearing an obstruction.
- Ensure that persons are task trained and understand the hazards associated with the work being performed.
- De-energize and Lock-out/Tag-out all power sources before working on crushers.
- Provide and maintain a safe means of access to all working places.

Roof Falls

These deaths can be prevented by following well-known precautions:

- Train persons to identify work place hazards and take action to correct them.
- Design, install, and maintain a support system to control the ground in places where persons work or travel.
- Examine and test ground conditions in areas where work is to be performed prior to work commencing and as ground conditions warrant during the shift.
- Install additional ground support before other work is permitted in the affected area when ground conditions create a hazard to persons.
- Be alert to any change of ground conditions.

Explosives and Blasting

This death can be prevented by following well-known precautions:

- Plug and map a diamond drill hole that intersects any opening.
- Consider mine specific conditions during blasting operations, including diamond drill holes and rock strata, and establish mine policies and procedures to protect all persons.
- Ensure all drilled holes and open passageways that intersect an area to be blasted are known and taken into consideration when developing a blasting plan and before initiating any blast.
- Use a central blasting system and schedule blasting between shifts or on off-shifts when no one is present.
- Train persons to identify hazards associated with blasting activity and take action to correct them.
- Never initiate a blast until the blast area has been determined to be safe and all persons have been evacuated from the designated blasting area.
- Take special precautions to ensure that all roadways and regularly traveled areas are blocked to prevent access when blasting is being conducted.

Fall of Person

These deaths can be prevented by following well-known precautions:

- Establish and discuss safe work procedures. Identify and control all hazards. Train all persons to recognize and understand safe job procedures before beginning work.
- Wear a safety harness and attach it to a securely anchored lanyard, where there is a danger of falling.
- Protect openings near travelways through which persons may fall by installing railings, barriers, or covers.
- Secure temporary access opening covers in place at all times when the opening is not being used.
- Ensure that areas are barricaded or have warning signs posted at all approaches if hazards exist that are not immediately obvious.
- Do not use lanyards that depend on free-fall speed to lock in applications where the danger is not limited to a free-fall,. Follow the manufacturer's recommendations.
- Ensure that persons working on material in bins, silos, hoppers, tanks, and surge piles are properly tied-off, with one line tender per person. No persons should enter the facility until the supply and discharge equipment are locked out.
- Establish policies and procedures for safely clearing muck in a bin excavation and ensure that persons follow these safe procedures.
- Ensure that persons are task-trained and understand the hazards associated with the work being performed and the proper use of their personal protective equipment.

Electrical

This death can be prevented by following well-known precautions:

- Conduct a risk assessment.
- Ensure employees are trained on all the electrical tests and safety equipment necessary to safely test and ground a circuit being worked on.
- Use properly rated personal protective equipment (PPE) including arc flash protection such as a hood, gloves, shirt and pants.
- Positively identify the circuit on which work is to be conducted.
- De-energize power and ensure that the circuit is visibly open.
- Place YOUR lock and tag on the disconnecting device.
- Verify the circuit is de-energized by testing for voltage using properly rated test equipment.
- Ensure ALL electrical components in the enclosure are de-energized.
- Ground ALL phase conductors to the equipment grounding medium with grounding equipment that is properly rated.
- Install warning labels on the terminal covers of bottom feed circuit breakers stating "Bottom Terminal Lugs Remain Energized When the Circuit Breaker is Open."

Other

This death can be prevented by following well-known precautions:

- Develop, implement, and maintain a written Hazard Communication (HazCom) program.
- Ensure that a Material Safety Data Sheet (MSDS) is accessible to persons for each hazardous chemical to which they may be exposed.
- Review and discuss MSDS control section recommendations. Establish and discuss safe work procedures before starting any work and identify and control all hazards.
- Train all persons to recognize and understand safe job procedures, including the physical and health hazards of chemicals that are being used and the proper use of respiratory protection.
- Ensure that adequate exhaust ventilation is provided to all work areas.
- Ensure that persons are not required to perform work alone in any area where hazardous conditions exist that would endanger their safety.

Failure to **Lock Out and Tag Out (LOTO)** equipment power sources continues to result in mine fatalities. These accidents that could have been prevented by electrically disconnecting power and assuring it is OFF, having each miner on the job lock the power source in the safe position, and attach his or her personal safety lock and tag to prevent reconnection and re-energization. In 2011, five such fatalities occurred, two in powered haulage conveyor accidents, two in a stationary machinery accident, and one in an electrical accident. **These would not have occurred had the power been disconnected and locked out.**

Violations of the priority standards identified as **Rules to Live By** continue to play key roles in mine fatalities. While not all of the fatality investigations have been completed, not all of the violations have been identified, and not all of the associated citations and orders have been issued, it currently appears that violations of the Rules to Live By standards were involved in several of those fatalities. MSHA's inspectors will be especially mindful of these issues while performing inspections. They will be talking to miners and mine supervisors in mines throughout the country to discuss these kinds of fatalities, and the ways to prevent others like them.

Contractors

In 2011, contractors were involved in 25% of the fatalities. Contractors and mine operators should ensure that contractors are properly trained and following the mine's safety policies and procedures. Contractors and mine operators should coordinate operations at the mine to ensure that safety and health management programs are in place and are effective, all workplace examinations are performed, and safe work procedures are followed.

The importance and value of effective **safety and health management programs** cannot be overstated. A thorough, systematic review of all tasks and equipment to identify hazards is the foundation of a well-designed safety and health management program. Modify equipment, processes, work procedures and management systems to eliminate or control identified hazards. Operators and contractors should create effective safety and health management programs, ensure that they are implemented,

and periodically review, evaluate, and update them. If an accident or near miss does occur, find out why and act to prevent recurrence. If changes to equipment, materials or work processes introduce new risks into the mine environment, they must be addressed immediately. Conducting workplace examinations before beginning a shift and during a shift – every shift – can prevent deaths by finding and fixing hazards. All required workplace examinations must be performed and identified problems resolved to protect workers.

Training. In 2011, 9 of the 16 (56%) miners killed had five years or less at the mine site and 7 of these miners (44%) had less than one year's experience at the mine. In addition, 10 of those 16 miners (62%) had less than five years experience at that job or task, including eight (50%) with less than one year at the job. Providing effective and appropriate training to miners is a key element in ensuring their safety and health. Mine operators and Part 46 and Part 48 trainers need to train all miners on the conditions that lead to deaths or injuries and measures to prevent them.

Miners deserve a safe and healthy workplace and the right to go home safe and well at the end of every shift, every day. We must all continue to work together to make that happen.