

Summary of 2010 Fatal Accidents at Metal/Nonmetal Mines and Preventative Recommendations

In 2010, 23 miners in the metal and nonmetal mining industry died in mining accidents.

Seven miners are dead as a result of **powered haulage** accidents. Six miners were killed when they were struck by **falling material**, and three miners died in **machinery** accidents. **Roof falls and rib rolls** crushed 2 miners, one miner lost his life due to an **exploding vessel** and another from **blasting**; one miner died in a **fall**, another **drowned**, and one was **electrocuted**. Ten (43%) 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 is a brief summary of these accidents:

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

A miner standing between the front and rear trailers of an over-the-road tandem trailer truck at a surface cement plant was killed when the truck pulled forward.

A miner was killed at a surface copper operation when a 240-ton haul truck pulled forward and struck a half-ton pickup that had parked in front of it.

A dozer operator was killed at a surface dimension stone mine when he dismounted his equipment and was struck by a haul truck working nearby.

A haul truck driver working temporarily as a plant attendant was killed at a surface crushed stone operation when he was drawn through a belt conveyor tail assembly. He was cleaning built-up material from between the ribs of a self-cleaning tail pulley.

A customer truck driver was killed at a surface fuller's earth operation when he was crushed between a loading dock and a backing trailer while conversing with another employee.

A mechanic was killed at a surface sand and gravel operation when the front end loader under which he was working rolled and struck him.

A quarry truck driver working temporarily as a plant attendant at a surface crushed stone operation was killed when he was drawn through a series of chutes when the belt conveyor on which he was standing started.

Six miners were killed by falling material.

A contractor was killed at a copper mine when a pipe that was being moved into position shifted and fell on him, knocking him to the ground.

A contract truck driver was killed on the surface at an underground salt mine when a 150-ton salt bin under which he was loading his truck collapsed onto the truck's cab.

Two gold miners working from a suspended platform in an underground mine ventilation shaft were killed when they were struck by pipe and aggregate materials that fell from above.

A blaster was killed at a surface crushed stone operation when he walked into the blast site to examine the shot material. The victim was approaching the edge of the shot material when the ground collapsed, engulfing him in the water-filled pit.

A mechanic replacing the hydraulic cylinder on a skid-steer loader was killed at a surface dimension stone operation when the forks lowered, pinning him against the frame.

Three miners were killed working on, under or inside machinery.

A contract driller at a crushed stone operation died when he was struck by a truck-mounted drill as he repositioned it.

A maintenance foreman at a surface crushed stone operation was killed when the roller mill he entered to inspect began to rotate while he was inside.

A mechanic was killed and another injured at a surface crushed stone operation when a 10-wheeled tractor fell from the 10-ton hoist that was suspending it, striking the two miners.

Two miners were killed by roof falls or rib rolls.

A contract miner was killed at an underground uranium mine when he was struck by falling material while he was scaling a rib.

A contract miner was killed at an underground silver mine when falling material struck him while he was scaling loose ground in a stope.

One miner killed by an exploding vessel and one during a blasting operation.

A miner was killed at a cement operation when the damaged drill steel he was cutting with an oxy-acetylene torch exploded.

A supervisor was killed at an underground gold mine when he entered a blast area and a misfire detonated without warning.

Three miners were killed in all other types of accidents.

A contractor millwright was killed at a crushed sandstone operation when he fell from the ladder on which he was working, over a handrail and 47 feet to the ground below.

A dredge operator drowned when he attempted to swim to and retrieve a small boat that had drifted into the dredge pond.

A contract electrician at a surface stone operation died in an arc flash accident while working on an energized electrical circuit breaker in a motor control center.

Mining deaths from 2001 to 2010/best practices

Deaths continue to occur needlessly in metal and nonmetal mining. Between 2001 and 2010, there were 92 powered haulage fatalities; 30 fatalities from falling material; 61 miners killed working on, under or inside machinery; 16 fatalities from roof or rib rolls; and 5 from exploding vessels or blasting accidents. For the same period, 77 fatalities occurred in other categories, of which 34 were from falls and 18 from electrical accidents.

Fatalities can be prevented. They are not inevitable in mining. 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 is what we do know at this time:

Powered Haulage Accidents

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

- Maintain Control of Mobile Equipment While in Motion.
- Maintain 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 Material

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

- Stay Clear of Suspended Loads
- Stay Clear of Persons Working Above
- Stay Out of the Line of Fire
- Conduct a Risk Analysis Before Beginning Work
- Inspect and Maintain Buildings for Structural Integrity
- Inspect and Maintain Equipment for Operational Reliability
- Routinely Examine Metal Structures for Indications of Weakened Structural Components (Corrosion, Fatigue Cracks, Bent/Buckling Beams, Braces Or Columns, Damaged/Loose/Missing Connectors, Broken Welds, Etc.)

Machinery Accidents

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

- Conduct a Risk Analysis Before Beginning Work
- Lock Out and Tag Out Equipment Before Performing Maintenance
- Block Equipment in the Raised Position Before Working On or Under It
- Secure Raised Equipment to Prevent Accidental Lowering or Rolling
- Stay Clear of Suspended Loads
- Pre-plan Work in Confined Spaces
- Never Place One's Body or Limbs between Powered or Moving Equipment and Stationary Objects when the Equipment is Operating

Roof Falls, Rib Rolls and other Ground Control Issues

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

- Perform Thorough Ground Examination
- Perform Examinations after Blasting and Whenever Conditions Change
- Scale Only from a Safe Location
- Never Work or Travel Under Unsupported Roof
- Stay Clear of the Tops and Toes of Highwalls and Stockpiles
- Use Ground Support Where Ground Conditions or Mining Experience in Similar Ground Conditions in the Mine Indicate It Is Necessary.
- Design, Install and Maintain Ground Systems to Control the Ground In Places Where Persons Work or Travel.

Exploding Vessels and Blasting

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

- Ensure that No Flammable, Combustible or Explosive Materials are Present When Heating, Cutting or Welding
- Examine Materials with Hollow Spaces or Cavities to Ensure Gases Can Vent Before Applying Heat
- Never Apply Heat to Materials Where Pressure Can Build Up
- Follow Manufacturers' Guidelines When Storing and Using Explosives
- Keep Explosives Storage Areas Clean, Dry And Orderly
- Properly Rotate Explosive Stock To Use Oldest First

- Never Use Damaged/Deteriorated/Outdated Explosives, Initiation Devices, or Blasting Agents
- Wait the Required Minimum Time before Entering the Blast Area When a Misfire or Burning Explosives is Possible

Fall of Person

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

- Use Fall Protection When Working Where a Fall Hazard Exists
- Position Ladders to Ensure Stability and Eliminate Trip Hazards
- Face the Ladder When Climbing or Working From a Ladder
- Do Not Lean While Standing on a Ladder
- Maintain Three Points of Contact When Climbing a Ladder

Drowning

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

- Wear a Life Jacket Where There is a Danger of Falling into Water
- Develop Procedures for Loading and Unloading Boats in Dredge Operations and Train All Persons
- Inspect Equipment, Including the Winch and Cable, Prior to Use and Maintain in a Safe Condition
- Attach the Trailer Winch Rope Securely to the Boat Prior to Removing from the Water
- Ensure Persons Working Around Water Are Trained to Swim

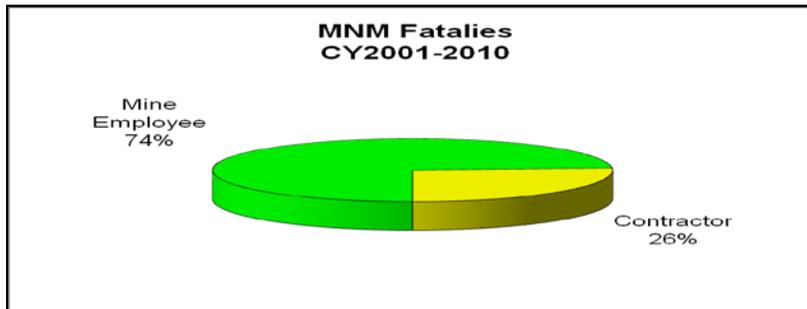
Electrocution

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

- Conduct a Risk Assessment
- Be Trained on All the Electrical Tests and Safety Equipment Necessary to Safely Test and Ground the 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 the "Bottom Terminal Lugs Remain Energized When the Circuit Breaker is Open."

Contractors represent a disproportionate number of the fatalities that occurred between 2001 and 2010: 73 fatalities or 26% of the total fatalities reported. In 2010 Contractors were involved in 43% 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 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.



Printable posters addressing the common causes of these fatalities can be found on the Alerts/Hazards section of MSHA's website, www.msha.gov.

Failure to **Lock Out and Tag Out (LOTO)** equipment power sources continues to result in mine fatalities. Over the last decade, 40 miners died in 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 log and tag to prevent reconnection and re-energization. In 2010 four such fatalities occurred, two in powered haulage conveyor accidents, one 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 earlier this year 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 still involved in **more than half** 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 them.

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 safety and health hazards. All required workplace examinations must be performed and identified problems resolved to protect workers.

Training. In 2010, 19 of the 23 (83%) miners killed had five years or less at the mine site and 6 of these miners (26%) had less than one year's experience at the mine. In addition, 15 of those 23 miners (65%) had less than five years experience at that job or task, including six (26%) 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 miners and mine supervisors on the conditions that lead to deaths and 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 work together to make that happen.

Machinery Accidents at U.S. Mine Sites



61 working miners have been killed in machinery accidents at metal and non-metal mines since 2001!

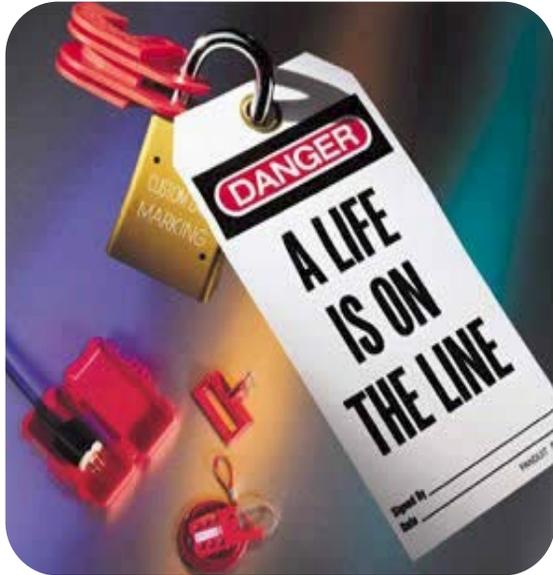
What Happened?

- 29** were struck by machinery.
- 26** were killed when machinery rolled over.
- 6** were struck or crushed by falling components.

Best Practices

- Operate equipment only on firm surfaces.
- Operate equipment away from drop-offs.
- Block equipment when in the raised position.
- Block motion of all moving components.
- Lock out all moving parts and energy sources.
- Never work under suspended loads or booms.

Electrical Safety: Always lock out, tag out!



Accidental Electrocutions

Since 2001, 40 metal and nonmetal miners were electrocuted due to improper lock-out, tag-out procedures.

How were they killed?

23 were electrocuted on energized circuits.

13 were pulled into moving machine parts.

4 were electrocuted when machine was re-energized by another person.

Best Practices:

- Comply with all electrical safety rules.
- De-energize electrical equipment before repair.
- Lock-out and tag-out the energy source.
- Test to assure the power is off.
- Release any stored energy.
- Audit your lock-out, tag-out records.

Mine Inspectors

Lock Out Tag Out (LOTO)

Best Practices

- Review shutdown procedures to make sure LOTO is addressed.
- All miners working on a circuit/equipment need to LOTO.
- LOTO procedures need to be routinely audited to check for compliance
- Have miners explain their LOTO program.
- All miners need to receive training annually on LOTO procedures.
- All energy source hazards need to be blocked or removed prior to performing repairs or maintenance.
- Compliance with 56/57.12016, 12017 and .14105.
- LOTO is personal! Never have another miner remove your LOTO.

Lock Out Tag Out (LOTO) Checklist

- ❑ Review training for LOTO program.
- ❑ Miners know their LOTO program.
- ❑ Miners are following their LOTO program.
- ❑ LOTO is monitored and enforced by management.
- ❑ All shutdown procedures address the importance of LOTO.
- ❑ Miners don't have other miners remove their LOTO.
- ❑ Circuits/Equipment being worked on have LOTO's for all the miners working on them.
- ❑ Prior to starting repair related work, a toolbox talk about LOTO procedures is conducted.
- ❑ Always check to make sure the correct circuit/equipment that you are working on is LOTO.

Attention Mine Inspectors:

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Contractor Safety at U. S. Mine Sites

Contractor deaths have accounted for nearly one-third of all fatal metal and non-metal mining accidents since 2001!



How Were They Killed?

- | | | | |
|----|-------------------------------|----|--|
| 20 | Fell to the ground below. | 14 | Were hit by falling material. |
| 13 | Were hit by mobile equipment. | 13 | Were pulled into moving machine parts and crushed. |
| 9 | Were electrocuted. | 4 | Died in hoisting or explosion mishaps. |

Best Practices

- Inspect your work area for hazards.
- Use your personal protective equipment.
- Check brakes on mobile equipment.
- Never, ever operate unsafe equipment.
- De-energize equipment and block it from movement BEFORE you begin repairs!