2016 Summary of Fatal Accidents at Metal/Nonmetal Mines with Preventative Recommendations

During 2016, seventeen miners were killed as a result of accidents in the metal and nonmetal mining industry. Four miners died in Powered Haulage accidents, four miners died in Machinery accidents, two miners died in a Falling Material accidents, two miners died in one Inundation accident, two miners died in a Fall of Persons accident, one miner died in a Blasting accident, one miner died in a Fall of Highwall accident and one miner died in an Electrical accident. Several of these reports are completed and their detailed investigation reports are posted on the MSHA website at: http://www.msha.gov/fatals/fab.htm

Here is a brief summary of these accidents:

Four miners killed in Powered Haulage accidents.
On March 8, 2016, a 54-year old miner with 5 years of mining experience was killed at a surface sand and gravel operation. The miner backed his haul truck over a dump site and the driver was found at the bottom of the embankment, 60 feet below. The victim was found unresponsive and partially submerged in water. CPR was attempted, but the victim was not able to be resuscitated.

On June 27, 2016, a 61-year old Mine Superintendent, with 24 years of experience, was killed at a limestone quarry. The victim was building a ramp to the lower bench, was positioning his haul truck to dump a load of material near the edge of a highwall, and rolled backwards over the 90 foot highwall.

On September 8, 2016, a 58-year old Haul Truck Operator with 23 years of experience was killed at a granite mine. The victim was operating a Caterpillar 773E haul truck and was returning to the pit to be loaded with shot rock. The truck veered from the right side of the haul road to the left and traveled over the berm at the top of the highwall. The truck landed upside down approximately 150 feet below. The victim was found outside the haul truck.

On Wednesday, December 21, 2016, a miner was injured when the brakes failed on his haul truck causing the haul truck to overturn. The truck was traveling from the mine site on its way to the company’s processing plant. He died several days later.

Four miners killed in Machinery accidents.
On April 11, 2016, a 61-year old dozer operator with 18 years of mining experience was fatally injured at a surface titanium ore mine. He had been leveling the haul roads into the pit with the dozer and was found lying approximately 30 feet in front of the dozer.
On August 9, 2016, a 33 year old Leadman Contractor, with 4 years of experience, was killed at a cement plant loadout. The victim was attempting to replace the lift cable pulleys on the barge loadout chute, when the anchor point for the temporary rigging separated from the loadout chute and it unexpectedly fell. The falling loadout chute caused the lift cables to tighten and the lift cables pinned the victim to the loadout chute causing fatal injuries.

On September 21, 2016, a 52 year old contract drill operator / mechanic, with more than 30 years of experience, was killed at a limestone mine while performing maintenance on a truck-mounted rotary drill. At the time of the accident, the victim was attempting to remove the spindle cap from the top of the drill head while standing on the drilling deck. The victim was using a modified pipe wrench in an attempt to loosen the spindle cap using the machine’s drill rotation hydraulics by reaching into the operator’s compartment. As the victim activated the drill rotation lever, the wrench swung and struck him. The force of the impact knocked him against the operator’s cab, denting the frame and breaking the side window while the rotating wrench pierced his abdomen. As the victim attempted to climb down an adjacent step ladder, he was observed falling to the ground and striking his head. The victim was transported to a local hospital and died later that day as a result of his injuries.

On October 9, 2016, a 61 year old Equipment Operator, with 3 years of experience, was fatally injured at a sand surface mine. The victim was attempting to attach a screen plant to a front-end loader by hooking them together with a steel cable when the equipment moved pinning the victim. The victim was later discovered injured and leaning against the loader bucket. The victim died of his injuries the following day.

**Two miners killed in Falling Material accidents.**

On February 26, 2016, a truck driver delivering multiple sections of polyurethane pipe was struck by a section of pipe during the unloading process. A forklift removed two sections of pipe from the passenger side of the truck, and then left the area with the two sections. While the forklift was away, a single, unsecured section of pipe rolled off on the driver’s side of the truck and struck the victim. Each section of pipe was approximately 50’ long and weighed approximately 1,750 pounds. Miners began first aid but the driver was unresponsive. He was transported to the local hospital and later died.

On December 19, 2016, a 62-year old Front-end Loader Operator with 6 years of mining experience was fatally injured at a sand and gravel surface mine. The victim was engulfed by sand when entered a hopper to remove a blockage.
Two miners killed in a single Inundation accident.
On June 3, 2016, a 24-year old haul truck operator, with 9 months of experience, and a 56-year old hydraulic excavator operator, with 6 years of experience, were killed at a sand and gravel operation. The two miners were working in a pit next to an abandoned roadway embankment, which partially bound an old pit. Waste clay and sand had been placed in the old pit for reclamation purposes. The embankment failed and the tailings and slurry engulfed both miners.

Two miners killed in Fall of Person accidents.
On May 10, 2016, a 46-year old maintenance man with 6 years of experience was fatally injured at a cement plant. The victim went to the top of the slurry tank to start the rake system. He fell 50 feet through a 3-foot by 4-foot opening in the walkway into the empty slurry tank below.

On September 15, 2016, a 60 year old Mechanic, with 28 years of experience, was fatally injured at a Magnesite facility. The victim was seriously injured when he fell while dismounting a front end loader. The victim was hospitalized and died on September 26, 2016.

One miner killed in a Blasting accident.
On March 22, 2016, a 42-year old lead man with 6 years of mining experience was fatally injured at a surface limestone mine when he was struck by fly rock from blasting operations. The lead man was parked in his pickup truck at a location to prevent others from accessing the blasting site. He was approximately 1,200 feet from the blast site.

One miner killed in a Fall of Highwall accident.
On July 25, 2016, a 59 year old Excavator Operator, with 17 years of experience, was killed at a limestone quarry. Prior to the accident, the victim was loading shot rock into haul trucks. While waiting for the haul trucks to return, the victim was separating out oversized rocks when the cab of his excavator was struck by falling material from the highwall.

One miner killed in a Electrical accident.
On April 9, 2016, a 25-year old plant operator with 4 years of mining experience was fatally injured at a surface copper ore mine. He was found unresponsive, kneeling with his face against a stainless steel flange that was connected to a high-density polyethylene pipe. The victim appeared to have received an electrical shock.
Best Practices

While some of the specific circumstances of these accidents remain under investigation, here are some of the best practices that can prevent them:

**Powered Haulage Accident**

These deaths can be prevented by following these Best Practices:

- Maintain berms at least mid-axle height on the largest piece of equipment using a roadway.
- Visually inspect dumping locations prior to beginning work and as changing conditions warrant. Clearly mark dump locations with reflectors and/or markers.
- Provide training to all dump-point workers on recognizing dump-point hazards, taking appropriate corrective measures, and using safe dumping procedures. Instruct all drivers to position haulage vehicles perpendicular to the edge when backing up at dump sites.
- To lower risks at dump areas, dumping should be conducted a safe distance from the edge. Utilize a bulldozer with the "dump-short, push-over" method of spoiling material.
- Ensure work areas and dump sites are properly illuminated at night.
- Equipment operators should always wear seat belts.
- Monitor persons routinely to determine safe work procedures are followed.

**Machinery Accident**

These deaths can be prevented by following these Best Practices:

- Task train persons to recognize all potential hazardous conditions and to understand safe job procedures for elimination of the hazards before beginning work.
- Train miners in safe work procedures and hazard recognition, specifically when clearing blocked hoppers.
- Ensure employees use proper housekeeping procedures in order to avoid extraneous trash from inadvertently entering feed hoppers.
- Establish and discuss policies and procedures for safely clearing hoppers.
- Equip hoppers with mechanical devices, grates/grizzlies or other effective means of handling material so persons are not required to work where they are exposed to entrapment by sliding material.
- Before working on or near equipment, ensure that the discharge operating controls are deenergized and locked out and ensure that material cannot discharge when the feeder is not activated.
• Wear a safety harness and lanyard, which is securely anchored and tended by another person, prior to entering bins, hoppers, tanks, or silos.

Falling Material Accidents

These deaths can be prevented by following these Best Practices:

• Establish and discuss safe work procedures before beginning work. Identify and control all hazards associated with the work to be performed.
• Task train all persons to understand safe job procedures and to stay clear of suspended loads. Never position yourself between mobile equipment and a stationary object. Always be aware of your location in relation to machine parts that have the ability to move.
• Ensure that line of sight, background noise, or other conditions do not interfere with communication.
• Use a tow bar with adequate length and proper rating when towing heavy equipment.
• Make yourself more visible by wearing brightly-colored clothing or clothing that is distinguishable from surroundings.

Inundation Accidents

These deaths can be prevented by following these Best Practices:

• Make sure that embankments containing ponds of water, tailings, processing waste, or other fluids are designed and constructed to be stable, and that mining operations are kept a safe distance away.
• Provide hazard training to all personnel working on or near an impoundment to recognize hazards associated with the impoundment, such as surface cracks or piping, and to recognize adverse conditions and environmental factors that can decrease stability before beginning work.
• Embankments adjoining workplaces and travelways should be examined weekly or more often if changing ground conditions warrant.
• Adverse weather, such as heavy rain, may introduce or increase hazardous conditions associated with impoundments, highwalls, and embankments. Workplace examinations to identify potential hazards should be increased as conditions change.
• Before beginning work, conduct a workplace exam of ground conditions from as many perspectives as possible (bottom, sides, and top/crest) to identify hazards, and take appropriate corrective action.
Fall of Persons Accidents

These deaths can be prevented by following these Best Practices:

- Always use the "Three Points of Contact" method. Use either two hands and one foot, or one hand and two feet when mounting and dismounting equipment.
- Keep hands free of any objects when making three points of contact.
- Maintain traction by ensuring footwear is free of potential hazards such as dirt, oil, and grease. Slip resistant material can be applied to existing foot holds and handrails.
- Use hoisting materials to transport tools and other objects to keep hands free for climbing.
- Inspect work areas for slip or trip hazards.
- Ensure steps and handrails are properly secured and free of defects and debris and always face equipment when mounting or dismounting it.
- Ensure landing areas are equipped with adequate lighting.

Blasting Accidents

These deaths can be prevented by following these Best Practices:

- Review and follow site specific blast plan prior to loading any explosives.
- Utilize technology, such as face profilers and borehole probes, to obtain specific geometric details of the material to be blasted.
- Adjust stemming depth and/or decking to maintain adequate burden on all sections of the blast hole.
- Develop a drill pattern by considering geology, face geometry, and surface topography.
- Clear and remove all persons from the blast area unless suitable blasting shelters are provided to protect persons from flyrock. Allow at least 15 seconds after a blast for any flyrock to drop.
- Examine blast site geology, communicate with the driller and review the drill log for angles, voids, competency of rock, loss of air, etc., prior to the loading any explosives. Make appropriate adjustments to ensure that the holes are not overloaded.
- Ensure blasting and fly rock areas are properly calculated to ensure the blast site is clear of all persons.
- Determine the actual burden for all face holes along their length and adjust the explosive power factor along the borehole accordingly.
Fall of Highwall Accidents

These deaths can be prevented by following these Best Practices:

- Operate excavators with the cab perpendicular to, and swinging away from, the highwall.
- Safely examine highwalls from as many perspectives as possible (bottom, sides, and top/crest). Look for signs of cracking or other geologic discontinuities.
- Maintain access to the top of highwalls so that thorough examinations can be conducted.
- Perform supplemental examinations of highwalls, banks, benches, and sloping terrain in the working area during and following inclement weather.
- Immediately remove all personnel exposed to hazardous ground conditions, barricade, and/or post signs to prevent entry, and promptly correct unsafe conditions.
- Use mining methods that ensure highwall stability and safe working conditions.
- Look, Listen and Evaluate your highwall and pit conditions daily, especially after each rain, freeze, or thaw.
- Establish and discuss safe work procedures for working near highwalls. Be your own examiner and find hazards before they find you.

Electrical Accidents

These deaths can be prevented by following these Best Practices:

- Establish and discuss safe work procedures that include hazard analysis before beginning work. Identify and control all hazards associated with the work to be performed and use methods to properly protect persons.
- Train all persons to understand the hazards associated with working near energized electrical conductors.
- Use properly rated Personal Protective Equipment (PPE) including Arc Flash Protection such as a hood, gloves, shirt, and pants.
- Ensure that all electrical systems are safely designed and properly installed and that all metal enclosing or encasing electrical circuits are grounded or provided with equivalent protection.
- Provide equipment grounding conductors, with a sufficiently low impedance to limit the voltage to ground, for metal enclosures. Use a properly rated meter to identify any stray electrical currents which may be present.
- Lock Out, Tag Out, and Try: Place your lock and tag on the disconnecting device and test for power.
Violations of the priority standards identified as **Rules to Live By** continue to be cited during investigations of mine fatalities. While not all of the fatality investigations have been completed and enforcement action taken, Rules to Live By standards continue to be identified in many of those fatalities. During inspections, MSHA’s inspectors continue to discuss, with miners and supervisors, the root causes of these fatalities and the ways to prevent recurrences.

The importance and value of effective **safety and health management programs** helps send miners home safely at the end of their shifts. A thorough, systematic review of all tasks and equipment to identify hazards is the foundation of a well-designed safety and health management program. Many root causes of fatal accidents show that management policies, procedures, and controls were inadequate and failed to ensure that persons were protected from hazards that could have been identified and then eliminated or controlled. Mine operators and contractors need to implement effective safety and health management programs and periodically review, evaluate, and update them. If an accident or near miss occurs, find out why and act to prevent a recurrence. If changes to equipment, materials, or work processes introduce new risks into the work environment, address them immediately. Conducting **workplace examinations** at the beginning of every shift can prevent injuries and deaths when safety and health hazards are **found and fixed**. Miners are protected when workplace examinations are conducted and hazards are identified and eliminated.

Take action to prevent additional injuries and deaths. Printable posters regarding the causes of some of these accidents can be found on the Alerts/Hazards section of MSHA’s website, [www.msha.gov](http://www.msha.gov). Fatalgrams describing each fatality and Best Practices to prevent a recurrence can also be found on the agency’s website.

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