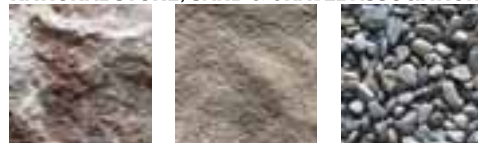




RIP & SHARE SAFETY HANDOUT



NATIONAL STONE, SAND & GRAVEL ASSOCIATION



Natural building blocks for quality of life

Electrical Safety in Metal and Non-metal Mining

Seventeen fatal electrical accidents occurred in the metal and non-metal sector from Jan. 1, 2000, through Sept. 15, 2008. In the same period, 381 electrical related injuries were reported.

Two fatal accidents occurred in 2008:

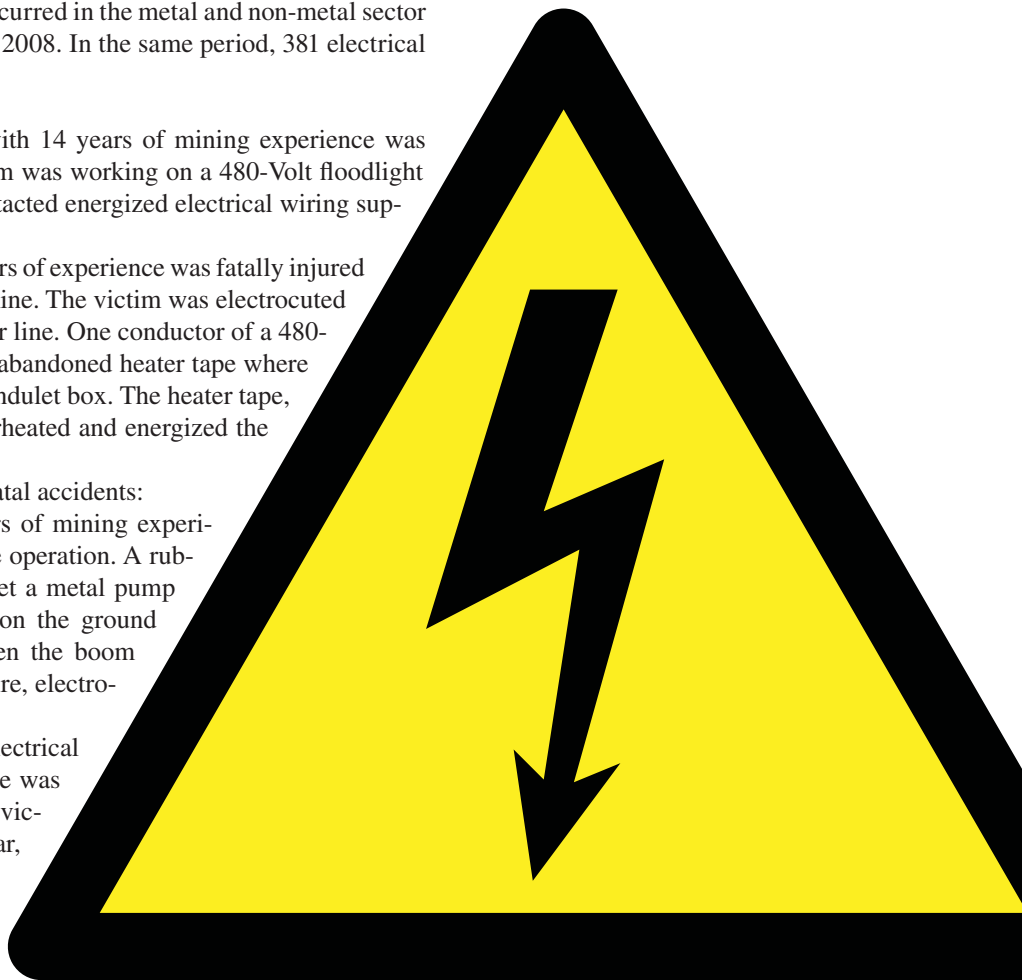
A 41-year-old apprentice electrician with 14 years of mining experience was fatally injured at a copper mine. The victim was working on a 480-Volt floodlight at the tailings booster station when he contacted energized electrical wiring supplying power to the light.

A 38-year-old shift foreman with 15 years of experience was fatally injured on the surface of an underground potash mine. The victim was electrocuted when he contacted an energized steel water line. One conductor of a 480-volt electrical circuit short-circuited to an abandoned heater tape where both circuits passed through a common conduit box. The heater tape, which was attached to the water line, overheated and energized the water line to 277 volts.

Narratives from a few of the previous fatal accidents:

A 50-year old electrician with 11 years of mining experience was fatally injured at a crushed stone operation. A rubber tired boom truck was being used to set a metal pump control house. The victim was standing on the ground touching the suspended pump house when the boom contacted an energized overhead power wire, electrocuting him.

A 46-year-old contractor assistant electrical superintendent with 20 years of experience was injured at a surface copper operation. The victim was checking a 4160 VAC switch gear, contacted an energized component and received an electrical shock. He was hospitalized and later



transferred to an extended care facility where he died on July 7, 2008.

A 49-year-old contractor electrician was fatally injured at a surface stone operation. The victim was performing repairs inside an electrical box when he contacted an energized component.

A 50-year-old foreman with 29 years of mining experience was fatally injured at a surface sand and gravel operation. The victim was in the process of making a splice in a 480-volt power cable that energized a water pump. As the victim attempted to remove the insulation, he contacted a live conductor, which resulted in a fatal electrical shock.

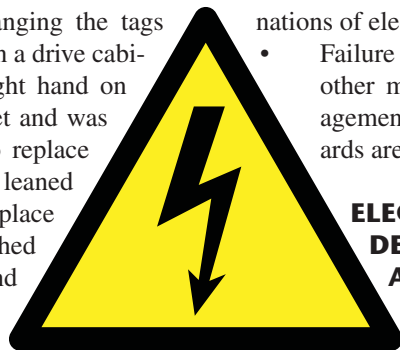
Narratives from a few of the non-fatal electrical incidents:

A miner was testing continuity on equipment prior to start-up. He was using a megger instrument on 2300V switch gear. The circuit being tested happened to be live. The megger arced and the flash burned the employee's left hand.

A miner was changing a fuse in a panel box. He stated he checked the power and made certain it was off. He pulled the fuse out and replaced it with a new fuse. When the new fuse made contact, the panel box exploded, causing burns to his hands and arms. The investigation revealed that the panel box was not locked or tagged out.

While attempting to reverse the rotation of an electrical motor, a miner received flash burns to both eyes and minor burns to his right wrist. He opened what he believed to be the correct circuit breaker. However, the wrong circuit breaker was opened, thus the power was not shut off to the motor. He was using a pair of needle nose pliers to move the wires when the arc occurred.

A worker was changing the tags on low voltage wires in a drive cabinet. He placed his right hand on the edge of the cabinet and was using his left hand to replace the wire. When he leaned down to see where to place the wire, his hair touched the 480 terminals and he received a shock, causing him to fall.



ELECTRICAL ACCIDENTS ARE AVOIDABLE

It takes a very low value of current

Current Values Through Body Trunk	EFFECT
1 milliampere or less	Barely perceptible.
1 to 8 milliamperes	Sensation of shock. Not painful.
8 to 15 milliamperes	Painful shock. Individual can let go at will, muscular control is not lost.
15 to 20 milliamperes	Painful shock. Muscular control of adjacent muscles lost. Can't let go.
20 to 50 milliamperes	Painful. Severe muscular contractions. Breathing is difficult.
100 to 200 milliamperes	Ventricular Fibrillation (fatal).
200 + milliamperes	Severe burns. Severe muscular contractions.

While attempting to isolate an electrical problem, the supervisor of a portable plant opened a switch box and put his right hand down in the area of the electrical breakers (without de-energizing the circuits) resulting in an electrical shock and burns. He suffered second- and third-degree burns to the right hand just below the thumb joint.

While investigating why a circuit breaker would not reset, the cover was taken off and the employee tried to reset it. A short circuit occurred and an electrical arc caused injuries to three miners.

These nonfatal injury descriptions obviously indicate that many more miners could have lost their lives.

A majority of the electrical accidents occurred from:

- Inadequate/improper training
- Failure to de-energize, lock out and tag
- Lack of knowledge of the locations of electrical equipment and components
- Failure to use proper equipment when performing electrical work
- Failure to adequately make examinations of electrical equipment
- Failure to communicate with other miners and mine management when electrical hazards are found

flowing through the human body to cause death or serious physical harm. The chart above illustrates the effects expected with current values:

Statistics for MNM mines indicate that on average there are 46 electrically related injuries each year. **That's 46 miners who got lucky.**

A few simple precautions will save lives:

1. SLAM Risks = Stop, Look, Analyze and Manage each job and take the steps necessary to eliminate the risk. Develop a plan of action.
2. Disconnect, lock and tag out circuits being worked on. Test to ensure power has been disconnected and any stored energy dissipated.
3. If you must work hot, be sure you have the correct personal protective equipment.

LUCK RUNS OUT – Don't work on energized circuits and do follow proper procedures. ■

This product was developed as part of the MSHA Alliance Program. It does not necessarily reflect the official views of MSHA. Use of the alliance Program logos is reserved for MSHA and its active Alliance partners. The MSHA Alliance Program is designed to promote miner safety and health through voluntary partnerships, which provide training and education, outreach, technical assistance and a national dialog on mine safety and health. For more information, contact MSHA, www.msha.gov/alliance/alliances.htm.