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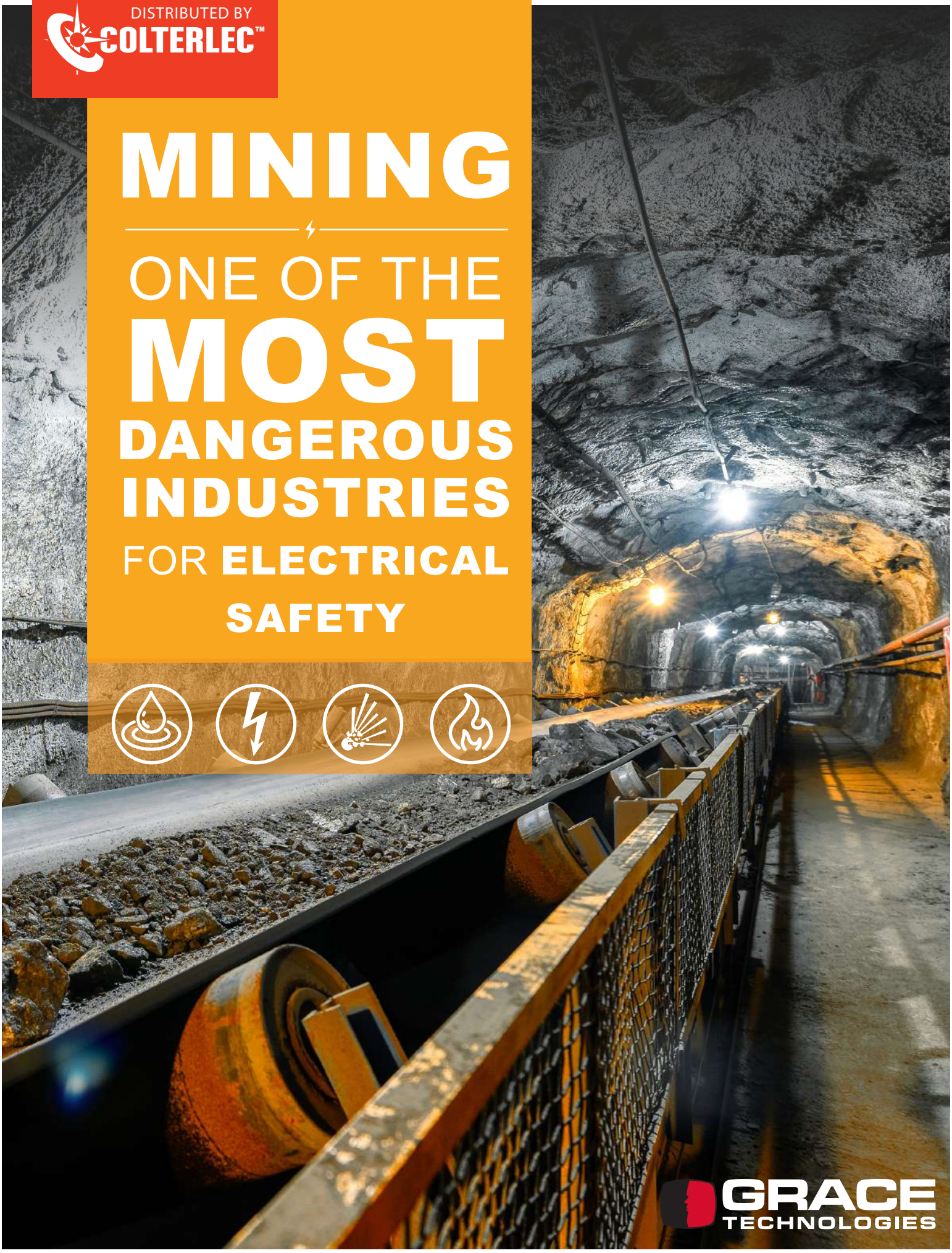
# MINING

## ONE OF THE MOST DANGEROUS INDUSTRIES FOR ELECTRICAL SAFETY



GRACE TECHNOLOGIES

Mining workers often face unique electrical hazards compared to most industries which requires a unique approach to electrical safety. These challenges make the mining industry one of the most dangerous to perform routine electrical maintenance tasks due to the extremely harsh conditions that personnel operate within. Exposed wiring and cables necessary to power mining operations are also hindered by wet and damp climates and require the utmost care for electrical safety precautions. Dust and gases generate a combustible and deadly combination that can quickly turn small electrical accidents into deadly fires or explosions.

When electrical hazards began to present themselves as one of the greatest threat to mining safety, the U.S. National Institute for Occupational Safety and Health (NIOSH), Office of Mine Safety and Health Research (OMSHR) conducted a study between 2000-2009. The study included three tasks:

1) A direct review of mining industry occupational injury data compiled by MSHA,
2) An interpretation of the narrative descriptions available for the injuries (from MSHA data) and
3) A separate examination of fatal electrical injuries. Eight-hundred sixty-five electrical injuries were reported during the 10-year period studied, with 39 of those being fatalities.

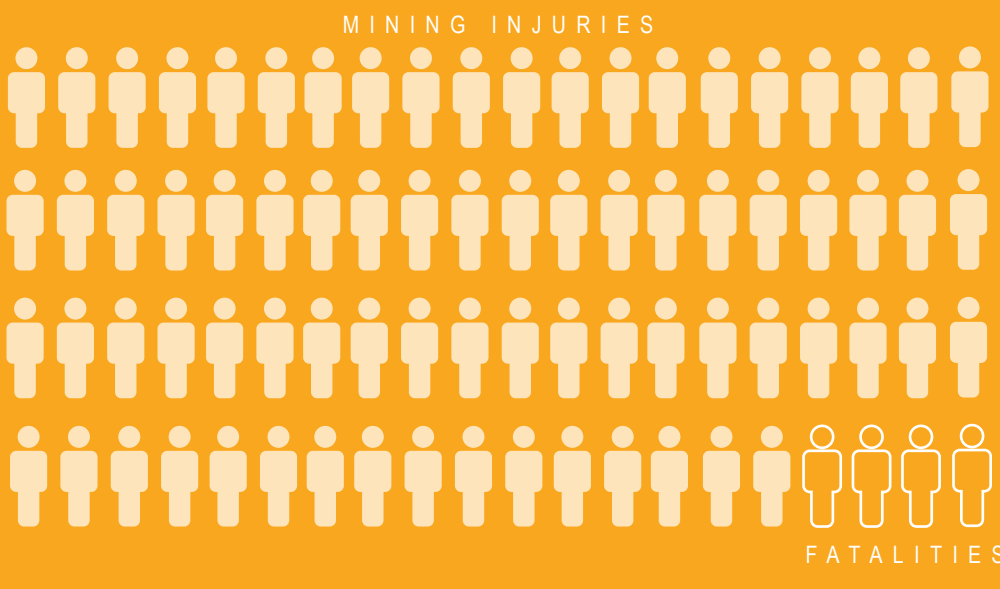
The U.S. Bureau of Labor Statistics reported that 1,573 workplace fatalities between 2003 and 2009 had an electrical cause, and an estimated 18,260 nonfatal electrical injuries, resulting in days away from work, occurred over the same period. The NIOSH, OMSHR study concluded that “There were 125,594 mining injuries reported to MSHA for 2000 through 2009, and Electrical was the 10th most frequently listed cause, with 853 injuries. Of the 853 mining electrical injuries for that period (those with the cause listed as Electrical), 39 were fatal, making electrical injuries the 6th most prevalent cause of death in mining.”

Of these injuries, 42% among them were electricians and mechanics. Contractor employees had a much greater chance of an electrical injury being fatal than did mine operator employees due to their unfamiliarity with the equipment and/or industry.

**Routine electrical and machine maintenance/ repair activities were involved in 69% of electrical injuries.**

The investigators identified the top three root causes for fatal electrical injuries as:

1) No or inadequate lockout and tagging.
2) Failure of power system components.
3) Contact of overhead electrical power lines by mobile equipment.




Of the **853 Mining Electrical Injuries** Between 2000 - 2009

**39 Were FATAL**

## As part of the **alert issued by MSHA**, the administration offered **electrical safety best practices**

**Lockout/Tagout (LOTO) circuits before working on electrical equipment.**

**Don't rush. Never work alone.** Talk to coworkers and confirm your plan is safe.

**Identify and control all hazardous energy sources before conducting any task** and follow safe work procedures.

**Train miners on equipment they may use.**

**Electricians must know how to de-energize and disconnect electrical systems and equipment.**

**Always troubleshoot without power first.**

In 2019, 3 electrical-related fatalities occurred that prompted Mine Safety and Health Administration (MSHA) to issue an alert on electrical hazards.
According to MSHA, these fatalities occurred when:

- An electrician contacted an energized component of an electrical circuit while adjusting the linkage between the disconnect lever and the internal components of the panel that supplied power to the plant feed belt motors.
- A contract electrician contacted an energized conductor while working inside a fire suppression system's electrical panel.
- An electrician contacted an exposed energized connector while troubleshooting a flooded bed scrubber motor circuit on-board a continuous mining machine.

The MSHA alert's best practices, while necessary to raise alarm, offered nothing new in terms of an employer's and a qualified electrician's responsibility when it comes to The Control of Hazardous Energy (OSHA 29 CFR 1910.147). This faithful reminder is simply a condensed and informal outline of the steps for performing LOTO.

**When LOTO is performed correctly, electrical hazards that may result in injuries or fatalities should be mitigated. However, that is not always the case.**

In an interview with Electrical and Instrumentation Supervisor, Jasyn Hiller, RSE, he shared a case he was familiar with about electricians performing LOTO correctly which proceeded to result in a shock hazard. Hiller recounted that these electricians were in the process of removing a Motor Control Center (MCC).

They had locked out the main source of energy to the MCC, then tested and confirmed absence of voltage. Having confirmed the MCC was locked out and tagged,
the electricians began to cut the cables feeding the MCC to field equipment.

As the electricians were almost through cutting the MCC section, they ran into a live cable. This created an unforeseen hazard as the cable had fed from an alternate source that went into this MCC. The live cable did not make electrical contact to the equipment or to the MCC itself. Essentially, as Hiller describes, “it was used as a junction box, inline spliced in one of the cable ways.”

Hiller described this as a unique situation and said it was like a trap that the team got caught in. “It went in and out, and that was obviously not picked up in your conventional test for dead procedure,” he said.
“It was obviously not installed to electrical code and the equipment wasn’t labeled as fit from an alternate source nor were the drawings updated to reflect the fact that a cable had entered and left that equipment.”

Jasyn Hiller has nearly 15 years of experience of electrical work in mining. This is just one of the many challenges he has encountered over those years; each one requiring a control to prevent predictable and unpredictable scenarios from occurring again. An important aspect of these scenarios to note about mining electrical safety that statistics may not always reflect is that many of these situations do not have the necessary experienced and knowledgeable staff to manage their operations. Mining operations typically have small crews of electricians or use contract electricians that do not necessarily have industry specific experience.

**This is reflective with mining’s electrical fatality rate that is 8 to 12 times higher than other industries across the US, with 1 out 22 electrical injuries mining results in death.**

This number is staggering considering all other mining-related injuries result in 1 death per 203 injuries. Nearly 75% of these electrical injuries and deaths happen while personnel are operating frequently used machines, tools, appliances, or lighting.

The reality is that a margin of human error, pressures for minimal downtime, and small, inexperienced crew operations will always exist. These statistics demonstrate the need to go beyond regulated compliance within these dangerous, volatile, and unpredictable environments. Control of Hazardous Energy is already one of the most cited violations each year by OSHA. An industry that slants towards higher-than-average risk regarding electrical safety would benefit greatly from the safety and productivity enhancements provided by Permanent Electrical Safety Devices (PESDs).

Permanently installed GracePESDs® include LED voltage indicators to verify when energy is present.


*GracePESD® Voltage Indicators with LED that illuminate when voltage is present.*

*Sources: U.S. National Institute for Occupational Safety and Health (NIOSH), Office of Mine Safety and Health Research (OMSHR), Mine Safety and Health Administration (MSHA), Center for Disease Control and Prevention (CDC)*

# In addition to **keeping voltage contact away from personnel**, combination PESDs® such as the **Voltage Test Station, offer improved productivity metrics:**

**Voltage presence LED indication will alert personnel when equipment is live,** providing better insights into what equipment cannot be accessed


**LOTO procedure times are reduced by 40%-70%** by providing safer absence of voltage testing using high-impedance protected test points

Shorter downtime periods result in a lower risk of human error

## 70% of injuries occur during reactive maintenance when safety procedures are rushed/ignored

Additionally, the Safe-Test Point™ allows qualified personnel to safely test for absence of voltage using their portable test instruments with device's high-impedance protected test points wired to the source.


When properly incorporated into a facility's written electrical safety program, PESDs protect users during mechanical LOTO with voltage presence LED indication. For absence of voltage testing, safer and more productive electrical LOTO can be performed using an individual Safe-Test Point™ or combination unit, Voltage Test Station, which are designed to enhance compliance, productivity, and reduce the risk of shock and arc flash.

GRACE PESDs®

In mining sectors, a small spark may result in a deadly combustion. Contractor electricians unfamiliar with equipment would benefit from PESDs providing a safer method of performing LOTO. Voltage presence LED indication will warn personnel when hazardous energy is present, preventing accidental contact. The return on investing in electrical safety will provide increased safety, reduced downtime, and peace of mind.

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For more information
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