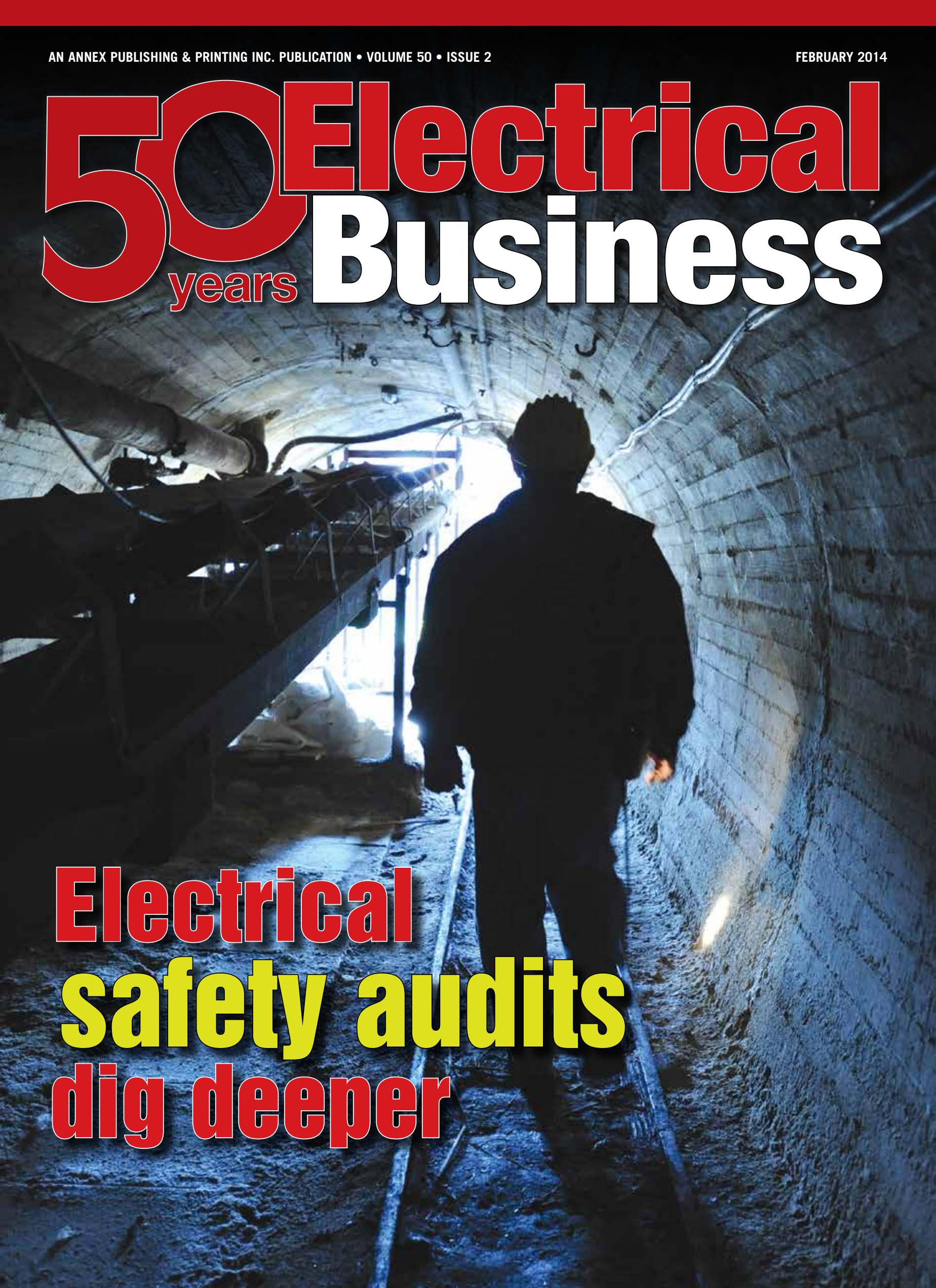
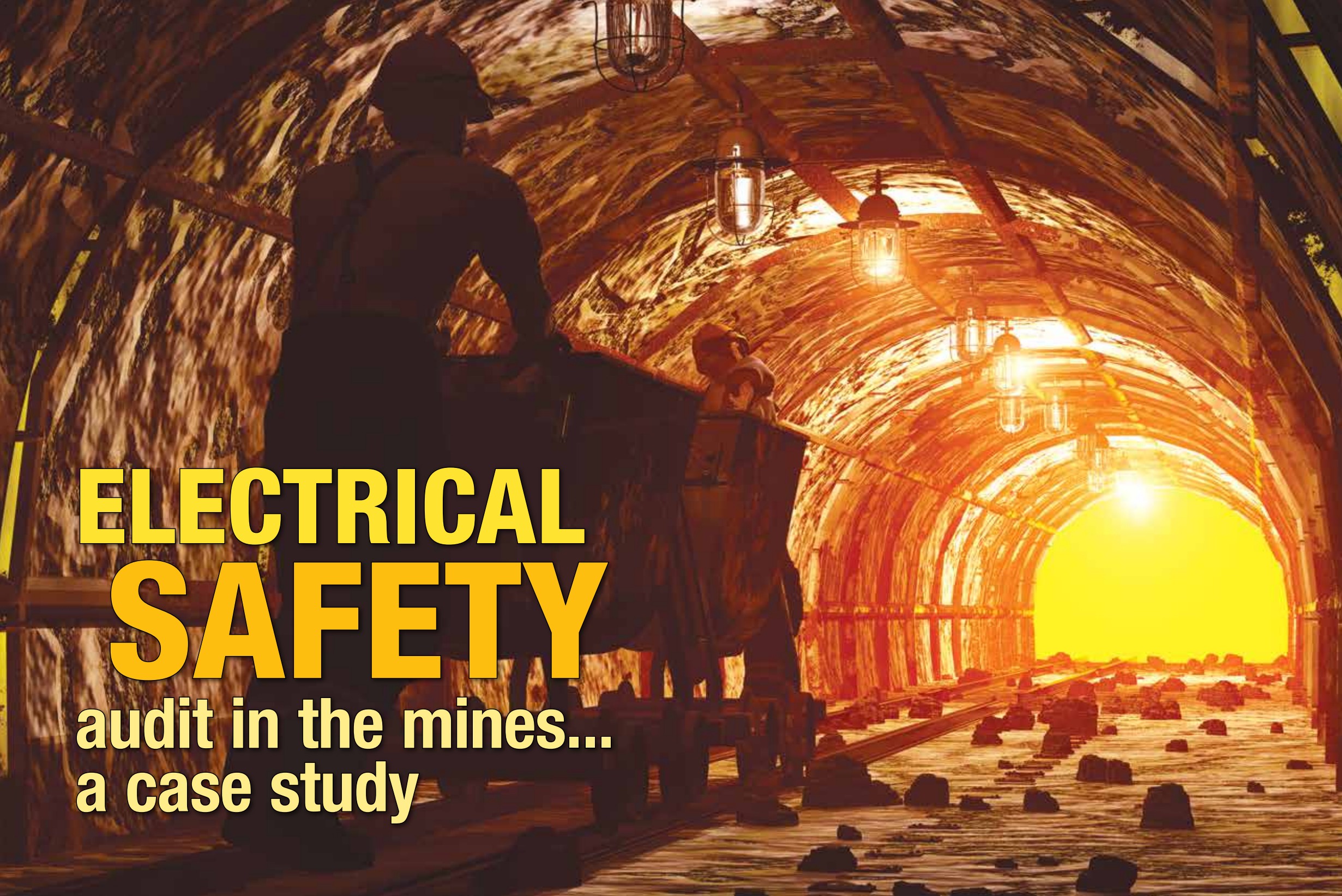


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ELECTRICAL SAFETY

audit in the mines... a case study

Terry Becker, P.Eng.

Experience is the most valuable lesson. Different industry sectors have attempted to interpret and implement practices using the CSA Z462 “Workplace electrical safety” standard as well as other applicable standards or guidelines but, from travelling across Canada and performing electrical safety audits, it is apparent we need to do a better job managing workplace electrical safety.

Here I will highlight the current state of workplace electrical safety at one company within the mining sector. Experience shows that, in many cases, a company’s ability to properly manage electrical hazards has been limited by the amount of correct information made available to them. Most companies take an approach that typically doesn’t include the development and application of an electrical safety program (ESP).

This article will reinforce my findings and

provide specific references. The goal is to ensure all workers in the workplace are not exposed to electrical hazards. When avoidance is not practicable by establishing an electrically safe work condition, then the risk related to the energized electrical work task performed needs to be reduced to as low as reasonably practicable (ALARP).

Why companies perform electrical safety audits

To have sustainable performance of the control measures you implement to mitigate or reduce the risk of worker exposure to electrical hazards, it is critical that you perform at least an annual internal electrical safety audit or an external electrical safety audit every three years.

From your interpretation of the available standards and your actual implementation, you must check to ensure the anticipated risk reduction is actually real.

Mining sector case study

While performing a detailed external electrical safety audit in the mining sector using the validation and verification techniques of interviews, documentation review and inspections/observations, I measured the success of the implementation of available controls.

Background

The mining sector company has a large underground mine, surface mill and related surface facilities. The company had completed an engineering incident energy analysis study, and detailed arc flash and shock warning labels had been applied to power distribution equipment. Arc-rated clothing, rubber insulating gloves with leather protectors, hot sticks and test equipment had been procured. Training had not been consistently provided to all qualified electrical workers, and no training at all had been provided to non-electrical workers.

STOCK PHOTO.

OH&S regulations

The applicable OH&S regs are very stringent with respect to worker safety in the mining sector. There is a general requirement to identify workplace hazards and take action to protect workers. Electrical hazards are not specifically identified within the requirements outlined by the regulator, in this case.

The company did have an overall comprehensive Occupational Health & Safety Management System (OHSMS) with a very detailed risk assessment process. The overall OHSMS included a detailed requirement for a field level hazard assessment (FLHA). Work tasks are controlled with a detailed Computerized Maintenance Management System (CMMS). There is a requirement to audit the overall OHSMS. The company had chosen to use CSA Z462 with respect to managing electrical hazards.

Findings

An OH&S management system audit is a systematic, structured approach to ensure the ‘system’ is performing as intended. All available preventive and protective control measures that have been implemented are reviewed and assessed against the expected performance—in this case, CSA Z462. At the completion of the electrical safety audit, some of the findings identified included:

- The existing OHSMS did not include any content related to electrical hazards. Incident investigation did not include information specific to electrical hazards. There was no identified process of emergency response to an electrical incident and no documented process of emergency release of a shock victim. A comprehensive lockout practice was established and followed.
- The existing FLHA process did not identify shock or arc flash. Workers were not identifying the electrical hazards and documenting the correct controls e.g. application of shock approach boundaries, the arc flash boundary, use of a procedure and selection of personal protective equipment (PPE), tools and equipment.
- An energized electrical work permit (EEWP) system had not been implemented.
- A single person was the champion for electrical safety at the mine.
- Contractors’ hazard identification processes had not been checked to confirm they were properly identifying electrical hazards and implementing appropriate controls.
- The 2-Second Rule was not used in the engineering incident energy analysis study.
- No formal electrical safety program was developed and implemented.
- Worker knowledge was not current to the requirements of CSA Z462 with respect to applicable boundaries, terms and phrases required to identify the electrical hazards and take appropriate action to implement control measures. Training had not been documented in a training matrix and provided at a regular frequency. No training had been provided to non-electrical workers.
- Maintenance shops were using some damaged extension cords.
- Risk assessment specific to an energized electrical work task was not being completed.
- Electrical-specific PPE, tools and equipment were available, but some rubber insulating gloves were found not to have been tested within the last six months. An excessive number of hot sticks were procured (over 20 when probably only five were required). No rescue hot sticks were available.
- Arc flash suit hoods did not have hood ventilation systems.
- It was uncertain whether qualified electrical workers were actually wearing the arc flash suits when required.

Recommendations

The outcome of the detailed external electrical safety audit recommended that a formal electrical safety program be developed and implemented, and that it becomes the focal point for effective

and sustainable management of electrical hazards. Specific recommendations included:

- Ensure the implemented electrical safety program provides details on electrical incident investigation and electrical-specific emergency response requirements.
- Ensure an electrical safety training matrix is developed and used to manage training requirements.
- Ensure contractors are included in the requirements of the electrical safety program.
- Ensure specific policies with respect to energized electrical work are documented (e.g. working alone, no jewelry policy, etc.).
- Update the engineering incident energy analysis to use the 2-Second Rule and further review mitigation with a target of 65 cal/cm² incident energy level or less.
- Implement an energized electrical work permit (EEWP) system.
- Update the FLHA process and implement an electrical hazard-specific FLHA complementary to the overall FLHA. Ensure qualified electrical workers complete a documented electrical hazard analysis for every energized electrical work task.
- Ensure the overall risk assessment process is applied to energized electrical work tasks.
- Implement eLearning as an effective training tool at the remote mine site.
- Review existing procedures and update them, or develop new procedures for use.
- Inventory all electrical-specific PPE, tools and equipment available.
- Improve PPE inventory management; reduce quantity of hot sticks.
- Upgrade existing arc flash suits, and arc-rated face shields.
- Implement a formal preventive maintenance process for testing rubber insulating gloves and hot sticks.

Conclusion

Upon completing the external electrical safety audit, the mining company realized they were uncertain whether the controls implemented were actually appropriate and effective. The outcome of the audit clearly identified significant gaps in performance and effective implementation of the available preventive and protective control measures.

On a go-forward basis, the mining company will implement its own annual internal electrical safety audits. A comprehensive Plan, Do, Check, Act process will be implemented with the adopted electrical safety program. **EB**

Terry Becker is a subject matter expert and the owner of ESPS Electrical Safety Program Solutions Inc., a provider of electrical safety consulting services and products. He has over 20 years of experience as an electrical engineer working in both engineering consulting, and for large industrial oil & gas corporations. Terry is the first past vice-chair of the CSA Z462 Technical Committee, and a Professional Engineer in the provinces of Alberta, British Columbia and Ontario. He is also a member of IEEE, NFPA 70E, CSA, NFPA, CSSE, CanWEA and PMI.