



Mines Safety Bulletin No. 138

Subject: Electrical arc flash hazards in mining

Date: 07 December 2016

Background

Over the five years from 2011 to 2015, 13 workers on Western Australia mine operations received injuries from arc flash incidents that required medical attention and were placed on restricted duties or lost time.

In the last three years, Resources Safety has published seven Significant Incident Reports covering arc flash incidents. Across industry there appears to be a lack of awareness of arc flash hazards and the need to put controls in place.



Summary of hazard

An arc flash is a dangerous condition associated with the uncontrolled release of energy caused by an electric arc. The temperature of the arc can be as much as four times that of the sun's surface, and it can vaporise a copper conductor to several thousand times its solid volume in a fraction of a second. The resulting explosion, or arc blast, can seriously harm people and damage equipment.

Contributory factors

Arc flash injuries usually arise when work is being conducted close to energised equipment without effective controls. For example:

- workers not wearing appropriate and adequate personal protective equipment (PPE)
- electrical equipment and cables not tested for insulation resistance prior to energising
- risk assessment not undertaken for a change in the isolation process
- work performed outside of the safe work instruction or procedure
- switchgear not subject to an adequate maintenance, test and repair program
- electrical drawings not updated to reflect changes to the electrical installation
- protection settings not calculated and set correctly.

Actions required

So far as reasonably practicable, the potential for arc flash should be minimised by using the

hierarchy of control as a guide (i.e. elimination, substitution, isolation, engineering, administration, PPE). The following actions are recommended to reduce the potential for arc flash incidents and the risk of harm to workers.

Design and installation

- Design, install, test and maintain electrical installations and equipment in accordance with the relevant standards.
- Where practicable, consider installing or retrofitting equipment such as remote switching and racking of circuit breakers, arc fault contained switchgear and/or arc flash detection systems.
- Ensure electrical drawings are updated and correctly reflect the current installation.
- Conduct a protection coordination study to provide the best possible fault clearance times to limit arc flash energy levels arising from a fault.
- Conduct an arc flash energy assessment of all switchboards and motor control centres (MCCs), and attach arc flash hazard labels so that workers are aware of the hazards and use appropriate arc flash PPE and work practices.

Supervision and training

- Provide sufficient supervisors to ensure effective supervision of electrical work.
- Educate electrical workers, supervisors and engineers about arc flash hazards.
- Confirm the competence of workers before they undertake unfamiliar electrical tasks.
- Monitor the effectiveness of, and compliance with, safe systems of work and PPE.

Work practices

- Develop, implement and review safe work procedures for electrical maintenance tasks, especially if the tasks involve working near energised equipment (e.g. fault finding).
- Undertake a risk assessment prior to electrical tasks and every time the situation or scope of work changes.
- Routinely inspect, test and maintain electrical switchgear, having regard for the original equipment manufacturer's specifications.
- Report defects or damage to electrical equipment to the manager or electrical supervisor.
- Identify all electrical supplies associated with a work task, apply isolation to the correct item of plant, and test that the isolation is effective.
- Operate electrical equipment as intended by its design.
- Consider additional control measures when working close to energised equipment (e.g. reduce protection tripping levels and operating times, install temporary barricades or shields).
- Wear appropriate PPE where there is the potential for arc flash or inadvertent contact with energised parts.

Further information

- Department of Mines and Petroleum, Mines safety alerts, www.dmp.wa.gov.au/Safety/Mines-safety-alerts-13194.aspx

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