NSW GOVERNMENT

NSW Resources Regulator

SAFETY BULLETIN

DATE: 25 MAY 2020

Electric shocks in the mining industry

This safety bulletin provides safety advice for the NSW mining industry.

Issue

During April 2020, there were five electric shock incidents notified to the NSW Resources Regulator. A further two were notified to the Regulator during the first week of May.

Electric shocks have the potential to result in fatalities due to the electric current affecting the heart rhythm and coordination (through ventricular fibrillation). Electric shocks can also directly affect breathing and may result in superficial or deep burns. There may also be secondary trauma resulting from injuries associated with the person's reaction to receiving the shock, such as a fall from height. Other effects from an electric shock may include ongoing pain, fatigue/weakness and altered sensations. The eyes, ears and kidneys may also be affected.

Depending on the severity of the shock, there may be psychological impacts ranging from depression, anxiety, phobias, cognitive function, social withdrawal, loss of concentration, fatigue and disturbed sleep.

Circumstances

IncNot0037093: A boilermaker suffered an electric shock while in contact with welding equipment in an underground workshop. He was not welding at the time.

IncNot0037112: A jumbo (drill rig) operator received an electrical shock while plugging in a submersible pump cable to the jumbo 'pump supply' outlet.

IncNot0037185: A mill operator suffered an electric shock while opening the mullock door of the surface crusher building and making contacted with the door proximity switch.

IncNot0037197: A mechanical fitter reported suffered an electric shock while torqueing up bolts while using a hydraulic tensioner unit. A welder was in the area conducting air arc gouging.

IncNot0037201: A boilermaker apprentice suffered an electric shock while operating a TIG welder in a surface hot work area.

IncNot0037296: A contracting labourer was collecting a concrete sample in the processing plant with a 240-volt coring drill. He was pulling down on the drill with one hand, while holding a steel pipe with the other, when he felt a 'tingle' in both hands.

IncNot0037311: An apprentice was stripping a cable when he felt a 'tingling' sensation. The electrician confirmed the presence of approximately 100 volts. A downstream uninterruptible power supply was isolated, removing the presence of the 100 volts.

Effects of electric shock

There are many factors that influence the severity and effects of an electric shock. They include:

- the current path through the body
- the voltage
- the frequency of supply voltage (DC, 50Hz, or high frequency)
- circuit impedance, which is affected by contact surface area, physical size of the person receiving the shock, the level of moisture in the skin, the presence of moisture and impurities in the moisture in clothing (this includes PPE such as clothes, gloves and footwear)
- duration of current flow
- timing of the shock current relative to the heartbeat.

Australian Standards AS/NZS 60479.1 and AS/NZS 60479.2 provide detail on the effects of electric current on human beings and on livestock.

More detail of these effects is provided in a presentation by Dr Chris Andrews at the 2019 Electrical Engineering Safety Seminar. Refer to his video presentation and PowerPoint slides.

Legislative obligations

Section 19 of the Work Health and Safety Act imposes a primary duty on the mine operator (and other PCBUs) at the mine to ensure, so far as is reasonably practicable, that workers and other people are not exposed to health and safety risks arising from the business or undertaking. This includes ensuring, so far as is reasonably practicable:

- the provision and maintenance of safe plant and installations

- the safe use, handling, and storage of plant
- provision of information, training and instruction
- supervision.

The mine operator is required to develop and implement a control plan for the management of risks associated with the use of electricity at the mine (WHS(M&PS) regs clause 26(5)), and must take into account all matters identified in of Schedule 2, clause 3 – *Electrical Engineering control plans*, including:

(3)(2) An electrical engineering control plan must set out the control measures for the following risks to health and safety associated with electricity at the mine or petroleum site taking into account the matters set out in subclause (3)—

(a) injury to persons caused by direct or indirect contact with electricity,

(b) injury to persons caused by working on electrical plant or electrical installations.

Recommendations

Mine operators, and other PCBUs, should review their electrical engineering control plans to ensure that risk controls for electric shock are appropriate for the activities at the mine. This should include a review of how effectively the risk controls are being implemented. Reference should be made to the Electrical engineering control plan code of practice, which provides guidance in respect to these matters.

The review should include the following:

- Energy isolation procedures, including suitable verification checks for sources of stored energy and back feeds from other equipment, such as:
  - emergency generators
  - uninterruptible power supplies
  - renewable energy sources.
- Identification of fit-for-purpose equipment, including:
  - use of extra low voltages for field devices
  - use of pneumatic or battery powered tools instead of mains powered tools in damp environments

- welding equipment with appropriate hazard reduction devices (HRD's) and an open circuit voltage suitable for the environment.

- Maintenance practices to ensure risk controls designed into the equipment continue to perform in the intended manner, such as:
  - ingress protection (IP) ratings for dust and moisture.
- Competence of workers and supervision of work activities, including:
  - the level of supervision provided is appropriate to the competence of workers (i.e. apprentices and trainees require more direct supervision)
  - the competence of supervisors (i.e. where work activities are supervised by non-electrical personnel, the competence of the electrical worker must be higher).
- Procedures for procurement and for the introduction to site of new equipment to ensure that only equipment that meets the mine's standards are accepted and used on site.
- Control of the work environment to ensure that other workers are not affected by activities that are being undertaken elsewhere.

NOTE: Please ensure all relevant people in your organisation receive a copy of this safety bulletin and are informed of its content and recommendations. This safety bulletin should be processed in a systematic manner through the mine's information and communication process. It should also be placed on the mine's common area, such as your notice board where appropriate.

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