Safety Alert

Date: September 2025

Electric shock from 11kV ethylene propylene rubber (EPR) insulated cable

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

Incident

A contract worker took oil samples on a 66kV/11kV transportable substation at an open-cut coal mine in the Hunter region on 23 June 2025. After taking a sample from the automatic tap changer, the worker repositioned and their arm made contact with the cable tray and cable sheath simultaneously, resulting in an electric shock.

The worker was assessed by ambulance paramedics including a 12-lead electrocardiogram (ECG) and was deemed fit to return to work.

Figure 1: 11kV EPR insulated cable installed between the transformer bushings and an adjacent 11kV switchboard

Investigation

The cable involved in this incident was a single core 120 mm^2 ethylene propylene rubber (EPR) insulated panel wire 12.7/22kV, also known as a HVPW cable.

Multiple manufacturers and suppliers provide similar cable constructions.

The key design feature of this HVPW cable is the semiconductive extruded layer, which is outer black covering that is used as a conductor screen. The purpose of this layer is to help distribute electrical stress evenly and prevent stress points forming, which could lead to cable failure.

Figure 2: Example illustration of a single core 120 mm^2 ethylene propylene rubber (EPR) insulated panel wire 12.7/22kV

The mine's investigation identified a peak open circuit voltage of 812VAC measured between the external cable sheath and the earthed cable tray.

The mine repeated the open circuit voltage test with a 1.25kΩ resistor installed in parallel to earth, to simulate the impedance of a human body. This simulation dropped the open circuit voltage to 1.1VAC with a measured current of 2mA.

Contributing factors

Further investigation with the cable manufacturer identified a list of specific installation requirements for this cable type, these are detailed within the manufacturer's installation guide. Below is a list of common installation errors for this cable type:

- HVPW cable installed external to metallic housed switchgear or substations.
- HVPW cable installed exposed to the elements/sunlight.
- HVPW cable installed touching other conductors or metallic structures (e.g. cable trays).
- HVPW cable installed in applications with more than 10 metres in length.
- Inadequate earthing of the semiconductive extruded layer.
- Use of unsuitable support systems for the HVPW cable.
- HVPW cable installed with bends exceeding the minimum bending radius.
- HVPW cable damaged during installation i.e. with indents or scuffing of the semiconductive extruded layer or with air pockets/bubbles in the EPR layer or between layers.

The incorrect installation of HVPW cable could result in:

- electric shock incidents from contact with the semiconductive extruded layer
- arc flash incidents or injuries
- corona discharge
- premature cable failure.

Recommendations

All mine operators should:

- review the mine's high voltage cable installations to confirm the cable types used
- assess the risk of high voltage cable installations and ensure that controls are implemented to manage risk as low as is reasonably practicable.
- Where HVPW cable is installed, review the installation against the manufacturer's requirements.

Note: Please ensure all relevant people in your organisation receive a copy of this safety alert and are informed of its content and recommendations. This safety alert 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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