



Electrical Engineering Safety

Decision Sheet 5.4

Electricity Distributor Supplies to Mines – General Considerations

A basis for consistent application of Electrical Engineering Safety issues across NSW

Decision Sheets are developed by the Inspectors of Electrical Engineering in response to issues raised or questions asked by others in the DPI, in particular Mine Safety Operations and from our external clients. They are for use by any staff in Mine Safety Operations, but primarily by Electrical Engineering staff. They can be distributed externally to the DPI.

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PREPARED BY: THE ELECTRICAL TEAM

APPROVED BY: J F WAUDBY SENIOR INSPECTOR OF ELECTRICAL ENGINEERING

Ph: 02 4931 6641 Fax: 02 4931 6790 Email: john.waudby@dpi.nsw.gov.au

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Preamble

Many mines (coal, metals and extractives) receive their electrical supply from Electricity Distributors. Many mines receive the supply at high voltage (110kv, 66kv,

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33kv, 11kv). This type of supply is often by OHL's. The location where the mine takes control of the electricity supply and carries out mining and associated work is often well defined. Any fault on the system or activity that causes a supply trip is completely in the control of the operator. However in some situations the OHL crosses the operation boundary and before the mine has complete control of the electricity supply there is a possibility that mining and associated activities can interact with the supply, eg a truck body contacting an OHL. The mine has no control of the electrical protection and isolation arrangements and it is possible for the electricity distributor to arrange supply circuit breakers to automatically reclose. The mine may not be able to make suitable arrangements with the electricity distributor on this matter.

As this electrical infrastructure supplies the operation, it should comply with the legislation.

Also refer to Electrical Engineering Safety Decision Sheet 5.3

Issues

Controlling the risks from distributor owned assets that supply a mine.

Earthing - Should the electricity distributor assets comply with the mining legislation, that is comply with AS/NZS3000 and AS3007?

Isolation points and prevention of reclosure onto faults on infrastructure within the operation boundaries.

Contact with OHL's.

Position

There is no technical reason why the electricity distributor assets can not comply with AS/NZS3007 and AS3007.

It is the mine's responsibility to make arrangements with the electricity distributor so that compliance with mining legislation is achieved. If interconnection of electricity distributor earths and mine earths cause the mine to not comply with touch voltage

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and clearance times specified in AS3007, then they can generally be separated so that faults on the electricity distributor assets are not transferred to mine assets.

Points to consider for the electricity distributors infrastructure are:

Design:

- Prevent dangers arising from auto reclosure onto a fault, that would affect the mine site (possible methods: HRC, directional relays and/or local non-auto-recloser at boundary);
- There should be a suitable isolation and protective device installed where the overhead line (OHL) crosses into the mine property. This device should be arranged to prevent automatic reclosure.
- Equivalent arrangements may be able to be provided by the electricity distributor at points away from the mine property – suitable contractual arrangements will need to be in place.
- Protection setting and clearance times to comply with AS3007 step and touch potential limits, minimum protection requirements will:-detect and clear earth faults, short circuit conditions and overloads;
- Protection to be designed to take into account possibility of an arcing fault (ie trip at 50% of prospective fault current);
- Professionally designed and documented earthing system and injection test to confirm compliance with AS3007 for step, transfer and touch potential,

earth potential rise (EPR) from high tension fault to earth to be low because personnel are likely to be present.

overhead earth wires can significantly reduce the step and touch potentials (refer: Design and construction of overhead lines, CB1);

Recommend separate high voltage and low voltage earth systems where there is the possibility of excessive transfer potential;

Mine to install equipotential bonding conductors on metal structures that could be dangerous due to high touch potentials;



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- Design consideration should place all electrical OHL's and substations away from all mining activities for the life-cycle of mining operation;
 - Plan to install power lines alongside boundaries of the mining area and/or use underground cables where risk of contact is present;
 - Increased minimum conductor heights to take into account mining equipment, drills, trucks, excavators. 10 to 12 m high is good;
 - Barriers to prevent access into restricted areas:
 - Surface signage to indicate presence of earthing system and its boundaries;
 - Signage and controls eg. goal posts, marker posts to prevent accidental contact with OHL's,
 - Restrictions on use of land below OHL's. Easement corridor under network 33/66/132 kV transmission lines that supply the mine site
- Design considerations should prevent dangers arising from reclosure onto a fault that can impact on the operation (HRC fuses, directional relays, local non-auto reclosers on the boundary of the operation)
- Power supply lines (overhead and underground, including earth grid/mats) to be identified on plan;
- Precautions where 33/66/132 kV transmission lines cross above site 11kv/415V power lines eg. use of insulated conductors on 11kv/415V.
- Emergency contact and response plan agreed to by provider and customer, and trialled.
- Inspection of OHL's before restoration of power.
- Adequate means to prevent unauthorised access to poles, switchrooms, and transformer substation yards.
- Inspection and tests of earthing and added controls at 11 or 13 month intervals (thus tests are done over all seasons over a period of 8 to 10 years)
- Documentation of earthing and protection settings.



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- Assistance to site manager to implement an awareness and safety inspection system.
- Pole inspections including sub-surface termite and rot tests. Adequacy of stabiliser and guy wires, cross arms and identification of physical damage to poles
- Maintenance of transformers and switchgear, breathers, insulators and surge/lightning diverters

Protection from effects of direct lightning strikes and from imported lightning on power lines.

- Compliance to AS1768.
- In particular, to minimize the magnitude of incoming lightning surges on overhead electricity supply service lines, overhead earth wires should be provided on all overhead electricity supply service lines within 1.5 km of the mine.
- Additionally, Surge Protection Devices should be installed at the termination of the overhead electricity supply service line for protection of connected cables or equipment.

