



Procedure

Electrical Safety Management

1 Purpose and scope

The Purpose of this Management Plan is to maintain safe working conditions by ensuring that all electrical equipment is correctly installed and kept in good order by competent and authorised persons and that all operational and health and safety risks associated with electrical work are adequately identified, assessed, managed and reviewed.

This Electrical Safety Management Plan provides mandatory requirements to support implementation and conformance with Roy Hill Operations HSES Performance Standard 05 - Working with Electricity, but is not intended to replace or override any legislative requirements or Australian Standards which shall be used in conjunction with this procedure.

This Management Plan applies to all persons entering Roy Hill operations, other workplaces or any area which Roy Hill has accountability.

2 General Requirements

2.1 Electrical Drawings and Records Management

Electrical records and documentation in compliance with statutory requirements and to facilitate maintenance and operational needs shall be maintained for each site.

Plans shall be maintained on a mine site showing the location of all high voltage cabling and equipment, main switches and buried electrical services.

All site based minor modifications to as-built electrical drawings shall be submitted to the Electrical Supervisor for approval. All major changes shall follow the engineering change process.

All approved amended plans for minor and major changes on electrical drawings shall be store with the electrical plans on site as per Mines Safety and Inspection Regulation 5.13 – Records to be kept.

2.2 Access to Electrical Work Areas

Any room, enclosure or other place used principally for the installation of electrical equipment (controlled area) shall be designed, such that by the placement of a lock or requirement for use of a tool, access is restricted to authorised persons only.

Access to an electrical cabinet or other enclosure with exposed energised terminals in excess of 1000V is prohibited.

All electrical panels located outside of a controlled area shall be effectively locked to prevent unauthorised access with the exception of those used in residential applications. Locks may be omitted subject to a risk assessment approved by the Area Manager.

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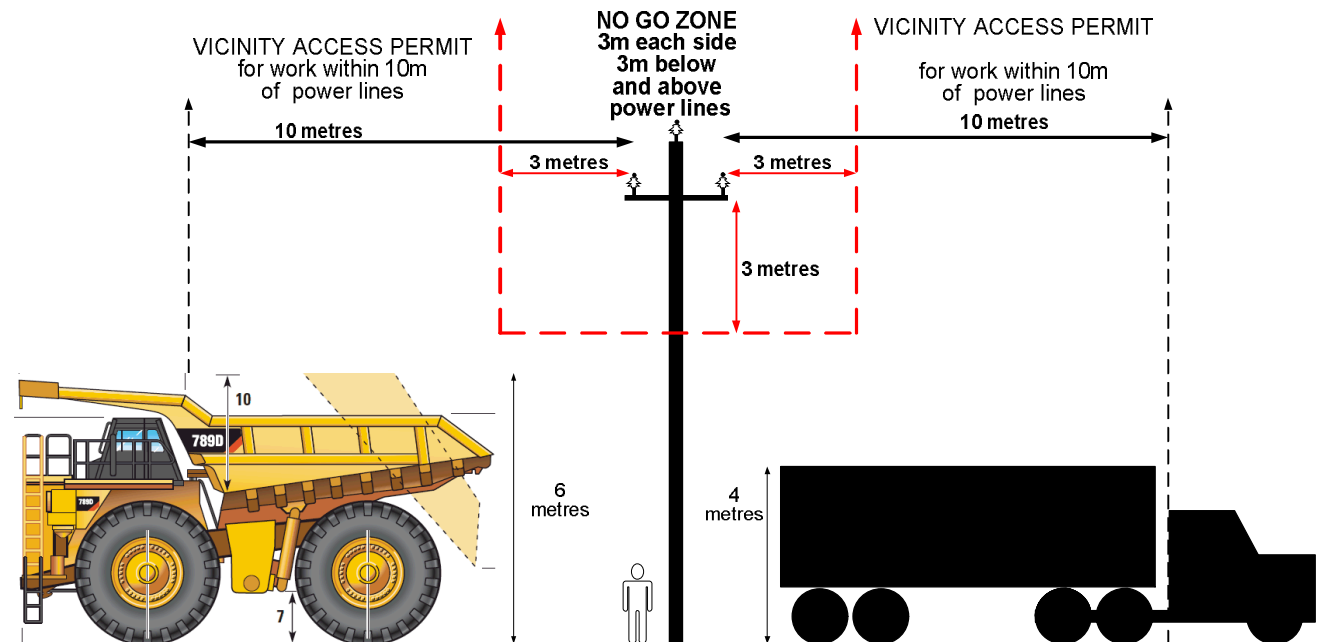
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The covers of electrical panels and enclosures shall be secured so that no access to energised parts is possible without the use of tools or keys. All fasteners securing electrical covers shall be in place and adequately fastened.

2.2.1 Overhead Power line Corridor Access

No work shall be performed within the Powerline Corridor, 10 metres either side of an overhead high voltage powerline, without a Vicinity Access Permit in place.

No work shall take place within 3 metres of a live powerline conductor.



Refer to the High Voltage Isolation Procedure [000RH-0000-HS-PRO-0016] for further information regarding the issue of Vicinity Access Permits and High Voltage Access Permits.

2.3 Electrical Appointments

2.3.1 Electrical Supervisors

Were required Electrical Supervisors shall be appointed in accordance with Regulation 5.9; 5.10, 5.11 to ensure all statutory obligations under the Mine Safety and Inspection (MSI) Regulations Part 5 are met and complied with.

To be eligible for this appointment, a person shall:

- Hold an electrical engineering qualifications acceptable for engineer membership of the Institution of Engineers Australia; or
- Hold a current West Australian electrical worker's licence endorsed "electrician" or electrical mechanic issued under the Electricity (Licensing) Regulations 1991; and
- Have not less than 2 years relevant experience of electrical work in the mining industry, or in other heavy industry.
- Hold a current certificate in cardio pulmonary resuscitation (CPR) and Low Voltage Rescue Training.

Shift rosters shall be considered when appointing Electrical Supervisors to ensure coverage is maintained at all times.

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2.3.1.1 Electrical Supervisor Accountabilities

- Ensuring all electrical work carried out is adequately supervised
- Ensuring that electrical installations and equipment are installed, maintained and tested in accordance with Regulatory requirements and related Australian Standards
- Developing and maintaining a system to ensure electrical work is performed only by persons competent and authorised to do so
- Ensuring details required under Part 5 of the Mine Safety and Inspection Regulation 1995 are recorded in the electrical log book
- Ensuring electrical installation work is certified by the relevant Contractor nominee or in-house installer licence nominee
- Investigating and reporting of defects and accidents to the Registered Manager/Asset Owner and supply authority.

2.3.2 High Voltage Operator

Any person appointed as a high voltage operator shall be appointed in writing by the registered mine/locality manager, with this appointment recorded in the Mines Record Book to carry out duties in accordance with MSIR (1995) 5.7, 5.9, 5.18, 5.28 and must possess:

- A current West Australian electrical worker’s licence; and
- A formal High voltage switching operator certification, recognised in Western Australia.

All high voltage personnel appointed shall complete the Roy Hill Section 44 Appointed Person Training.

Note – Although the MSIR doesn’t apply to the Rail controlled areas the process has been adopted and will be adhered to.

2.3.3 Electrical Nominee

Any person appointed to a nominee role must have successfully completed the nominees course and possess a current West Australian electrical workers’ or electrical contractor’s licence.

The Electrical Nominee may also be the appointed Electrical Supervisor.

The Electrical Nominee shall be responsible to ensure continuity of the In House Licence and will be an appointment under Section 44 MSIA and be recorded in the Mines Record Book.

2.4 Electrical Log Book

An approved Electrical Log book shall be maintained as per the requirements of the Mine Safety Inspection Regulations for all Mine Sites. This requirement also applies to Rail even though they may not come under the Mine Safety Inspection Act.

The Accountable Manager shall sign off Electrical Log Book entries at a frequency of no less than once every six months.

Details of all new electrical installing work shall be entered into section one of the Electrical Log Book and this electrical work shall be certified by the electrical contractor or In-house nominee within 28 days of the work being performed by an Electrical Worker.

The following information shall be entered into section two of the Electrical Log book and be verified by the signature and licence number of the electrical supervisor:

- All notifiable events, electrical incidents and accidents/shocks

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- Maintenance and test results of electrical equipment;
- Test results of the effectiveness of the earthing system and continuity of earthing conductors
- Electrical equipment replacement.

Note: this does not apply to daily or pre-use pushbutton tests on portable Residual Current Devices (RCD).

2.5 Electrical Competency Requirements

No electrical work shall be undertaken unless the person is authorised to carry out that work and holds a current West Australian electrical Licence or permit issued under the Electricity (Licensing) Regulations 1991.

Where an electrical licence has specific restrictions or conditions placed on it by the issuing authority, the respective worker shall not under any circumstances carry out electrical work beyond the scope of the licence conditions.

Where electrical work is not subject to a licence or permit or is subject to compliance under any wiring rules - AS/NZS3000:2007 requirements, then the person shall be experienced and competent in the work to be performed. This person is still subject to all requirements as an electrical worker by this management plan.

All licensed, permitted or otherwise competently deemed persons performing electrical work on any Roy Hill sites are accountable to the appointed Electrical Supervisor and shall submit their license, permit or competency details to the appointed Electrical Supervisor for inspection and record purposes before commencing any electrical work on site.

Note – The completion of electrical tag and test certification task does not require a person to hold an electrical licence.

2.5.1 Portable Appliance Testers – Non electrical personnel

2.5.2 Electrical Hazard Awareness

All personnel potentially exposed to electrical hazards shall receive electrical awareness at the commencement of their employment during the induction process. Additional Electrical awareness sessions may also be rolled out as toolbox topics, notices, posters etc. as required.

2.5.3 Training requirements for Substation Entry

All personnel needing to enter a controlled substation area for work purposes shall complete a Sub Station area orientation, possess a current first aid certificate, CPR refresher and be trained in low voltage rescue.

Upon successful completion of this orientation and associated competencies, their access shall be authorised.

Any contract electrical personnel who meet the criteria must report to the area electrical supervisor prior to entering any substation and when they are leaving the substation.

A visitor to these areas shall be escorted at all times by a competent and authorised person, to ensure all hazards to the visitor are identified.

2.6 Electrical Incidents and Incident Investigation.

Any electrical incident shall be reported to the appointed Electrical Supervisor and Registered Manager/ Area Manager.

The following incidents shall have a record made in the electrical log book:

- Any electrical shock or burn received by a person;
- any fire suspected to be caused by electricity; and

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- any dangerous occurrences involving electricity which could have caused injury to a person.

Every electric shock or burn to a person and dangerous occurrence involving electricity shall be reported to the Director Energy Safety as well as the Department of Mines and Petroleum District Inspector for the region in which the mine is situated as soon as possible after the occurrence.

The following electrical incidents shall be immediately reported to the relevant Registered Manager or Area Manager:

- An electric shock which does not require medical or first aid treatment
- An electrical incident where no injuries are sustained, but precautionary medical treatment is sought
- An electrical accident which requires medical or first aid treatment and includes fatalities.

The appointed Electrical Supervisor for the area shall be a member of the investigation team for electrical incidents, electrical fires and dangerous occurrences involving electricity.

Any person suspected of receiving an electrical shock shall be transported to the site medical facility for review.

3 Electrical Work

3.1 No Live Work

Electrical work on energised equipment or in close proximity to energised equipment is prohibited unless that work has been approved by the issue of an [Electrical Energised Live Work permit \[OP-FRM-00021\]](#) and is in accordance with AS/NZS 4836:2011 and the Code of Practice Safe Low Voltage Work Practices by Electricians as published by Energy Safety. .

3.1.1 Low Voltage Testing Commissioning and Fault Finding

Testing, commissioning and fault finding may require proximity or access to live equipment. A safe system of work shall be developed for each task in accordance with the requirements of Energy Safety Code of Practice for Safe Low Voltage Work Practices by Electricians. The safe system of work shall include assessment of the following;

- A risk assessment of the task
- Personnel are qualified , competent and correctly approved/appointed
- Use of suitable insulated test tools and instruments
- Appropriate PPE and/or shielding to mitigate against inadvertent contact to live parts
- Appropriate PPE for arc flash hazard risk
- Identification of isolation points
- Requirement for trained safety observers

3.1.2 High Voltage Testing, Commissioning and Fault Finding

The requirement for proximity to or access to live HV equipment operating at power frequency and system voltages is not approved. Procedures for isolation, switching and restoration of power are covered elsewhere in this document.

Testing, commissioning and fault finding utilising HV test equipment may require proximity or access to live test equipment. A safe system of work shall be developed for each test task.

The safe system of work shall include assessment of the following;

- A risk assessment of the task
- Personnel are qualified , competent and correctly approved/appointed

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- Use of suitable insulated test tools and instruments
- Appropriate PPE and/or shielding to mitigate against inadvertent contact to live parts
- Appropriate PPE for arc flash hazard risk
- Identification of isolation points
- Requirement for trained safety observers

3.2 Electrical Supervision

All electrical work shall be supervised by competent persons commensurate with the level of work being undertaken. The electrical supervision function shall be detailed in the works plan. No work shall commence without notification to the appointed Electrical Supervisor.

The Electrical Supervisor retains at all times the right to access and inspect the electrical works being undertaken whether directly involved with the work or not.

3.3 Electrical Installing Work

Persons initiating electrical installing work shall provide a completed Intent to Commence Electrical Installing Work form to the area Electrical Supervisor prior to the commencement of the work.

Prior to any high voltage installation the complete details of the proposed installation are to be submitted to the DMP.

Requests for construction power shall be submitted to the Electrical Supervisor. Offsite requirements shall be submitted to the relevant network operator or Energy Safety where no network operator exists.

Electrical installing work shall be performed and tested in accordance with AS 3000 Wiring Rules and the WA Electrical Requirements. Construction premises shall also comply with AS 3012 Electrical installations – construction and demolition sites. NOTE: When on a mine site there are additional requirements under the Mine Safety & Inspection Regulations 1995.

A Preliminary Notice and Notice of Completion shall be submitted to the relevant network operator (where a network operator is involved) within the defined timeframes as per the Electrical (Licensing) Regulations 1991.

An Electrical Safety Certificate shall be submitted by the relevant Electrical Contractors Licence Holder for all electrical installing work and modification completed.

The above requirement does not apply to work completed under an In House licence.

3.4 Energising of Electrical Installations

Prior to the energising of new installations a Notice of Energisation (NOE) shall be submitted to the Electrical Supervisor to seek approval to energise the electrical works. The Electrical Supervisor shall review the NOE and supporting documentation (e.g. test sheets, commissioning results, and the like) and either approve or reject the NOE.

3.5 Electrical Maintenance

Electrical installations shall be maintained so far as reasonably practicable, to the standard of their original installation, to ensure the safety of all equipment and cables.

Electrical maintenance and testing systems shall be put in place.

3.6 Appliance Testing and Tagging

All electrical appliances, including electrical equipment adaptors that plug directly into the socket outlet without the use of a 240/415 volt supply cable (portable electrical equipment), shall be tested and tagged in accordance with the Testing & Tagging Electrical Appliances Procedure [050RH-0000-HS-PRO-0021].

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These tests shall be performed prior to initial introduction to service and throughout the equipment's service life at the following frequencies:

- Portable electrical equipment and extension leads - quarterly
- Stationary electrical equipment and kitchen appliances– annually
- Office electrical equipment - five yearly.

Equipment found to be defective shall be repaired or removed from service.

The appointed Electrical supervisor has at all time the right to inspect and request testing of any electrical equipment on site at any time, regardless of ownership, and instruct that the equipment be removed from service if defective.

General knowledge and requirements of appliance and cord testing and tagging shall be part of the induction process.

Appliance testing and tagging shall be programmed into site maintenance planning system. Records of completed checks shall be kept for review and audit.

3.7 Residual Current Device Testing

Residual Current Devices shall be tested and records kept in compliance with regulatory requirements.

Residual Current Devices testing shall be programmed into site maintenance planning system. Records of completed checks shall be kept for review and audit.

3.8 Plant Statutory Checks

Statutory checks shall be performed in compliance with regulatory requirements

Statutory checks shall be programmed into the site maintenance planning system, section two of the area electrical log book referencing test results or location of test results, work order number, date completed, electrical workers name and EW licence number.

All record sheets for completed checks shall be kept for review and audit.

3.9 Low Voltage Switching, Isolation and Restoration of Power

Low Voltage isolation and switching procedures shall comply with the LV switching WIN and site isolation and tagging procedures. Personnel shall be trained and authorised as LV switchers.

“Tripped/Faulted” electrical equipment may be reset once by the field operator with authorisation from the electrical supervisor and if the equipment trips/faults a consecutive time it shall be investigated, repaired and reset by authorised electrical personnel only.

The site LV switching WIN will include provisions for;

- Switching procedure for isolation and restoration of power
- PPE requirements
- Rescue/emergency response plan

3.10 High Voltage Switching, Isolation and Restoration of Power

Site HV switching work instructions (WIN) shall comply with the High Voltage Procedure and the Isolation and Tagging Procedure.

Personnel shall be trained and authorised as HV switchers. Appointment of HV switchers shall be in writing by the Registered Manager for mine sites and/or by the General Manager for other areas in accordance with

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Mines Regulations requirements. HV switching authority shall be hierarchy layered to the sites appropriate switching needs. HV switchers shall be retrained/competency tested at minimum 2 year intervals.

“Tripped/Faulted” HV electrical equipment shall be investigated, repaired and reset by authorised electrical personnel.

The site HV switching procedure will include provisions for;

- A system of HV access permits
- Switching plans for isolation and restoration of power
- Testing and commissioning procedure
- Verification of switching plans by an a higher tiered HV switcher
- PPE requirements
- Registered key HV padlock system in place with HV padlock key holders restricted to authorised persons as part of the HV switcher appointment process.
- Rescue/emergency response plan

3.11 Personal Protective Equipment (PPE) for Electrical Work

All individuals entering a controlled area or performing electrical work shall wear approved PPE. Metallic personal adornments, such as watches, necklaces, earrings, exposed metal zips and large metal belt buckles shall not be worn whilst performing electrical work in the vicinity of live electrical equipment.

Persons who enter a controlled area shall be wearing PPE consisting of:

- Ankle to wrist cotton clothing;
- Medium impact safety glasses;
- Non-conductive Leather boots;
- Leather gloves as required for the work being performed;
- Persons who enter a high voltage substation with exposed high voltage apparatus shall wear a hard hat in addition to the PPE mentioned above (a higher category rating may be required dependant on the task.

Additional PPE is required for those workers high voltage electrical switching.

3.11.1 Insulated Gloves

Insulated gloves shall be used in accordance with LV and HV operational and maintenance procedures/WIN.

LV PPE shall be selected in accordance with AS/NZS 4836:2011 and the Code of Practice Safe Low Voltage Work Practices by Electricians as published by Energy Safety

Tasks are to be rated as high or medium risk:

1. High risk is electrical work conducted where there is an exposure to high fault currents (e.g. working in distribution boards with escutcheon open or any other relevant works in the vicinity of “exposed” live equipment).
2. Medium risk electrical work conducted where there is an exposure to low fault currents (e.g. fault finding in distributed IO panels or control panels where terminals are not exposed). A risk assessment shall always be carried out.

LV gloves shall be worn for all high risk tasks and selected for use on medium risk tasks based on a risk assessment,

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Insulated gloves with leather protectors shall be used in the following situations:

- Arc flash protection where required.(Note - Arc Flash Labels should be placed indicating required PPE where Arc Flash Protection is required)
- Operating HV isolators and earth switches when in direct contact with the switching mechanism
- Using insulated test sticks, operating rods or measuring sticks on HV equipment when in an earthed situation e.g. standing on the ground or in an uninsulated EWP.

4 Electrical Safety - Technical

4.1 Minimum identification Requirements for Electrical Equipment

4.1.1 Electrical distribution boards

Electrical distribution boards shall have:

- The source of supply identified on the exterior of the door
- The highest voltage identified externally on all doors and internally on removable panels that provide access to live parts
- Placed on the front, the standard electrical sign of a triangular yellow background with black border and black flash pictogram as per AS 3000:2007 Australian/New Zealand Wiring Rules and Danger Sign with Voltage.
- Clearly labelled 240 V socket outlets and switches in workshops, plants and offices
- A current legend located on the inside of the board listing the circuits supplied by each board
- Protection devices labelled with the circuit description and corresponding neutral where applicable.
- All electrical field equipment shall be effectively labelled to identify its purpose and point of supply.
- All main switches shall be clearly labelled.
- Where the back panels of switchgear and motor control centres are accessible, they shall be labelled with the same description and number as that on the front.

4.1.2 Substations and motor control centre rooms

All substations and motor control centre rooms shall be labelled with the following notices:

- Unauthorised entry prohibited
- Danger high voltage and Highest Voltage (if high voltage is contained within).
- Danger signage shall be fitted to all doors and covers on equipment which provides access to live parts.

Signs displaying instruction for resuscitation of persons suffering from electric shock shall be displayed at switch rooms, motor control centres, main switchboards, workshops, substations and control rooms.

Arc Flash Labels indicating Hazard Level and PPE requirement shall be fitted to all equipment likely to be operated, maintained or tested while energised where the potential for an arc flash hazard exists.

4.2 Fault Level, Load, Touch/Step Potential, Protection Grading Studies

Site fault level studies shall be conducted. The studies shall be utilised to verify the following;

- 3 phase short circuit and ground fault levels are known at all main switchboards at all voltage levels.
- Load flows and adequacy of sizing of electrical equipment.

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- Protection system grading.
- Touch and step potentials.
- Arc Flash analysis
- Harmonics, resonances and voltage flicker, and
- NWIS grid operator requirements

Results of the studies shall be maintained in a live model and be available as a report.

4.3 HV Impedance Earth Systems

All HV installations and subsequent earthing system design, construction and testing shall be in accordance with AS 2067-2008, Substations and High Voltage

Principal safety requirements include;

- Limitation of touch and step potentials.
- Minimisation of risk of explosion/fire/arc flash

4.4 Low Voltage Switchgear

LV Switchgear installation shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Principal safety requirements include the following;

- Fully enclosed metal clad construction.
- Designed with appropriate fault rating.
- Equipment labelled and in compliance with single line diagram equipment numbering.
- Lockout/Tagout facilities deployed at an individual feeder, motor starter or functional unit level.
- Boards are a type tested design for arc fault rating and bus bar current rating.
- Preferential cable bottom entry design. (i.e. minimise water ingress)
- Top mounted busbar design. (i.e. minimise dropped tool/debris short)

Routine switchboard maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal safety requirements include;

- Periodic cleaning and inspection.
- Fixings and covers in place to preserve IP and arc fault containment ratings
- Thermographic Inspections

4.5 High Voltage Switchgear

HV Switchgear installation shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements. Oil filled HV switchgear shall not be used.

Principal safety requirements include the following;

- Proprietary manufacture, metal clad, fully segregated, modular, type tested, arc fault vented design.
- Equipment labelled and in compliance with single line diagram equipment numbering.

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- Power cable bottom entry design.
- Top mounted busbar design.

Routine switchboard maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal safety requirements include;

- Periodic cleaning and inspection.
- Fixings and covers in place to preserve IP and arc fault containment ratings.
- Partial discharge testing.

4.6 Low Voltage (LV) Fault Protection

LV protection shall be fully engineered to provide;

- Fault discrimination on an individual circuit basis
- Reduced impact/risk of fire/explosion damage and personnel injury.
- Minimise impact to business continuance.

Principal design safety requirements include;

- Equipment fault current ratings exceed prospective fault rating of installation.
- Fault current limiting circuit breakers utilised for circuit protection.
- Fast protection schemes to provide fault discrimination and control arc flash risk.
- Backup protection is identified for each LV protective device.
- Loop impedance design checks carried out on each circuit to verify that instantaneous/magnetic trip will operate. (i.e. is there sufficient fault current at the end of circuit)

Routine protection maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal design safety requirements include;

- Switchboard commissioning data available to detail initial settings, injection testing and circuit breaker operation results.
- Change management and recording of protection settings.
- Periodically injection testing of Main LV circuit breakers and feeders to verify protection and circuit breaker operation.

4.7 High Voltage Fault Protection

HV protection shall be fully engineered to provide;

- Fault discrimination on an individual circuit basis
- Reduced impact/risk of fire/explosion damage and personnel injury.
- Minimise impact to business continuance.

Principal design safety requirements include;

- Equipment fault current ratings exceed prospective fault rating of installation.

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- Fast protection schemes to provide fault discrimination, control step/touch potential and control arc flash risk.
- Backup protection is identified for each HV protective device.
- Utilisation of IEC 61850 based protection relays to implement sophisticated protection schemes.
- Continuous monitoring of power supply status by the plant control system including battery voltage, current draw, alarm and watchdog status.

Routine maintenance and inspection of the protection system shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal design safety requirements include;

- Switchboard commissioning data available to detail initial settings, injection testing and circuit breaker operation results.
- Change management and recording of protection settings.
- Periodically injection testing of HV circuit breakers to verify protection and circuit breaker operation.

4.8 Tripping Power Supplies

Tripping power supplies shall comply with Roy Hill technical standards.

Principal design safety requirements include;

- Continuous monitoring of power supply status by the plant control system including battery voltage, current draw, alarm and watchdog status.
- Each circuit supply is individually protected so that a fault in one circuit will not affect power supply to any other device.

Routine maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal safety requirements include;

- Inspection for leaks, connection corrosion, electrolyte levels, battery case swelling, powered ventilation functioning as required etc.
- Battery capacity and pulse testing.

4.9 Network Grid Security

A comprehensive agreement between the utility provider and Roy Hill shall be agreed including safety operational issues.

Principal operational and safety issues include;

- Control and management of earth potential rise issues under fault conditions.
- Understanding of critical fault clearing times
- Integration of protection systems to achieve fault discrimination and protection grading.
- Load shedding systems to preserve grid integrity.
- Agreement on switching and access to facilities under emergency conditions.

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4.10 Earthing and Bonding

Earthing, bonding and lightning protection shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Principal design safety requirements include;

- Attainment of suitably low earth impedance to ensure reliable operation of protection equipment.
- Bonding and grading of plant, structures and foundations to limit step and touch potentials.
- Integration to site lighting protection systems and surge arrestors.

Routine maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal maintenance and inspection safety requirements include;

- Maintenance of accurate earthing schematics and earthing plot plans.
- Earth impedance testing.
- Inspections

4.11 Lightning Protection

Lightning protection shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Principal design safety requirements include;

- Attainment of suitably low earth impedance to ensure reliable dissipation of lightning current to ground.
- Bonding and grading of plant, structures and foundations to limit step and touch potentials.
- Astute placement surge arrestors at every voltage level to provide high level of system integrity.

Routine maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal maintenance and inspection safety requirements include;

- Maintenance of accurate earthing schematics and earthing plot plans.
- Earth impedance testing.
- Inspections

4.12 Lighting & Small Power Installation

Site lighting and small power installation shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Principal requirements include the following;

- All circuits protected by fault current limiting circuit breakers.
- All lighting and GPO circuits to be earth leakage protected.
- All circuit isolation points lockable by padlock to comply with isolation and tagging requirements.

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4.13 Cabling

Site cabling installation shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Principal safety requirements include the following;

- Cabling is installed to provide a high level of mechanical protection.
- HV Cabling is earth screened.
- LV Cabling is double insulated.
- Underground cables are termite resistant design.
- HV, LV and Control cables are segregated.
- Cabling is numbered at each end and at building entry points.
- Cables are intumescent fire proof coated in proximity of substations and at major building entry points.

4.14 Redundant Cabling

Redundant cables shall be preferentially pulled out.

If cabling cannot be pulled out the redundant cabling shall be isolated, shorted, bonded to earth and labelled at both ends.

A register of redundant cables should be kept in the electrical supervisor's office.

4.15 Overhead Powerline to 33kV

Overhead powerlines shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Underground cable crossings shall be installed at roads crossings to completely eliminate the risk of inadvertent contact with overhead live wires. Powerlines should preferentially be installed over 10 metres or more away from roads, fixed plant and equipment so that routine maintenance requirements are not restricted by the requirement for Powerline Corridor Vicinity Access permits

In situations where overhead lines (i.e. existing powerlines) cross roads, danger signage and height clearances shall be clearly posted. Overhead powerlines shall be equipped with high visibility orange warning balls over roadways. At approximately 10 metres either side of an overhead powerline road crossing, safe clearance overhead wires with warning balls/bunting shall be installed at the safe clearance height.

Insulators shall be overrated to provide long life, additional pollution tolerance, reduced leakage/tracking and improved resistance from inadvertent contact from animals.

Routine maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal maintenance and inspection safety requirements include;

- Vegetation clearing within powerline corridor is routinely done to minimise risk of vegetation contact and bushfire risk.
- Poles are periodically inspected to ensure powerline integrity for items such as collar rot, termites, corrosion, broken/cracked insulators, bent/broken crossarms, tracking/burning at kingpin and insulator mountings.
- Thermographic/acoustic/RF discharge testing techniques are employed to detect failing/failed insulators.

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All heavy mobile equipment shall be fitted with a sign in the operators cab identifying the height of the vehicle in its normal operating state and with operating parts fully raised.

4.16 Trailing Cables

Trailing cables are in place for power supply to mobile infrastructure shall comply with Roy Hill electrical installation standards, Roy Hill equipment standards, regulatory and standards requirements.

Routine maintenance and inspection shall be programmed within the site maintenance planning system. Records of completed checks shall be kept for review and audit.

Principal maintenance and inspection safety requirements include;

- Impact protection of the trailing cable and pullers is routinely done to minimise risk of damage.
- trailing cable and pullers are periodically inspected to ensure integrity for items such as corrosion, broken/cracked insulators, bent/broken crossarms, tracking/burning at insulator mountings.
- Thermographic/acoustic/RF discharge testing techniques are employed to detect failing/failed insulators.

5 Definitions

TERM	DEFINITION
Competent	A person who is qualified to perform a duty based on knowledge, training and experience.
Competent non-electrical worker	A person who has satisfactorily completed an “Energy Safety” approved training course in the use of a Portable Appliance Tester (PAT) and whose competency has been verified by the Electrical Supervisor.
Electrical Work	Work that is carried out on electrical machines or instruments, on an electrical installation or on electrical appliances or equipment to which electricity is supplied at a nominal voltage exceeding 50 Volts a.c. or 120 Volts ripple free d.c. whether or not the thing on which the work is performed is part of, or is connected to or to be connected to any distribution works or private generating plant and, where work is performed on any appliance, whether or not electricity is supplied or may be supplied through an electric plug socket or socket outlet.
Electrical Worker	Licensed person engaged in electrical work. Includes restricted licence holders, permit holders and holders of an electricians training licence (apprentices).
Extra Low voltage	Extra-Low Voltage means a voltage not exceeding — (a) 50 Volts a.c.; or (b) 120 Volts ripple-free d.c..
High Voltage	Voltage exceeding 1,000 Volts a.c. or 1,500 Volts d.c.
Low Voltage	Low Voltage means a voltage exceeding Extra Low Voltage, but not exceeding 1,000 Volts a.c. or 1,500 Volts d.c.
Power line Corridor	Area under a power line and 10m either side of the power line live conductors.
Shall	Indicates the requirement is mandatory
Should	Indicates that the primary intent is to comply with the full requirements. Where this not practicable, the variation shall be based on the assessment of risk
Supervision	Overseeing the performance or operation of a person or group. There are three (3) levels of supervision: Direct Supervision - Competent person to be at the work position Constant Supervision - Competent person to remain at the worksite in close proximity to the work position. Must be able to maintain line of site and be able to communicate directly with the persons under their supervision. Routine Supervision -

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	Competent person ensures tasks are explained and understood. Does not require a constant presence but presence must be sufficient to ensure safe and satisfactory work practices and standards are maintained.
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Table 1: Definitions

6 Associated Documents and References

<i>Document number</i>	<i>Title</i>
OP-FRM-01269	Intent to Commence Electrical Installing Work form
OP-MAN-00081	Isolation and Tagging Manual
OP-PRO-00129	High Voltage Isolation Procedure
OP-STD-00037	Roy Hill Operations HSES Performance Standard - 05 Working With Electricity
	Bow Tie PH-03 Fire and Explosion (Non Explosives)
	Bow Tie PH-04 Electricity Interaction
	Bow Tie PH-15 Severe Weather
AS/NZS 3008	Electrical Installations – Selection of Cables
AS/NZS 3010	Electrical Installations – Generating Sets
AS/NZS 3017	Electrical Installations - Verification Guidelines
AS 3190	Approval and Test Specification – Residual Current Devices
AS/NZS 3760	In-service Safety Inspection and Testing of Electrical Equipment
AS/NZS 3000:2007	Wiring Rules
AS/NZS 4836	Safe Working on Low Voltage Electrical Installations
AS/NZS 1760	Lightning Protection
AS 3007	Electrical installations surface mines and associated process plants
AS/NZS 3012	Electrical Installations – Construction and demolition sites
AS/NZS 3019	Electrical Installations – Periodic verification
AS/NZS 1674.2	Safety in Welding and Allied Processes
AS 2467-2008	Maintenance of Electrical Switchgear
	Checking and Testing Electrical Installation Work (Energy Safety WA)
	Electricity Act 1945
	Electricity (Licensing) Regulations 1991
	Electricity Regulations 1947
	Mine Safety and Inspection Act 1994
	Mine Safety and Inspection Regulations 1995
	Occupational Safety and Health Act 1984
	Occupational Safety and Health Regulations 1996
	Environmental Protection Act 1986

Table 2: Associated Document and References

7 Review

This procedure will be reviewed in accordance with the Roy Hill Change Management Standard [000RH-0000-RH-STD-0007]. If no changes are requested it will be reviewed annually.

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