# Electrical engineering control plan

1. **AIM:** The aim of this plan is to provide a system that allows for the management of the risks to health and safety from electricity at on the mine site. The plan will set out the control measures to be used to manage these risks and to ensure that electrical installations are designed, installed, operated, repaired, modified and maintained in a safe manner and in accordance with relevant standards. Our EECP will attempt to adopt all maintenance and inspection requirements as specified by the original equipment manufacturer (OEM) and will be performed by competent persons who hold appropriate qualifications. All repairs, maintenance and inspections will be recorded to provide a history of work completed and to enable better planning of scheduled maintenance.
2. **WHAT:** The purpose of the EECP is to set out control measures to prevent injury to persons caused by direct or indirect contact with electricity. It is also designed to prevent:

* injury to people caused by working on electrical plant or electrical installations
* the unintended initiation of explosions
* the unintended operation of plant
* the occurrence of uncontrolled fires.

The EECP extends to all areas of the mining operation and applies to the overall life cycle requirements of the electrical aspects of plant and electrical installations that are hired, new, existing or second hand. This includes all plant and electrical installations introduced to site by suppliers and contractors. The EECP applies to all workers, contractors, designers, manufacturers, importers and suppliers that are involved in all aspects of electrical work.

An assessment of risks associated with the electrical aspects of plant and electrical installations will be conducted using (Form 11 A). This assessment of risks will be the initial commencement point for the development of the EECP.

1. **WHO:** All electrical work on site will be performed by people who have been trained and who have the necessary competencies and qualifications.

Extra low voltage (ELV) (< = 50 V AC or <= 120 volts ripple free DC). Work will only be performed by our electrical tradesperson, an (auto electrician), or a competent person. Our sites regular auto electrician is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Low voltage (LV) (exceeding ELV but not exceeding 1000 V AC or 1500 V DC). Work will only be performed by a competent and qualified electrical tradesperson. Our qualified electrical tradesperson is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. They have been nominated to perform the statutory function of qualified electrical tradesperson for our site and their nomination has been recorded in our management structure Program 2.

They have supplied us with a copy of their trade certificate and a copy of their qualified supervisor certificate, proficiency certificate or evidence of continuous employment at a mine as an electrical tradesperson since 2005. They have also provided a record of their skills and experience in using these qualifications in recent work, as evidence of their maintained competency.

High Voltage (HV) (exceeding 1000 V AC or 1500 V DC). Where high voltage work is required on site or if the total connected power at the mine is greater than 1000 KW, then all electrical work will be supervised by an electrical engineer. Our qualified electrical engineer is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. They have been nominated to perform the statutory function of electrical engineer for our site and their nomination has been recorded in our management structure Program 2, (remove if not applicable).

Our electrical engineer has supplied us with evidence of either having an electrical engineering practising certificate (coal mines), or a recognised qualification in electrical engineering, along with their compliance with the Australian Engineering Competency Standards Stage 2 in respect of mining operations at a mine, and verification that they are registered on the National Engineering Register.

1. **HOW:**  The EECP provides guidance on the overall life cycle management and electrical practices to be used to manage electricity and electrical installations on site. Key requirements are identified in each of the life cycle phases for the design, manufacture, installation, commissioning, operation, maintenance (including repair, modifications and overhaul), decommissioning and disposal of electrical aspects of installations.

**Competences:**

**Electrical tradesperson:** The statutory function of our electrical tradesperson is to supervise the installation, commissioning, maintenance and repair of electrical plant and installations at the mine.

**Electrical engineer** (if applicable): The statutory function of our electrical engineer is to develop and review the standards and procedures for the installation, commission, maintenance and repair of electrical plant and installations at the mine, and to also supervise the installation, commissioning, maintenance, modifications and repair of electrical plant and installations at the mine, in conjunction with the electrical tradesperson.

**Safe systems of work**

The development of the site’s safe work management statements (SWMS/procedures) for electrical work will begin with the site risk assessment. The safe systems of work will also be supported by the development of our electrical maintenance schedule and our site electrical services diagram. A copy of the electrical services diagram (Form 11F) will be displayed in the main switch room, along with the isolation procedure (Form 11G) and the restoration of power procedures (Form 11H).

Risk assessment – The electrical risk assessment will be completed to identify all hazards associated with the use of electricity.

This risk assessment (Form 11 A) will be completed by the quarry manager and the individual nominated to exercise the statutory function of electrical engineer, or if no engineer is required, our competent electrical tradesperson \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (tradesperson’s name).

Once completed all identified hazards will be risk rated and appropriate controls will be determined, implemented and recorded as being completed.

Our mine has several SWMS that detail the controls to manage the risks associated with the use of electricity on site. Our workers and workers of our electrical contractor will be required to perform their work in accordance with these SWMS, unless the electrical contractor has a health and safety management plan, or SWMS, of their own that is consistent with the sites SMS. These documents will be reviewed and written notice given to the contractor to confirm that they are consistent with the sites SMS. The SWMS contained in the EECP will include but not be limited to:

Safe work method statements

1. Isolation procedure, Form 11G
2. Restoration of power procedure Form 11H
3. Electric shock procedure Form 11I
4. Welding procedures Form 11J
5. Working near overhead power lines Form 11K
6. Use of electrical test instruments (Form 11L)
7. Other SWMS \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Equipment:**

All new circuitry and modified circuitry will be tested in accordance with AS 3000, before the application of power, with a compliance certificate (or equivalent document) supplied to the operator of the mine, (Form 11E example). The test results will be recorded on the compliance certificate or on a separate form attached to the compliance certificate. Our electrical services diagram will also be updated to reflect the changes, where applicable.

Maintenance of our electrical equipment will be performed as per the *Planned electrical maintenance/testing schedule* (Form 11C). This schedule has been developed in consultation with our statutory electrical engineer and/or electrical tradesperson after considering the suggested testing frequencies in (FORM 11C and 11D).

A record of all completed electrical maintenance/ testing activities will be kept on record (Form 11 B) or in an individual plant file/book.

The lifecycle approach to electrical engineering practices includes:

**Procedure or acquisition**

When considering the purchase, acquisition, or construction of any new items of electrical plant and equipment, the compliance, performance and maintenance obligations required of that equipment are to be clearly understood by all parties involved. Additionally, the requirements for effectively maintaining the equipment while it is in service will be considered (e.g. safe access for inspections and maintenance tasks). In short, the equipment must be fit-for-purpose.

**Design**

The electrical aspects of plant and equipment will be designed so they are without risks to health and safety to workers throughout the life cycle.

In general, the design of any item of electrical plant and equipment, shall comply with all relevant Australian Standards (AS), and also comply with any specific safety or design features required under the WHS legislation.

Design of new, or modifications to existing electrical installations requires the designer / supplier to provide all of the requisite engineering checks and certifications as part of the scope of supply.

**Manufacture**

The electrical aspects of plant and equipment will be manufactured so they are without risks to health and safety to workers throughout the life cycle.

**Installation, commissioning and construction**

The risks to health and safety associated with installation, construction and commissioning of electrical plant and equipment will be managed in accordance with our risk management procedures (Program 5).

Installation, construction and commissioning activities will be carried out in accordance with the information provided by the designer, manufacturer, importer or supplier of the plant and equipment.

All work will be supervised by our statutory electrical engineer or qualified electrical tradesperson.

**Operation**

No electrical plant and equipment will be operated where a defect would mean that the plant is a risk to the operator or other people.

All electrical plant and equipment will only be operated within its designed operating parameters as described in the equipment’s operating manuals.

Any damage to electrical plant and equipment will be reported to the manager or delegate and a review of controls measures will be conducted to identify remedial actions to be taken.

**Maintenance**

The maintenance of electrical aspects of plant and equipment will be managed in accordance with the OEM servicing requirements and as recorded in the planned electrical maintenance/testing schedule, (FORM 11 C). Maintenance also includes the regular inspections and tests that are controls resulting from the risk assessments, as well as those mandated by WHS laws (e.g. test and tagging).

**Decommissioning**

The risks to health and safety associated with decommissioning of electrical plant and equipment will be managed in accordance with our risk management procedures (Program 5).

**Disposal**

Electrical plant and equipment will be disposed of in a manner that does not harm the environment and is economically responsible. Where electrical plant and equipment is on-sold, all operating manuals, service manuals, maintenance records and a condition report will be supplied to the purchaser.

1. **WHEN:** Maintenance will be conducted on each piece of electrical plant and equipment as per the *Planned electrical maintenance/testing schedule* (Form 11C). These agreed maintenance and testing frequencies have been determined after reviewing the information obtained from the respective plant service manuals, discussions with our electrical tradesperson or electrical engineer (if applicable), and recommended schedules in Australian Standards
2. **ACTION:** If during the course of completing the initial electricity risk assessment or any other subsequent maintenance test, something is found not to meet the site’s standards, or is unsafe, then the person completing the assessment will record it on (Form 11 A) and will notify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (nominated person) of the problem. If the problem is not fixed immediately because it does not create a health and safety risk to persons using that plant or equipment then the hazard will be transferred into the daily diary or action plan.
3. **DOCUMENT CONTROL:** Larger pieces of electrical equipment may have their own plant file/book located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(e.g. noticeboard). Where the site has a small number of electrical appliances all maintenance will be recorded in a single file/book, the daily dairy or (Form 11B).

Scheduled maintenance: All scheduled maintenance/testing will be recorded on Form 11B) or in the plant file/book (e.g. attach completed supplier service sheets, where if applicable).

Breakdown maintenance: All unexpected breakdown maintenance will be recorded on the plant file/book.

External service provider: All documentation received during the course of completing service work by external service providers will be recorded in the plant file/book.

Form 11A: Electricity – risk assessment

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| --- | --- | --- | --- |
| **Mine:** |  | **Inspection area :** |  |
| **Statutory electrical engineer or tradesperson:** |  | **Site representative:** |  |
| **Date:** |  | | |

| **Category** | **Risk assessment questions** | **Risk**  **If NO = H** | | | **Audit observations – controls** |
| --- | --- | --- | --- | --- | --- |
| **H** | **M** | **L** |
| **Systems** |  |  | | |  |
| Management | If high voltage electricity (HV) is used on site, or if there is over 1000KW of electrical equipment installed, is there an electrical engineer nominated by the mine as the statutory electrical engineer? (Notification form to be submitted) |  | | |  |
|  | If HV is delivered to the site is there a high voltage management plan as required by the local supply authority service rules? |  | | |  |
|  | If there is no HV on site, or less than 1000KW installed, has there been nominated an electrician as the “qualified electrical tradesperson”. |  | | |  |
|  | Is there an electrical engineering control plan? |  | | |  |
|  | Does the EECP include a planned electrical maintenance/testing schedule? |  | | |  |
|  | Does the maintenance schedule refer to compliance with AS/NZS 3000 and AS/NZS 3760? |  | | |  |
|  | Does the electrician issue a statement of compliance for new installations? *(section 8 tests performed – AS/NZS 3000)* |  | | |  |
|  | Is there an electric shock protocol? |  | | |  |
|  | If HV is delivered to the site is there a high voltage management plan as required by the local supply authority service rules? |  | | |  |
|  | Are there electrical circuit diagrams on site and available for use and a site plan of electrical distribution? |  | | |  |
|  | Does the mine operator require the regulator to be informed of a new power source? (Not required if an electrical engineer is nominated) (Form to be submitted) |  | | |  |
|  |  |  | | |  |
| Isolation | Is there an isolation system (tag out / lock out)? *(including documented procedure)* |  | | |  |
|  | Does it include a “test before you touch” policy and procedure? |  | | |  |
|  | Is there a removal and restoration of power procedure? *(SWMS)* |  | | |  |
|  | Is there a “No Live Work” policy at the mine? |  | | |  |
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| **Competencies** |  |  | | |  |
|  |  |  | | |  |
| Tradesperson | Is electrical work only conducted by qualified people? |  | | |  |
|  | Has the site obtained copies of the electrician’s qualifications? |  | | |  |
|  | Has the electrician been given a site induction? |  | | |  |
|  | Does the site induction include the site isolation procedures? |  | | |  |
|  | Does the site induction include the site removal and restoration of power procedures? |  | | |  |
|  | Does the site induction include the site the “Test before you touch “policy? |  | | |  |
|  | Does the site induction include the site policy for “No Live Line Work”? |  | | |  |
|  | Does the site induction include the site’s “Electric Shock Protocol”? |  | | |  |
|  |  |  | | |  |
| Employees | Do mine workers know the electric shock protocol? |  | | |  |
|  | Have mine workers been trained in the isolation procedure? |  | | |  |
|  | Have mine workers been trained in the Removal and Restoration of Power procedures? |  | | |  |
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| **Equipment** |  |  | | |  |
|  |  |  | | |  |
| General | Are all installations appropriately IP rated to prevent ingress of contaminants? |  | | |  |
|  | Are all cables routed to protect them against physical damage? |  | | |  |
|  | Are all cables supported to prevent strain? |  | | |  |
|  | Have all redundant cables been removed or terminated properly? |  | | |  |
|  | Is permanent equipment supplied by fixed cables? (Should not be flexible leads) |  | | |  |
|  |  |  | | |  |
| OHL | Have OHLs (over head lines) been assessed to confirm clearances, voltages, signage and exclusion zones? |  | | |  |
|  | Are all OHLs drawn on a site plan, including clearances and isolation points? |  | | |  |
|  | Is there no stockpiling, loading or storage of material and equipment under OHL? |  | | |  |
|  | Have local authorities been contacted to confirm clearances? *(clearance depends on voltage)* |  | | |  |
|  | Does your emergency procedure include OHL emergencies? |  | | |  |
|  | Are power lines, poles and transformers included in workplace inspections? |  | | |  |
|  | Are all underground cables drawn on a site plan, including voltage, depth, isolation points? |  | | |  |
|  |  |  | | |  |
| Unauthorised access | Are all cabinets and switch room access doors labeled to highlight “no unauthorised access”? |  | | |  |
|  | Are all cabinets labeled to warn of the danger of electricity and with the maximum contained voltage? (e.g Danger 415 Volts) |  | | |  |
|  | Do all cabinets require the use of a tool to access live parts and terminals >50 volts? |  | | |  |
|  | Are all cabinets and switch room clean and in good physical condition? |  | | |  |
|  |  |  | | |  |
| Generators < 25kW  (portable and stand alone) | Are portable 240 volt generators provided with earth stakes?  Are generators fitted with RCDs with a sensitivity of no more than 30mA?  Are extension leads screened, with the screening connected to earth.  On generators with isolated windings, does the circuit breaker operate in both supply conductors?  On generators with isolated windings, are the supply conductors isolated from earth?  On generators with isolated windings, is it mandated that power boards are not to be used, and that no earthed device are connected, and maximum of one double insulated device can be used) |  | | |  |
| Generators > 25kW  (mobile & stand alone) | Is there earth leakage protection fitted? *(refer to* [EES 014 Technical principles for the use of standalone generators](https://www.resourcesandenergy.nsw.gov.au/__data/assets/pdf_file/0008/280754/OUT10-2110-EES-014-Technical-principles-for-the-use-of-stand-alone-generators-_version-2__5_.pdf)*)*  Is there an earth stake?  Is equipotential earth bonding provided between the generator and the equipment being supplied  Is the generator being operated in parallel with another generator? If there is then has it been checked by a qualified electrician or engineer? |  | | |  |
| Large generators with fixed installations | Was the system designed by a professional electrical engineer?  (Requirement for earth stake depends on design system used) |  | | |  |
|  |  |  | | |  |
| Earthing | Have earthing arrangements for the site been tested and confirmed compliant to AS/NZS3000. |  | | |  |
|  | Are the electrical protection arrangements suitable for detecting and clearing all faults so as to maintain touch potential clearance times to as AS/NZS3000 Fig. B4 |  | | |  |
|  | Are all socket outlets protected by 30mA RCDs in accordance with AS/NZS3000? |  | | |  |
|  | Is there documented evidence that electrical tests are performed and recorded in accordance with AS/NZS 3000? |  | | |  |
|  | Has the mine considered hand tools powered by an energy source other than mains power? (e.g. battery or compressed air?) |  | | |  |
| Hand-held tools | Are tools and extension leads tested and tagged in accordance with AS 3760? (min six monthly, depends on exposure) |  | | |  |
|  |  |  | | |  |
| Switchboards | Are there resuscitation signs in place? |  | | |  |
|  | Are circuits regularly tested for quality of insulation? (i.e. insulation testing) |  | | |  |
|  | Are RCDs tested as per AS/NZS 3760 (by a qualified electrician)? |  | | |  |
| Welding | Do procedures (SWMS) exist to control welding activities? *(AS 1674.2)* |  | | |  |
|  | Are welders regularly inspected and tagged by your electrician? |  | | |  |
|  | Are HRD (hazard reduction devices) fitted to welders?  VRD (voltage reduction device), or  trigger switch, or  open circuit safety switch |  | | |  |
|  | Does the mine restrict electric welding to qualified persons? |  | | |  |
|  | Are people trained in electric welding and assessed as competent? |  | | |  |
|  | Are welding machines, leads, clamps and handpieces regularly inspected? |  | | |  |
|  | Are welding machines regularly overhauled (each two years)? |  | | |  |

Form 11B: Electrical register and maintenance/testing results

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| --- | --- | --- | --- | --- | --- |
| Location of plant or electrical equipment | Equipment typePrimary plant **(motors)** | Specific details  - make  - size (kw)  - item number  - serial number | Maintenance / test results | | |
| Type of maintenance / test | Result | Performed by whom |
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| **Total installed power (Kw)** | (if >1000Kw – statutory elec engineer required) |  |  |  |  |
|  | Secondary plant  **(hand tools, generator etc)** |  |  |  |  |
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Form 11C: Planned electrical maintenance/testing schedule

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| --- | --- | --- |
| Electrical maintenance and inspections | | |
|  | **Actions** | **Frequency** |
| Emergency stop testing |  |  |
| Lanyard testing |  |  |
| Portable electrical tools and appliances |  |  |
| Test and tag |  |  |
| Insulation resistance testing of each circuit |  |  |
| Continuity testing of each circuit |  |  |
| Earth leakage circuit breaker/RCD/relay |  |  |
|  |  |
| Welders |  |  |
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|  |  |
| Thermography |  |  |
| Connections/terminations |  |  |
| Verify currency of buried services drawing |  |  |
| Low voltage rescue kits |  |  |
| Test instruments |  |  |
| Earthing system (include magazines) |  |  |
| General lighting, visual |  |  |
| Emergency lights, performance |  |  |
| Housekeeping |  |  |
| Signs and labelling in place and legible |  |  |

Form 11D: Example electrical services diagram

Draw the electrical services on your site with all services included as shown in the example in Program 11 Instructions.