11

Electrical engineering control plan

The electrical engineering control plan is one of the key 'plans' that exists in the safety management system and it is an essential document in maintaining the safety of plant and equipment on site.

The attached template is in Word format for you to customise for your site.

1. **AIM:** You may use the standard aim statement provided in the template or edit it to suit your operation's needs.
2. **WHAT:** All control plans generally begin with a risk-based review of the hazards associated with the activity. The electrical engineering control plan (EECP) is no different.

   This risk assessment will be conducted by the mine manager and the nominated statutory electrical tradesperson.
3. **WHO:** It is important to identify all people who will be performing tasks associated with the electrical aspects of the sites plant and equipment.

   Record who will be your regular auto electrician to work on extra low voltage installations.

   Record who will be your nominated statutory electrical tradesperson and record their name in your management structure.

   Record who will be your nominated statutory electrical engineer and include in the management structure. This is only a requirement if the site uses high voltage or a total connected power at the mine of greater than 1000kw.
4. **HOW:** Using (Form 11A) review all of the risks associated with the electrical aspects of the sites plant and equipment.

HINT: Involve a competent electrical tradesperson to assist in this risk assessment if possible.

After completing Form 11A, fill out an electrical register and have a competent electrical tradesperson test the equipment and record the results in Form 11B (in the template).

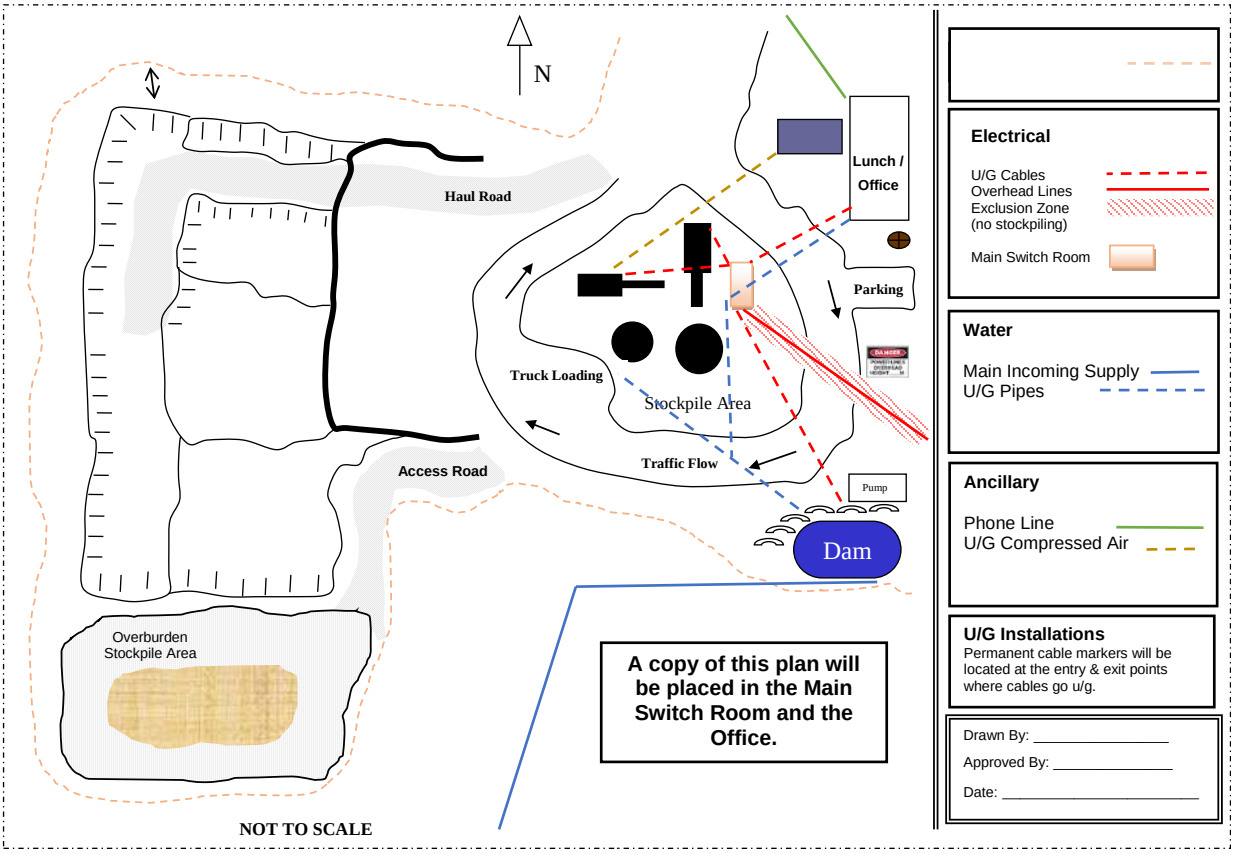
In conjunction with a competent electrical tradesperson, Form 11C should be completed with agreed testing actions and frequency of inspections. See example below.

Example of Form 11C

Electrical maintenance and inspections		
	Actions	**Frequency**
Emergency stop testing		monthly
Lanyard testing		monthly
Portable electrical tools and appliances		before and after use
Test and tag		3 monthly
Insulation resistance testing of each circuit		annually
Continuity testing of each circuit		annually
Earth leakage circuit breaker/RCD/relay	push button testing	3 monthly
	injection testing	annually
Welders	inspect for damage	before and after use
	insulation	3 monthly
	competent person inspection	monthly
	HRD open circuit voltage testing	3 monthly
Thermography		annually
Connections/terminations		annually
Verify currency of buried services drawing		annually
Low voltage rescue kits		6 monthly
Test instruments		annually
Earthing system (include magazines)		annually
General lighting, visual		monthly
Emergency lights, performance		3 monthly
Housekeeping		monthly
Signs and labelling in place and legible		6 monthly

Electrical services diagram (Form 11D) needs to be drafted with all services included on the plan. See example below.

Example of Form 11D



The EECP may contain a number of SWMS. Any additional SWMS that need to be developed will be created as per Program 8 Safe work method statements.

To help you with any additional SWMS, you may refer to the examples (listed after the references in these instructions):

- → Isolation procedure
- → Restoration of power procedure
- → Welding procedure
- → Working near overhead powerlines
- → Using electrical test equipment

To ensure that maintenance is performed to an acceptable standard you must have available the necessary service manuals and/or recognised service standards.

5. **WHEN:** The frequency of testing and maintenance should be determined after reviewing the service manuals and after discussion with your electrical tradesperson or engineer.

   (Form 11B) should be used to record your site's testing and maintenance results for the various pieces of electrical plant and installations. See your template for this form.

   (Form 11 C) should be completed after reviewing the suggested testing and maintenance frequencies and after reviewing the service manuals.

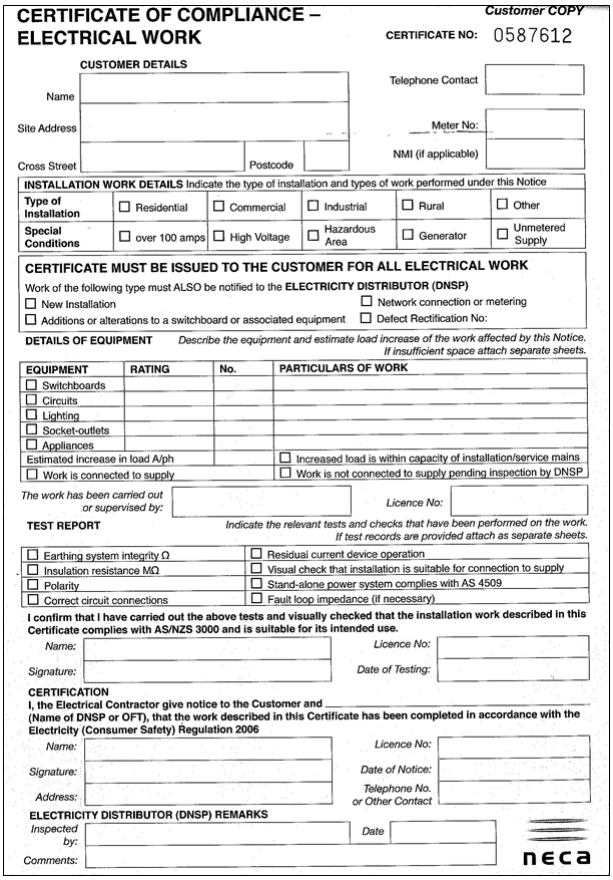
   To help you with maintenance schedules for larger plant, you may refer to the example (listed after the references in these instructions):

   → Example of an electrical maintenance schedule for process plant.

6. **ACTION:** Nominate who will be notified when hazards are found during the course of the initial assessment of electrical risks on site.

   This nominated person is responsible receiving certificates of compliance from the competent electrical tradesperson who carries out the testing, maintenance and repairs of electrical equipment and plant.

   See an example of a certificate of compliance below:



CERTIFICATE OF COMPLIANCE – ELECTRICAL WORK *Customer COPY*

CERTIFICATE NO: 0587612

CUSTOMER DETAILS

Name | Telephone Contact

Site Address | Meter No:

Cross Street | Postcode | NMI (if applicable)

INSTALLATION WORK DETAILS Indicate the type of installation and types of work performed under this Notice

Type of Installation	☐ Residential	☐ Commercial	☐ Industrial	☐ Rural	☐ Other
Special Conditions	☐ over 100 amps	☐ High Voltage	☐ Hazardous Area	☐ Generator	☐ Unmetered Supply

CERTIFICATE MUST BE ISSUED TO THE CUSTOMER FOR ALL ELECTRICAL WORK

Work of the following type must ALSO be notified to the **ELECTRICITY DISTRIBUTOR (DNSP)**

☐ New Installation ☐ Network connection or metering

☐ Additions or alterations to a switchboard or associated equipment ☐ Defect Rectification No:

DETAILS OF EQUIPMENT *Describe the equipment and estimate load increase of the work affected by this Notice. If insufficient space attach separate sheets.*

EQUIPMENT	RATING	No.	PARTICULARS OF WORK
☐ Switchboards			
☐ Circuits			
☐ Lighting			
☐ Socket-outlets			
☐ Appliances			
Estimated increase in load A/ph			☐ Increased load is within capacity of installation/service mains
☐ Work is connected to supply			☐ Work is not connected to supply pending inspection by DNSP

The work has been carried out or supervised by: | *Licence No:*

TEST REPORT *Indicate the relevant tests and checks that have been performed on the work. If test records are provided attach as separate sheets.*

☐ Earthing system integrity Ω	☐ Residual current device operation
☐ Insulation resistance MΩ	☐ Visual check that installation is suitable for connection to supply
☐ Polarity	☐ Stand-alone power system complies with AS 4509
☐ Correct circuit connections	☐ Fault loop impedance (if necessary)

I confirm that I have carried out the above tests and visually checked that the installation work described in this Certificate complies with AS/NZS 3000 and is suitable for its intended use.

Name: | *Licence No:*

Signature: | *Date of Testing:*

CERTIFICATION

I, the Electrical Contractor give notice to the Customer and _____ (Name of DNSP or OFT), that the work described in this Certificate has been completed in accordance with the Electricity (Consumer Safety) Regulation 2006

Name: | *Licence No:*

Signature: | *Date of Notice:*

Address: | *Telephone No. or Other Contact*

ELECTRICITY DISTRIBUTOR (DNSP) REMARKS

Inspected by: | *Date*

Comments:

neca

7. **DOCUMENT CONTROL:** Depending on the size of your operation will dictate on the system used to record maintenance activities.

   A smaller site may simply record information in the daily dairy, whereas larger sites may have an individual file or record book for each piece of plant.

   Organise a file/book for each piece of plant and equipment if that is the record keeping method you choose.

8. **EMERGENCY PROCEDURE:** In the event of an emergency involving electricity such as electric shock, fire or explosion etc, refer to Program 9 Emergency plan

References:

Work Health and Safety Regulation 2017, part 3.1 Managing risks to Health and Safety, clause 32-38

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, Part 2 Division 3 clause 26 (5) Electrical Engineering Control Plan

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, Part 2 Division 4 clause 32 Electrical Safety

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, Schedule 2 clause 3 - Principal Control Plans – Electrical Engineering Control Plan

Work Health and Safety Regulation 2017, clauses 148 – 151, 164-165, 166

Health and Safety in Quarries

Section 12 Machinery and Equipment

Australian Standard AS/NZS 3000 – Electrical Installations, known as the Wiring Rules

Australian Standard AS/NZS 3007 - Electrical equipment in mines and quarries—Surface installations and associated processing plant

Australian Standard AS/NZS 3760 – In service safety inspection and testing of electrical equipment.

Example documents

Electrical maintenance schedule for process plants

PROCESS PLANT		
DESCRIPTION OF PLANT AND MAINTENANCE TASK.	FREQUENCY OF MAINTENANCE TASKS	SCOPE OF MAINTENANCE TASK
Control panel power supply cable		
External examination	Monthly	External inspection
Condition monitoring	6 Monthly	Insulation and earth continuity tests
Overhaul / replace	As required	As determined by inspections & electrical tests
Control / distribution panels		
External examination	Monthly	External inspection
Internal examination	6 Monthly	Internal inspection
Condition monitoring	12 Monthly	Insulation and earth continuity tests
Condition monitoring	12 Monthly	Thermograph study – Accessible areas
Overhaul	As required	As determined by examinations & electrical tests
Protection systems		
Operational function test	Monthly	Fire detection system - Conducted by external specialists
Operational function test	Monthly	Belt slip, signal line, brake lift, blocked chute, man on belt, tracking limits, emergency stops
Operational function test	6 Monthly	Earth leakage test
Internal examinations	12 Monthly	Internal inspection – Mechanical devices (tracking switches), junction boxes (slip, blocked chute etc.)
Calibration	12 Monthly	Certification of performance of earth leakage, overload & short circuit – specialised task
Calibration	12 Monthly	Certification of fire detection system – specialised task
Electrical protection grading	As required	Determined by fault level/load flow study
Overhaul / replace	As required	As determined by examinations, electrical tests, certification process or failure

Motors		
Internal examination	Monthly	Carbon brush examination – replace as required
External examination	Monthly	External inspection
Lubrication	6 Monthly	Grease motors-type and quantity of grease specified
Internal examination	6 Monthly	Internal inspection
Condition monitoring	6 Monthly	Insulation and continuity tests
Condition monitoring	12 Monthly	Thermograph study – Accessible areas
Overhaul	As required	As determined by examinations & electrical tests

PROCESS PLANT		
DESCRIPTION OF PLANT AND MAINTENANCE TASK.	FREQUENCY OF MAINTENANCE TASKS	SCOPE OF MAINTENANCE TASK
Motor supply cable		
External examination	Monthly	External inspection
Condition Monitoring	12 Monthly	Insulation and earth continuity testing
Overhaul / replace	As required	As determined by examinations & electrical tests
Vibratory Feeders		
External examination	Monthly	External inspection
Calibration	6 Monthly	Confirmation of feeder stroke setting – specialised task
Internal examination	12 Monthly	Internal inspection – general condition
Condition monitoring	12 Monthly	Insulation and earth continuity tests
Overhaul	As required	As determined by examinations & electrical tests
Overhead crane		
External examination	Monthly	External inspection
Lubrication	3 Monthly	Grease motors-type and quantity of grease specified
Internal examination	12 Monthly	Internal inspection – general condition – connections, contamination ingress
Condition monitoring	12 Monthly	Insulation and earth continuity tests, including pendants
Lubrication	6 Monthly	Grease motors with specified grease
Overhaul	As required	

		As determined by examinations & electrical tests
Field devices		
External examination	Monthly	External inspection
Operational function test	Monthly	Confirm effective operation ie emergency stops, isolators, indicators etc.
Lubrication	3 Monthly	Lubrication of moving mechanical parts
Calibration	6 Monthly	Certification of belt coal weigher operating parameters – specialised task
Internal examination	6 Monthly	Internal inspection – Marshalling boxes, welding outlets, conveyor belt winding outlet – connections , contamination ingress
Condition monitoring	12 Monthly	Insulation and earth continuity testing
Internal examination	12 Monthly	Internal inspection
Overhaul / replace	As required	As determined by examinations & electrical tests
Air conditioning systems		
External examination	6 Monthly	External inspection
Internal examination	12 Monthly	Internal inspection – Conducted by external specialists
Operational function test	12 Monthly	Conducted by external specialists
Service / Overhaul	12 Monthly	Conducted by external specialists

PROCESS PLANT		
DESCRIPTION OF PLANT AND MAINTENANCE TASK.	FREQUENCY OF MAINTENANCE TASKS	SCOPE OF MAINTENANCE TASK
General power & lighting circuits		
External examination	Monthly	External inspection
Condition monitoring	12 Monthly	Insulation and continuity tests
Operational function test	12 Monthly	Audit performance of circuits and report.
Calibration	12 Monthly	Circuits protected by RCDs – test RCDs for trip current and time
Internal examination	12 Monthly	Internal inspection – distribution board(s) – connections, contamination ingress
Internal examination	As required	Electrical fixtures – Carried out at time of repair
Overhaul / replace	As required	As determined by examinations & electrical tests.
Metal structure earthing		
External examination	Monthly	External inspection
Condition monitoring	12 Monthly	Earthing resistance test conducted by external specialists Done during routine earth continuity testing
Control room		
External examination	6 Monthly	External inspection
Internal examination	6 Monthly	Internal inspection
Operational function test	12 Monthly	Conducted by external specialists
Service / Overhaul	12 Monthly	Conducted by external specialists

Example isolation procedure form

APPLICATION:
This procedure is to be used when personnel are carrying out work on faulty equipment and where energy sources need to be isolated.
This procedure will be used for all electrical and mechanical equipment and other situations where persons could be harmed due to an uncontrolled release of energy, (gravity, pressure etc).

IDENTIFY → SWITCH / ISOLATE → LOCK → TAG → TEST →

PROCEDURES:

1. The person placing the lock and tag is responsible to see that correct procedures are followed

Before any work commences:

2. The appropriate padlock and key is to be taken from the Isolation (Lockout) Station and used to lock out the field isolation switch.
3. Isolator switches are to be turned off, and locked where possible. Where a piece of plant does not have an isolator, the key will be removed and will remain in the custody of the person completing the task.
4. Danger tags are to be attached to the field isolating switch in a position readily visible. Where an isolator does not exist, affix the tag at the ignition switch where the key was removed from.
5. Prior to the commencement of work, a 'test for dead' of the equipment will be undertaken to establish that the plant has been successfully isolated.
6. Where more than one person is required to work on the piece of plant each person will place a separate lock on the isolator.

On completion of work:

7. A check is made to ensure that there is no danger from placing the equipment back in service.
8. Isolation switches can have the tag removed, be unlocked and turned on.
9. The padlock and key is to be returned to the isolation (lockout station) along with the personal danger tags.
10. The person charged with completing the task will check the immediate area to establish that no other person will be affected by re starting the equipment.
11. If a person is not able to be located then they should be contacted directly and requested to return to remove their tag. If they cannot be contacted the supervisor must be sure that the person is off site prior to re energising any equipment and will record his observations.
12. The main control panel switches can be turned on and operation recommenced.

End of shift

13. If work is incomplete at the end of a shift, all personal danger tags are to be removed and replaced with an out of service tag, which indicates the plant is not able to be operated safely.

Example of a restoration of power procedure

APPLICATION:

Electrical power is removed (switched off) and restored (switched on) for various reasons, including operational requirements and electrical safety.

There are increased risks to operators and maintenance personnel if the process of switching off and switching on is not carried out systematic and rigorous manner.

PROCEDURES:

Removal of power

There are two methods for the removal of power:

1. Manual: where switch devices are physically operated to switch the power supply off i.e. switching power off as a part of an isolation process and remote switching.

   Remote switching includes control circuits such as emergency stops and lanyard control systems.

2. Automatic: where switching devices are operated and tripped by electrical protection systems. i.e. overload, short circuit and earth fault protection.

Restoration of power

There are two methods for the restoration of power:

1. Manual: where the power has been removed MANUALLY the restoration of power could be the reverse action that was used in removing the power.
2. The process of restoring power should require the person restoring the power supply to check and confirm the circuit is safe to re-power. i.e following isolation.
   Automatic: where the power is removed AUTOMATICALLY, the restoration of the power should require an investigation and, if required, testing by a licensed electrician for the safe application of power.

Fuse replacement

Where the restoration of power involves the replacement of a fuse, the mine should not fit fuses to live fuse holders.

The replacement of fuses should only be undertaken by qualified electrical workers.

The reason why the fuse operated (tripped) should be investigated by a qualified electrical tradesperson.

Circuit breaker reset

If the cause of the trip is able to be identified as a short circuit or earth leakage fault, the circuit breaker should not be re-closed and an electrician called.

If a proper investigation into the cause of a trip is not done, this may result in restoring power onto a fault. This can have very high consequences of injuring people, catastrophically damaging equipment or initiating fires.

Access to switchgear

Some access will be restricted to competent and authorised people.

Where access is restricted conspicuous, durable and legible signage should be posted in appropriate positions to warn of the restrictions. Restriction could be applied to switch rooms and electrical enclosures.

HV switching

High voltage switching should only be carried out by qualified competent electrical workers trained in high voltage switching. Where high voltage switchgear is part of the infrastructure of the mining operation, all switching of high voltage circuits should conform to the site's high voltage management plan.

Example welding procedure

APPLICATION:

The purpose of this procedure is to provide a consistent and structured approach to the conduct and management of electric welding activities on our mine site.

PROCEDURES:

Welding activities are likely to be carried out in a number of areas on site:

14. **Classification of welding areas:**

Category A environment is an environment where-

a) The risk of an electric shock or electrocution by arc welding is low;
b) Normal work practice is used; and
c) It is not possible for a welder or any other worker to be in contact with the work piece, in the event of being in contact with a live part of the welding circuit.

Category A environments require considerable effort to insulate the welder and others from the work piece. The type of work would typically be bench-top welding where the work piece is small and /or is a repetitive operation in an area such as a workshop. Under some conditions a category A environment could become a category B environment. e.g. change of weather conditions – cool at start (in the morning) and increased temperature during the day causing the welder operator to sweat freely,

Category B environment is an environment where there is a significant risk of the welder contacting the work piece or other parts of the welding circuit. Such an environment may be found where the ambient temperature is less than 32^{o}C and,

a) Freedom from movement is restricted, so that an operator is forced to perform welding activities in a cramped position (e.g. kneeling, sitting, lying), with physical contact with conductive parts (e.g., the work piece); or
b) There is a high risk of accidental or unavoidable contact by the operator with conductive element, which may or may not be in a confined space as defined in AS/NZS 2865

In Category B environments it is recognised that there is an increased risk of electric shock and include general fabrication activities, large work pieces, steel structures, inside pressure vessels, processing tanks and conductive confined spaces. Under some conditions, e.g. hot weather and/or working in direct sun light, a category B environment could become a category C environment.

Category C environment is where the risk of an electric shock or electrocution by arc welding is greatly increased due to low body impedance of the welder operator and a significant risk of the welder operator contacting the work piece or other parts of the welding circuit.

Category C environments include, but are not limited to, trenches, underground welding tasks, splash zones and wet work areas.

There are no Category A welding environments at our mine site.

All electric welding areas at our mine have been classified as Category C unless a detailed and documented risk assessment, carried out by the mine, has determined the work area to be classified as a Category B environment.

Hazards to consider for Category B Areas	
Electric shock from the power supply equipment cables	Fire to surrounding environment
Electric shock from the welder output power – the electrode and work piece are to be regarded as electrically live	Eye injury due to flying materials
Radiation burns to eyes or body from welding arcs	Slips, trips and falls around work site
Asphyxiation or illness due to inhalation of gases created during welding	Burns due to heating of work piece, weld spatter, hot molten material or ignition of clothing.

Additional hazards to consider for Category C areas	
Electric shock – perspiration resulting in lower body electric resistance	Electric shock – welder operator being part of the electric circuit
Electric shock – work conducted in damp or wet area	Electric shock – work conducted in a confined space

Considerations for Category B Areas	
1. Power supply protected by an RCD.	2. Ventilated work place.
3. Welding equipment that has current inspections	4. Clean and dry work area
5. Fit for purpose PPE	6. Arc barrier screen(s)
7. Welding machine fitted with a Hazard Reduction Device–HRD (VRD, or Hand piece trigger switch fitted to MIG and similar type welders)	8. Welding equipment in good condition
9. Equipment required for confined spaces – includes confined space permit (Refer AS2865), hot work permit, an observer, rescue equipment and a Welding Safety Switch in the electrode lead.	10. Insulation material – rubber mats, duckboards etc.
Additional Considerations for Category C Areas	
1. Equipment required for confined space work - including an observer, rescue equipment, ventilation fan to cool the welder operator, gas detection equipment (flammable gas, deficiency of oxygen etc.)	2. Safety equipment required for damp and wet work areas – includes an observer, Welding Safety Switch in the electrode lead, insulation material, duck boards, tarpaulins (or equivalent).
3. Dry change of cloths, gloves and foot ware for the welder operator.	

Electric welding preparation steps

Preparation Steps – Category B Areas
1. Welder operator to be dressed in dry fireproof clothing that covers the legs and arms.
2. Welder operator has steel cap rubber soled safety footwear. The steel cap of the footwear is to be totally covered.
3. Welding gloves are to be in good condition, dry and fitted to both hands.
4. Leads and components (electrode holders, cable connectors and earth clamps etc.) have been inspected for damage. Damaged leads and components are not to be used but tagged out of service and removed for repair or discarded.
5. Leather cushions, rubber matting, wooden duckboards or other means will be used to insulate the welder operator from any damp floor areas any exposed parts of the work piece.
6. Where necessary, welding arc screen(s) are in position.
7. The welding machine is fitted with a **H**azard **R**eduction **D**evice.
8. If a VRD is fitted, test the VRD for correct operation.
9. Check correct operation of the VRD indicator lights – ex. GREEN (reduced voltage output) RED (full voltage output).

9. Welding machine is powered from an outlet protected by a 30 milliamp RCD.

10. The welding machine is to have an “S” in a square on the nameplate to identify compliance with AS 60974.1. If the marking is not on the nameplate, the welding machine is not suitable for use.

11. For confined space welding activities - A permit for confined space entry is required, (PROGRAM 8)

12. An observer is to be present for confined space tasks.

10. Where required, apply a Hot Work Permit, (PROGRAM 8)

Additional Preparation Steps – Category C Areas
12. The work piece is to be isolated and tagged and locked out. (Any power cables are to be physically disconnected to prevent welding currents from travelling in these cables instead of the proper earth return welding cable.)
13. Check leads for correct size and lengths – voltage drop.

Electric welding process steps

Process Steps – Category B Area
1. The work piece is to be connected to the work lead by a suitable attachment. e.g. work lead clamp (not damaged)
2. The work area is to be kept tidy & free from tangled leads, discarded off-cuts & electrode stubs
3. Welding gloves are to be worn whilst welding activities occur and while changing electrodes.
4. Insulation mats, insulation or duck boards to be positioned.
5. While tacking two pieces together, the arc is to be struck on the piece connected to the work lead.
6. The electrode holder or gun is not to be placed on the work piece where it may short circuit, but placed in an area isolated from the work piece.
7. Before replacing electrodes the power to the welding machine is to be turned off.
8. The power to the welder is to be switched off and the disused electrode removed from the electrode holder: • Before the welder operator leaves the work area • When ever the leads have to be moved.
9. At completion of work, clean up area and store welding equipment away. Report any defects to supervisor.
10. If an operator or other experiences an electric shock the supervisor is to be informed and electric shock protocol is to be applied.

Additional Process Steps – Category C Area
1. Consider the use of secondary gloves to be worn under the welding gloves- added personal protection against electric shock.
2. If the gloves and clothing become damp through perspiration or water, replace the gloves and clothing with dry PPE.
3. Where required, insulation rubber mats and / or duck boards to be positioned.
4. For confined space work, use a fan, or similar system, to keep the welder operator cool.
5. Position the observer at Welding Safety Switch and maintain vigilance on the welder operator.

Example working near overhead power lines form

APPLICATION:

This procedure documents a systematic and structured approach to managing the hazards associated with working near or around Overhead Power Lines (OHL).

PROCEDURES:

The person tasked with work that may be near or around OHL's is required to adhere to the following procedures when planning and performing the task.

<u>Prior to any work commencing:</u>

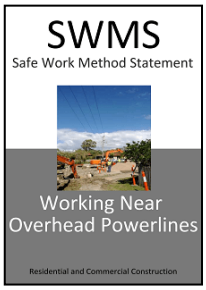
15. Before work begins a risk assessment will be conducted with the other members of the work team. This will focus on the identification and control of hazards associated with the OHL and more specifically establish the safe limits of approach distances as per (Code of Practice 2006 - Work Near Overhead Powerlines – Safe Work NSW)

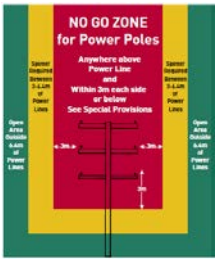
- Contact the electricity utility to determine the operating voltage of the line and confirm the safe limits of approach distances.

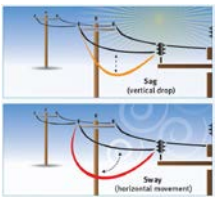
- Request assistance from the electricity utility if the work <u>must</u> be performed at a distance that is less than those specified by the code of practice. In this situation have the electrical utility disconnect or relocate the line if needed.

- If this is not feasible to do, carry out the following;

    - Before operating equipment, review the documented controls in the risk assessment that are to be implemented to prevent contact with the lines,
    - Plan your work area and movements to establish whether there are power lines to pass under or avoid,
    - Check the height of your equipment or load against the specified safe limit of approach.
    - Do not allow equipment or objects to approach power lines closer than the safe limit of approach specified,
    - Look for uneven ground that may cause your vehicle to weave, bob or bounce,
    - Think about wind and temperature that may affect the power lines height,



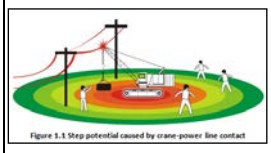




- Never ride or climb on equipment or load when near a power line,
- Work around power lines in daylight hours only,
- Use a trained spotter to act as an observer where work is required to be near the safe limit distance,
- Do not place materials under the OHL that could reduce the clearance distance to the lines,
- Do not allow excavations to reduce the support required of power poles.
- Install agreed signage to alert workers to the hazards associated with working near the power lines.

<u>In an Emergency</u>

- Activate your sites emergency procedure.
- If you are alone and don't have a radio, stay in the vehicle until help arrives, as this is the safest place.
- Stay alert and keep other workers away from the area.
- Try to break contact with the lines by moving the vehicle.
- Don't try to break contact if the cable or equipment appears to be welded to the line, as this may create a whip lash hazard.
- If the line is on the ground, it could be charging the surrounding area.
- Stay well back from the area as walking towards the scene may. expose you to an electric shock through your legs due to a graduated 'step potential difference' created in the ground.
- If you must navigate ground which has the potential to be alive, 'bunny hop' without stepping to reduce the potential of electric shock.
- Do not assume the lines are dead as transmission lines generally have an automatic recloser.
- If possible contact the electrical utility provider to turn the power off.
- Isolate any rubber tyred vehicles for 24 hours that have come into contact with live OHL, as the potential exists for tyre explosions.
- Once the emergency has been managed conduct an investigation into the effectiveness of the controls with your team.
- Where required report to the regulator.



Example form using electrical test equipment

APPLICATION:

This procedure documents a systematic and structured approach to using electrical test equipment and managing the hazards associated with electrical test equipment.

IMPORTANT

- It is a policy of the mine that there is no live electrical work to be done on electrical circuits that are either Low Voltage (LV) or High Voltage (HV).
- Testing on high voltage circuits, and associated equipment will be determined by the nominated electrical engineer.
- This procedure only applies to circuits that are low voltage.

EQUIPMENT REQUIREMENTS

- Multi-meters are to be complaint to category IV 600V or better {CAT IV)
- Multi-meters must have current limiting fuses fitted, with a rupturing capacity of 10KA
- Instruments that are being used for measurements for records should be calibrated at least annually. (Examples include RCD testers, PAT testers and earth continuity testers.)
- Test instruments should be stored in cases that prevent damage to the instrument.
- Test leads should be free of damage, be securely attached to the instrument.

PROCEDURES:

- All test instruments are to be used as per the original equipment manufacturers (OEM) directions.
- Carry out a visual inspection of the instrument before use. If it is damaged then it is not to be used.
- **Insulation testing**
    - Ensure power is isolated before testing insulation
    - If the instrument has a discharge function then follow the OEM directions to discharge any accumulation of electric charge during the testing process;
- **RCD Testing**
    - Isolate power to the circuit under test;
    - Insert the testing leads into the test points
    - Re-energise the circuit;

- Operate the RCD tester as per the OEM instructions

- **Earth Continuity Testing, Earth testing**
  - Ensure power is isolated to the circuit that is having the earth continuity tested;
  - Isolate any adjacent circuits that are energised that may induce unwanted voltages into the circuit under test.
  - Follow the OEM instructions