Powerlink QUEENSLAND

SAFE FOR LIFE
Everyone. Everywhere. Everyday.

Electrical Safety Rules

November 2024

Foreword

The Powerlink Electrical Safety Rules (Rules) prescribe the minimum standard for electrical safety work practices related to Powerlink Queensland's Electricity Transmission *Network*.

At Powerlink, the safety of our employees, contractors, and the communities in which we operate remains paramount. Every individual is responsible and accountable for managing electrical safety, with our leaders actively demonstrating this commitment.

These Rules are an essential part of Powerlink's safety management system and *must* always be applied. Everyone must ensure they meet or exceed the requirements of these Rules and have a current copy readily available.

These Rules are designed to complement the Electrical Safety Act 2002 (Qld) and are developed and maintained through Powerlink consultative mechanisms with the support of key stakeholders.

In this update, we have introduced a new structure, simplified the content, and largely removed procedural elements to enhance usability and accessibility. The aim is to make the Rules more practical and user-friendly, ensuring that everyone—whether a seasoned professional or someone new to our team—can easily understand and apply them in their day-to-day work.

We trust that these changes will further strengthen our collective commitment to electrical safety and make it easier for every individual to contribute to a safer work environment.

Gary Edwards
Chief Operating Officer
Powerlink Queensland

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In acknowledging the reviewers listed above, we also acknowledge the contribution of more than fifty subject matter experts who provided feedback to ensure the Rules are accurate and fit for purpose.

Version history

Edition	Date	Section/s	Summary of changes
1	March 2003	All	Document has been amended to include Department of Mines and Energy Safety Publications and Electrical Safety Legislative requirements.
2	October 2006	All	Document has been amended in line with revised HVIA Procedures, new Powerlink Working at Heights document and newly introduced work practices.
3	May 2008	All	Document has been amended in line with the release of the new Queensland Electricity Entity Procedures for Safe Access to *High Voltage* Electrical Apparatus, which has replaced the previous Powerlink *High Voltage* Isolation and Access Procedures. Other minor changes and additions have been included. As part of the general document review and improvement process. Assigned SM-STA-026A.
4	May 2016	All	Document has been amended with minor changes and additions have been included as part of the general document review and improvement process. (This version was not released)
5	June 2018	All	Document has been updated with minor changes for consistency with Electrical Safety Legislation and contemporary practice.
6	June 2021	All	Document has been updated for consistency with Powerlink Health, Safety and Environment Management System and further alignment with contemporary practice.
7	November 2024	All	Document has undergone an extensive review, including: • New structure to improve navigation and ease of reference. • Removal of procedural content (where procedures exist) to ensure only one source of truth across Powerlink. • Alignment with Electrical Safety Legislation, other entities, and contemporary practice

Users of these Rules are responsible for ensuring that this edition is the latest version available at: www.powerlink.com.au.

Powerlink welcomes feedback for the continuous improvement of these Rules at: esr@powerlink.com.au.

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PART I

Introduction and Definitions

1.0

Introduction and Definitions

Key

 Powerlink Requirements

 Legislative Requirements

 Australian Standards

1.1 Purpose

The purpose of these Rules is to ensure:

- Electrical Safety of all persons and property. Under all circumstances this *must* be the prime consideration;
- Compliance with relevant Queensland legislation; and
- Security of Powerlink Queensland's *High Voltage (HV)* Electricity Transmission *Network* and other property.

These Rules only address electrical safety and do not manage other work health and safety risks.

1.2 Application

This HSE Standard prescribes the electrical safety rules for the performance of all work associated with the Powerlink Queensland *HV* Electricity Transmission Network, which includes:

- All work associated with Powerlink's *HV* Electricity Transmission *Network* and *Associated Sites* throughout the asset lifecycle; and
- Work and all activities by all persons in any capacity including employees, contractors and *service providers*, licensees, contestable *service providers*, *Visitors*, and others.

These Rules also apply to:

- *Work* by Powerlink on customers' and others' *electrical equipment* unless alternate electrical safety rules are negotiated and *approved* by Powerlink; and
- *Work* on Powerlink property, which does not form part of Powerlink's *High Voltage* Electricity Transmission *Network* and *Associated Sites*, if nominated by Powerlink in its management system.

It is the duty of all persons working under these Rules (including employees, contractors, licensees, contestable *service providers*, *visitors*, and others) to:

- Apply these Rules relevant to the scope of their activity; and
- Report any non-observance of these rules.

If it is unclear whether or how these Rules are to be applied, it is the responsibility of the individual to report the uncertainty and seek clarification from their supervisor or Powerlink representative before proceeding.

Electrically Safe alternate methods of achieving or exceeding specific requirements may be *approved* by Powerlink on written application to the *Person In Control of Electrical Equipment (PICEE)*.

1.3 Application of Regulations and Standards for Electrical Work and Equipment

As an element of Powerlink Queensland's Health, Safety and Environment management system, these Rules supplement and *must* be complied with alongside, all applicable legislation, Codes of Practice, Australian Standards, Management of Not Electrically Connected Standard, and the Queensland Electricity Entity Standard for Safe Access to High Voltage Electrical Apparatus [SAHVEA].

The Network and *Associated Sites* are designed, constructed, operated, and maintained in accordance with Australian and/or international standards, codes, guidelines, and government regulations. All work carried out on the *Network* and *Associated Sites* is to be carried out in accordance with relevant legislative and Powerlink Requirements. If individuals are not familiar with relevant designs the work *must not* proceed until clarification is provided.

All electrical work *must* be verified to comply with applicable design and construction requirements and requirements for *works*, applicable commissioning, and verification procedures.

1.4 Training and Licensing

Workers undertaking electrical work *must* be licensed in accordance with legislative requirements. Workers *must* be trained, *competent* and *approved* for the work they are undertaking. Workers *must* be an *authorised person* to perform any work requiring *authorisation*.

Work licenses are not required in the circumstances covered by Electrical Safety Act 2002 Section 55 (3).

Legislative requirements

Queensland Electrical Safety Act 2002
Electrical Safety Regulation 2013

1.5 Revision Procedure

The Rules are managed as a Standard under Powerlink Requirements.

The Standard requires review on a minimum three yearly basis and may be updated as required. Reviews will be subject to the application of appropriate consultative mechanisms and involve key stakeholders and representatives.

Any feedback or proposal for revision should be sent to Powerlink in writing via:
Esr@powerlink.com.au

Powerlink Requirements

Powerlink's Document Management Framework
Powerlink HSE Communication and Consultation

1.6 Interpretation and Definitions

1.6.1 Interpretation

Throughout this document, terms in italics have a defined meaning. Where terms are not in italic, they should be interpreted as indicated by the context or subject matter.

Where there is a reference to Powerlink Requirements it is necessary to consult and apply the referenced Powerlink requirements. Powerlink *must* communicate changes to Powerlink Requirements to persons working under these Rules.

A reference to a law is to the common law and legislation of the relevant jurisdiction. Any references to legislation are to be interpreted by reference to the current legislation.

1.6.2 Definitions

Access Permit	A document that forms part of an electrical safety system to work, to provide *electrically safe* access to *high voltage electrical equipment*.
Approved	Having appropriate endorsement in writing for a specific function.
Associated Sites	Places which are associated with the *High Voltage* Electricity Transmission *Network*. (This includes without limitation electrical switchyard and substation sites, control and communications facilities, transmission structures, lines, and related facilities).
Authorisation	A formal authority to execute and/or perform a role, which is defined under the Electrical Authorisation Governance Framework.
Authorised Person	A person with enough technical knowledge or sufficient experience who has been *approved* or has the delegated authority to act on behalf of the organisation, to perform the duty concerned.
Competent / Competent Person	Means a person who has acquired, through training, qualifications, experience or a combination of these, the knowledge and skill to carry out a particular task.
Conductor	an object or type of material that allows the flow of charge (electric current) in one or more directions.
De-Commissioned	Equipment that once was commissioned and has been taken out of service (e.g. redundant, under-rated, etc.) but not physically removed from site, this equipment may be re-commissioned later.
De-Energised	Not connected to any source of electrical energy but not necessarily *isolated*, *earthed*, discharged or *de-commissioned*.
Disconnector / Isolator	A device that, when open, renders *electrical equipment isolated* by providing breaks in all active *conductors*.

Disconnection Point	An adequate break created by the removal or absence of *conductors* and deemed no longer a source of inadvertent re-energisation. The break *must*: • Not be able to be re-established by switching operations; • Maintain *Exclusion Zone* distances appropriate to the voltage, or maintain electrical non-flashover distance appropriate to the voltage; and • Be created in accordance with the *approved* procedure to establish a *disconnection point*.
Do Not Operate Board (DNOB)	An electrical safety sign bearing the words "Do Not Operate" used to identify *isolation points* and/or *operator earths*. Refer to Queensland 'Electricity Entity Standard for electrical safety Access to high voltage Electrical Apparatus.'
Earthed	Electrically connected to the general mass of earth by a *conductor* to ensure and maintain the effective dissipation of electrical energy.
Earthing Switch	A permanently installed device which, when closed, ensures that the *electrical equipment* at that point is *earthed*.
Electrical Equipment	Any electrical apparatus, *electric line*, appliance, cable, *conductor* fitting, insulator, material, meter, or wire: • Used for controlling, generating, supplying, transforming, or transmitting electricity at a voltage greater than *Extra Low Voltage*; • Operated by electricity greater than *Extra Low Voltage*; or • That is, or that forms part of, a cathodic protection system.
Electric Line	A wire and associated equipment used for transmitting, transforming, or supplying electricity at a voltage greater than *Extra Low Voltage*. (An *electric line* is *electrical equipment*.)
Electrical Risk	• The risk to the person of death, shock or injury caused by, or originating from electricity; and • The risk of property damage caused by, or originating from, electricity.

Electrically Safe	• For a person or property, that the person or property is *Free from Electrical Risk;* • For *electrical equipment* or an electrical installation, that all persons and property are *Free from electrical risk* from the equipment or installation; • For the way *electrical equipment*, an electrical installation or the *works* of an electricity entity are operated or used, that all persons and property are *Free from electrical risk* from the operation or use of the equipment, installation, or *works*; • For the way electrical work is performed, that all persons are *Free from electrical risk* from the performance of the work; • For the way, a business or undertaking is conducted, that all persons are *Free from electrical risk* from the conduct of the business or undertaking; and • For the way *electrical equipment* or an electrical installation is installed or repaired, that all persons are *Free from electrical risk* from the installing or repairing of the equipment or installation.
Emergency Switching	immediate *switching* for safeguarding personnel preventing damage to *electrical equipment* restoring supply or providing access for emergency repair of *electrical equipment*.
Energised	Connected to any source of electrical energy or electrically charged.
Exclusion Zone	the safe distance that *must* be maintained from *electrical equipment*, as identified in these Rules and the Electrical Safety Regulation.
Exposed	Bare or not effectively insulated; or not effectively guarded by either a fixed barrier or an *earthed* metal shield.
Extra Low Voltage	A voltage not exceeding fifty volts AC or 120 volts ripple free DC.
Free From Electrical Risk	• *Electrical Risk* to the person or property has been eliminated, as far as is reasonably practicable; or • If it is not reasonably practicable to *eliminate electrical* risk to the person or property, the risk has been minimised as far as is reasonably practicable.

High Voltage (HV)	A nominal voltage exceeding 1,000 volts AC or 1,500 volts ripple free DC.
High Voltage Electrical Transmission Network (the Network)	Refers specifically to Powerlink's electricity transmission *Network* operated under the Electricity Act 1994 (Qld) and includes all *works* of an electricity entity.
Instructed person	A person adequately advised and supervised by an *authorised person* to enable them to avoid the hazards which may be present.
Insulating Gloves	Gloves manufactured to an *approved* Australian Standard and appropriate for the intended task.
Insulating Mats, Covers and Sleeving	Mats and sleeving of an *approved* shape, size and material used under certain specified conditions for protection of workers when performing *work on*, or within reach of, *exposed live low voltage electric equipment*.
Isolated	Disconnected from all possible sources of energy by means that prevent inadvertent energisation of the apparatus.
Isolation Point	An adequate break *approved* by the organisation that prevents any inadvertent energisation, for example from lightning, *switching* or back energisation. (A *DNOB must* be attached at the *Isolation Point* for SAHVEA isolations.)
Lethal Current	current in excess of 30mA alternating current or 100mA direct current through the human body.
Live	*Energised* or subject to hazardous induced or capacitive voltages.
Live Line Work (in substation or on lines)	*Live work* on *exposed live high voltage conductors* or *exposed live* parts of *electrical equipment*.
Live Work	Electrical work performed in circumstances where the subject of the work (the *electrical equipment*) is *energised*.
Low Voltage (LV)	Voltage greater than *extra low voltage* but not more than 1,000 volts AC RMS or 1,500 volts ripple-free DC.

Low Voltage Isolation Point	The item of *electrical equipment* that is used to isolate *Low Voltage ElecMobile Apparatus Trailing Earth (MATE)*
Mobile Apparatus Trailing Earth (MATE)	A *portable earthing device*, used to connect mobile apparatus to a single earth point on a structure in the vicinity of the work.
Must	Is to be interpreted as mandatory.
Must not	Is to be interpreted as forbidden.
Network	for the purposes of this document, *Network* is defined as the *High Voltage Electrical Transmission Network.*
Not Electrically Connected (NEC)	*Electrical equipment* no longer connected to any sources of supply by the creation of *Disconnection Points*, appropriate to the voltage and insulating medium and, not able to be *energised* by *switching* and created in accordance with the industry Standard for the Creation of a *Disconnection Point.*
Non-Access Work (NAW)	Work performed on *electrical equipment* by an *Authorised Person*, where an *Access Permit* has not been issued, and where *exclusion zones* are maintained at all times, or where an *approved* insulated tool enters the *exclusion zone* as part of the work activity.
Officer for Local Security (OFLS)	An authorised role responsible for site security and access at nominated sites.
Operational Switching	*Switching* carried out or directed to be carried out by a System Operations Control Centre for the purpose of reconfiguring the *high voltage* system, connecting, and disconnecting generators on a routine basis and voltage or fault level control to suit system conditions.
On or near	In close proximity to *exposed* energised *conductors* or *live* conductive parts. **Note:** This term relates to *Low Voltage* and *Extra Low Voltage* work in accordance with AS4836:2023 Safe Working on or near low-voltage and extra-low voltage electrical installations and equipment
Operator Earths (Access Authority Earth)	*Approved* earthing and short-circuiting equipment applied to *electrical equipment* (with *DNOB* attached), as a requirement for the issue of an *Access Permit,* to ensure that *electrical equipment* is *earthed.*

Person in Control of Electrical Equipment (PICEE)	an authorised role held by the position of General Manager Operational Engineering that is responsible for the electrical safety governance framework and the management of electrical safety *authorisation* across *the network*.
Personal Danger Tag	A tag fitted to *electrical equipment* to prevent its operation that is only removable by the person who fitted it, or by an appropriate supervisor.
Plant	includes: • Any machinery, equipment, appliance, container, implement and tool; • Any component of any of those things; and • Anything fitted or connected to any of those things.
Portable Earthing Device (PED)	(previously also referred to as Hand Earths) – Portable device of *approved* type and size that are used to ensure that *conductors* and/or *electrical equipment* are *earthed*, at a point where the use of an *earthing switch* is not possible.
Powered Mobile Plant	*plant* that is provided with some form of self-propulsion that is ordinarily under the direct control of an operator.
Recipient	An *authorised person* to whom an *Access/Test Permit* may be issued and is the person responsible for compliance with the requirements of a permit under SAHVEA procedures.
Restricted Access Zone (RAZ)	a defined area within a Powerlink owned or controlled asset containing an item or items in a condition or suspected of being in a condition that represents an increased risk to safety.
RPEQ Engineer	an Engineer registered with the Board of Professional Engineers Queensland, in the appropriate area of engineering, to perform a specific role in providing professional engineering services to Powerlink.
RPEQ Engineer - Non-Standard Earthing Advice	an authorised role as per the Electrical Authorisation Governance Framework.
Service Provider	A group or company responsible for providing services in accordance with a contract or Service Level Agreement.
Switching	Any action that alters connections in an electrical circuit or any action specified in a *switching* sheet.

Switching Coordinator	An *authorised person* who co-ordinates *switching* performs *switching* by supervisory control and approves the issue of access and *test permits*.
Switching Operator	An *authorised person* who performs *switching*, and issues/cancels *Access* and *Test permits*.
Test Permit	A documented form of *authorisation* that allows access to *high voltage electrical equipment* for testing and minor work associated with testing and the removal of *operator earths*.
Test Stick	A device specifically designed, tested, and *approved* for testing and proving *de-energised, high voltage electrical equipment.*
Testing Officer in Charge	The person in charge of testing operations and all related work when *HV electrical equipment* are being tested.
Underground Cable System (UGC)	*High Voltage* cables and associated equipment (terminations, joint bays, joints, cable trench, sheath, earthing, and oil systems) that are mostly buried below the ground and used to connect *electrical equipment* or as part of a feeder.
Vehicle	Is considered as *plant* at a fixed height. For example, a *vehicle* includes an elevated work platform where its boom is secured in a non-operational position so that it can travel to another location where the boom is intended to be operated.
Visitor	A person without sufficient training or experience to enable them to avoid the risks associated with *work*.
Warning Notice	A plate, board or sign capable of being placed in a prominent position and suitably designed in accordance with Australian Standard AS 1319 Safety Signs for the Occupational Environment.
Works	The *electrical equipment* and associated equipment that is controlled and operated by Powerlink Queensland to transform, transmit and supply electricity. **Note:** where these Rules are to be applied to work by Powerlink on customers' and others' electrical *works* then a reference to *works* is to be taken to include the other's *works*.

Working Earths	*Approved* earthing and short-circuiting equipment, applied to *electrical equipment*, additional to *operator earths*, following the issue of an *access permit*.
Work near	Performance of a function within 3m of exposed *energised conductors* or *live* conductive parts and/or *electrical equipment*. **Note:** This term relates to *Low Voltage* and *Extra Low Voltage* work in accordance with AS4836:2023 Safe Working on or near low-voltage and extra-low voltage electrical installations and equipment
Work on	Performance of a function within 500 mm of e*xposed energised conductors* or *live* conductive parts and/or *electrical equipment*. **Note:** This term relates to *Low Voltage* and *Extra Low Voltage* work in accordance with AS4836:2023 Safe Working on or near low-voltage and extra-low voltage electrical installations and equipment

PART 2

Accessing *the Network*

2.0

Accessing *the Network*

2.1 *Authorisations*

Certain activities are only permitted to be undertaken by persons holding a specific *authorisation*, in accordance with Powerlink Requirements.

The *PICEE* is accountable for the development and implementation of the Powerlink Requirements, including matters relating to *authorisations*.

Powerlink Requirements

Electrical Authorisation Governance Framework

2.2 Entering *the Network* and *Associated Sites*

Entry to *the Network* and *Associated Sites* is restricted to *Authorised Persons, visitors, and instructed persons* in accordance with Powerlink requirements or persons otherwise *approved* by the *PICEE*.

Additional requirements that apply to entry by *visitors* and *instructed persons* are set out in these Rules.

Powerlink requirements

Electrical Authorisation Governance Framework

2.2.1 Entry Requirements

Persons *must* enter, work within, and depart *the Network* and *Associated Sites* in accordance with Powerlink Requirements, including requirements for pre and post entry activities.

Powerlink Requirements

Entry to Substations, Communication Sites and Transition Sites - Procedure

2.2.2 Security

The security of *the Network* and *Associated Sites* must be maintained at all times. Any damage, which directly affects the integrity of site security, *must* be reported to the *OFLS* immediately.

Selected sites have been fitted with electric fences. While the electric security fence is designed to give a safe electric shock, it *must not* be touched unless the fence has been *isolated* in accordance with Powerlink Requirements.

Powerlink Requirements

Accessing and Working on Powerlink Electric Fences - Guideline

2.2.3 Apprentices/Trainees

Apprentices and trainees *must* be supervised appropriately for the type of work being performed and the level of training and competence of the apprentice/trainee in accordance with Powerlink Requirements.

Apprentices/trainees who have not finished the first 6 months of the apprenticeship *must not* perform or participate in work that places them in the immediate vicinity of *live HV exposed* parts or where there is a risk they could come into contact with *live LV exposed* parts.

Powerlink Requirements

Apprentice Supervision Guideline

2.2.4 *Instructed Persons*

To enter *the Network* or *Associated Sites*, an *instructed person must* remain under the supervision of an *authorised person* and *must* receive a documented site-specific electrical safety induction in accordance with Powerlink Requirements (this information may be recorded on the Hazard Assessment Conversation). The level of supervision provided by the *authorised person must* be adequate for the level of risk considering the complexities of the task being performed.

Powerlink Requirements

Entry of Instructed Persons to Powerlink Sites – Form

2.2.5 *Visitors*

To enter *the Network* or *Associated Sites*, a *visitor* must be accompanied at all times by an *authorised person* in accordance with Powerlink Requirements. A *visitor must* receive a documented site-specific electrical safety induction in accordance with Powerlink Requirements (this information may be recorded on the Hazard Assessment Conversation). A *visitor must* only be allowed to observe and not participate in work activities.

Powerlink Requirements

Electrical Authorisation Governance Framework
Electrical Authorisation - Specification

2.2.6 Communication between Work Groups

When two or more workgroups are working on the same site, the person in charge of each workgroup *must* advise the other workgroup(s) of the purpose of their visit and consult, co-operate and coordinate work activities as appropriate. Before leaving site, the person in charge of the departing group *must* advise all other workgroup(s) of their intended departure.

2.3 Danger from Insulated and Apparently Insulated *Electrical Equipment*

Electrical equipment with tape, rubber or other fabric directly applied *must not* be assumed as adequately insulated.

HV insulated cables *must not* be handled when *Live* unless they are completely covered by an *earthed* metal sheath and free from visible damage. The metal sheath *must not* be touched unless appropriate insulation is used.

De-energised HV cables fitted with a metal sheath *must not* be handled unless appropriate insulation is used (e.g. *HV insulating gloves* and *insulating mats*). *HV* insulators, support stacks or bushings *must not* be handled unless the associated *electrical equipment* is *isolated* and *earthed*.

2.4 Step, Touch and Transfer Potentials

Where the risk of creating a step, touch or transfer potential exists, controls *must* be implemented to eliminate the risk.

Transfer potential controls may include:

- Moving the work area to the power outlet so it is at the same earth potential as the power source;
- Using an i*solation transformer*, or
- Using a separate *isolated* power supply such as a portable generator.
- Use of *Insluating Gloves, mats, covers or sleeving*.

2.5 Use of Electrically Conductive Ladders

Metallic, wire-reinforced, or otherwise conductive ladders *must not* be used where an electrical hazard might result from their use, in accordance with legislative requirements.

Legislative requirements

Managing electrical risks in the workplace Code of Practice 2021

2.6 Direct contact or flash-over to *Plant* or *Vehicle*

If any part of *powered mobile* plant or *vehicle* accidentally contacts *live electrical equipment*:

- Any person on the *powered mobile plant* or *vehicle* must remain on the *powered mobile plant* or *vehicle* until the *electrical equipment* has been *isolated*, tested, proved *de-energised* and *earthed* in accordance with Powerlink Requirements;
- All persons who are on the ground *must* be warned to keep clear and not attempt to rescue person/s from *powered mobile plant* or *vehicle* until the electrical equipment involved in the incident has been *isolated*, tested, proved *de-energised* and *earthed* in accordance with Powerlink Requirements; and
- If a person cannot remain on the *powered mobile plant* or *vehicle* due to immediate danger, like fire, the person *must*:
- Assess their escape route and check for fallen power lines and other hazards;
- Exit the *powered mobile plant* or *vehicle* by jumping away from the *powered mobile plant* or *vehicle*, with both feet together;
- When jumping away, never touch the *powered mobile plant* or *vehicle* and the ground at the same time;
- Once the person has landed with both feet together, continue jumping in this manner - feet together bunny hop style. Alternatively, move by shuffling with their feet together without letting their feet leave the ground; and
- Continue moving away from the accident site in this manner until they are at least ten metres away from the *powered mobile plant* or *vehicle*. The person *must not* go back.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

2.7 Restricted Areas

Where there is an identified risk of exposure to electrical hazards for persons within *the Network* or *Associated Sites*, *approved* barriers *must* be erected to restrict access. Signs *must* identify all such areas in accordance with Powerlink Requirements. Access to these areas *must* be kept secure when not in immediate use.

Powerlink Requirements

Appendix 3 – Network Barrier Chart

2.8 *Restricted Access Zone (RAZ)*

A *RAZ* is one possible control measure to manage a safety risk or hazard associated with an asset. Implementing, entering, or working within a *RAZ must* be done in accordance with Powerlink Requirements.

Powerlink Requirements

Restricted Access Zone – Management - Procedure

2.9 Substation Temporary Abnormalities

The Substation Temporary Abnormality (STA) system *must* be applied whenever equipment is to be left in an abnormal state for longer than the current working day, or when a *Restricted Access Zone* is declared.

Additionally, when an STA is identified within *the Network* and *Associated Sites*, temporary changes to in-service *electrical equipment must* be easily identifiable from a central location and in relevant information technology systems (SAP) in accordance with Powerlink Requirements.

Powerlink Requirements

Substation Temporary Abnormality System (STA) - Procedure

2.10 Abnormal electrical interference

The risks associated with partial discharge exist within *the Network* and *Associated Sites*. All persons are to ensure an *approved* AM radio is in use when in an electrical switchyard or substation in accordance with Powerlink Requirements.

Powerlink Requirements

Detection of Abnormal Electrical Interference from High Voltage Plant - Procedure

2.11 Earth Grids

To reduce step and touch potential at the substation fence line, all substations have an underground earth grid that typically extends one metre beyond the substation fence to ensure the electrical safety of persons entering and exiting and the public.

It is essential that the earth grid is not broken or damaged, as there could be different potentials between *conductors*. An electric shock or electrocution may result if there is inadvertent contact between those *conductors* as a conductive bridge may be created.

Copper theft or vandalism could cause conductive structures to become un-*earthed*, introducing an increased risk of unacceptable step and touch potentials.

In the event of, or if it is suspected that the earth grid has being damaged or broken (including damaged or missing earth tails) the following *must* occur:

- All work *must* cease immediately;
- Assessment made of the suspected or actual damage; and
- Immediate notification to the *OFLS* so persons are aware that the earth grid integrity may be or has been compromised.

Repairs and modifications to the earth grid *must* be performed as soon as practicable, using *approved* procedures. Changes to the designed and installed earthing system *must* be *approved* by an appropriately qualified *RPEQ Engineer*.

Where a bridge has been put in place and repairs cannot be made immediately, the bridge *must* be securely fixed in place and a danger tag or board *must* be attached at both ends of the bridge. A temporary barrier *must* also be placed around the area. The *OFLS must* be informed of the placement of the bridge and danger tag attached.

Where it has been identified that there is an unacceptable step and touch potential risk, such as when the earth grid has not been tested as required, the persons scoping the work *must* determine the appropriate control strategies to be applied and communicated to the work group.

Insulated tools and equipment *must* be of an *approved* type and *must* be in good order, regularly maintained, and tested. Where any doubt exists as to whether the insulation of tools and equipment is adequate, they *must not* be used.

2.12 Incident Response

Electrical incidents *must* be managed in accordance with Powerlink Requirements.

Powerlink Requirements

HSE Event Management Procedure

2.13 Emergency Preparedness

Adequate plans *must* be in place to prepare and respond to emergencies and incidents. Emergency preparedness *must* be planned to ensure the requirements of these Rules are in place prior to work commencement and effective.

Persons planning work *must* also ensure emergency exercises are conducted to test the effectiveness of response.

Powerlink Requirements

Emergency Response Plan - Lines/Easements
Emergency Response Plan - Substations

2.14 Powerlink Control Room Emergency Communication

If a risk or incident is identified which impacts or has the potential to impact *the Network*, then it must be reported to Powerlink *Network* Operations (Control Room) on the below contact numbers.

Emergency Action	
Power Systems Operations Emergency Numbers	(07) 3384 4567
Power Systems Operations (Control Room)	
Southern Control Desk	(07) 3860 2599
Central Control Desk	(07) 3860 2699
Northern Control Desk	(07) 3860 2799
All Other Issues *Network* Incident Management	
Southern Region	(07) 3266 9410
Central/Northern	(07) 3256 9329

2.15 Risk Management

Persons *must* plan for *electrically safe* work in accordance with Powerlink Requirements.

Powerlink Requirements

HSE Risk Management Procedure

2.16 Personal Protective Equipment

To minimise the risk of electrical exposure, all persons must use personal protective equipment (PPE) that is appropriate to the task and situation appropriate, in accordance with Powerlink Requirements.

Powerlink Requirements

PPE Management Procedure

2.16.1 *Insulating Gloves*

LV Insulating Gloves must comply with Australian Standards.

Insulating gloves rated at 1,000 volts *must* be worn by all persons when:

- Operating a *HV disconnector/isolator* and an *earthing switch*;
- Applying *operator earths* or *working earths*;
- Using *test sticks* or operating sticks on *HV Electric Lines* and *electrical equipment*;
- Using pole leakage testers; or
- Entering an operational substation where the earth grid is unconfirmed (not tested).

Note: The above requirement may not be relevant for *approved* methods of *HV Live Line Work*

When it is not reasonably practicable to use *insulating gloves*, a *competent person must* complete a *risk assessment* to determine if it is *electrically safe* to commence or continue work.

LV Insulating gloves must not be used for any contact with *live HV.*

Where there is a potential that the *insulating gloves* could be damaged due to the work being performed, leather outer gloves *must* be worn for mechanical protection.

Insulating gloves must be stored in an untreated canvas bag or equivalent bag/enclosure.

Soiled *Insulating gloves must* be cleaned in accordance with the manufacturer's instructions or replaced prior to use.

All persons *must* leak test and inspect *insulating gloves* for holes or damage before use.

Gloves that are used as protection against non-electrical hazards are not to be used as *insulating gloves*.

Australian Standards

AS/NZS IEC 60903 Live working - Electrical insulating gloves

2.16.2 Arc Flash

Risks associated with arc flash hazards *must* be controlled in accordance with Powerlink Requirements.

Appropriately rated arc flash resistant clothing and associated personal protective equipment *must* be worn for tasks where an arc flash hazard exists.

Signage will indicate the category of PPE required. Where signage is not present, advice *must* be sought from the authorised *RPEQ Engineer* to confirm the level of arc flash risk.

Powerlink Requirements

PPE Management Procedure

HSE Risk Management Procedure

2.16.3 Jewellery and Personal Equipment

When accessing *the Network* and *Associated Sites,* persons *must not* wear unsecured conductive jewellery and personal equipment. For example:

- Items that have potential to swing away from the body, such as chains and necklaces; and
- Items that have potential to fall from the body, such as metal framed glasses.

When performing work where there is a risk of contact with *energised* parts, persons also *must not* wear conductive items and items that are likely to pose a risk of heat retention. For example:

- Rings, earrings, bracelets, and watches;
- Metallic belts; and
- Metallic items with potential to fall from pockets.

When performing work using *insulating gloves* or barriers, persons *must not* wear any items that have potential to damage the gloves or barriers.

2.16.4 Medical Implants (electronic and metallic)

Authorised persons must ensure *visitors* and *instructed persons* are made aware that the *HV* environment may affect medical electronic devices and metallic implants. Individuals *must* make the *authorised person* aware that this may apply to them and not enter the environment without clearance from their medical practitioner.

2.17 Substation Storage

Material and equipment *must* not normally be stored within the confines of any electrical substation, communications site or switchyard within *the Network* or *Associated Sites* unless such material and equipment are required for use at that *Network* or *Associated Site* under normal or emergency conditions.

Where storage is necessary, the storage location *must not* impede access, egress, or performance of normal operations of work. During storage, material and equipment *must* be left in an *electrically safe* manner with consideration to minimising unlawful access and theft.

Materials and equipment including shipping containers, skip bins and other storage items *must not* hinder the performance of normal operations or work. Where materials and equipment require Earthing, the earthing design *must* follow current Powerlink earthing practices or be *approved* by an *RPEQ Engineer*.

2.18 Handling and Moving

Anything of a conductive nature constitutes a hazard where there is a risk of contact with *electrical equipment.*

All materials and equipment, including liquids, flame, and gases, *must* be regarded as being conductive unless determined otherwise by a *competent person* and the risk managed in accordance with Powerlink Requirements.

Conductive tools or equipment that can change dimension *must* not be used where it has the potential to enter an *exclusion zone* (refer Appendix I).

Conductive scaffolding, skip bins, *powered mobile plant* or similar *must* be connected to the earthing system at the site by an *approved earthing* device as soon as, and for as long as, it is practicable.

When carrying and handling objects of a length liable to cause an *electrical risk*, consideration *must* be given to:

- The use of *insulating gloves*
- Induction risk
- *Earth potential rise*

To minimise induced voltages into metallic materials and to prevent the chance of entering an *exclusion zone* pipes, rods, ladders or similar items *must* be carried in a horizontal position and as close to the ground as is practicable.

Where necessary, additional *Competent Persons must* be used to maintain adequate control of items being moved and to ensure that the prescribed *exclusion zone* is not breached.

Powerlink Requirements

HSE Risk Management Procedure

2.19 Substation Fencing

All Substation fencing *must* be designed and installed as per the requirements of *approved* engineering systems in accordance with Powerlink design standards.

2.19.1 Temporary Fencing

Temporary fencing within *the Network* or *Associated Sites* must be installed as per the requirements of *approved* engineering systems in accordance with Powerlink design standards.

Where temporary fencing is used as the main site security, work priority *must* be given to re-instating the permanent fence.

2.19.2 External Isolation Fencing

A minimum of 3m of non-conductive insulated fencing *must* be installed where any fence attaches to a substation fence in accordance with Powerlink design standards.

2.20 *Powered Mobile Plant*

Operators of *Powered Mobile Plant* must be either an *authorised person* or be an *instructed person*, supervised by an *authorised person*.

Excluding *Live HV work* in accordance with Section 3.10.26, a person *must not* operate any *plant* or *vehicle* in situations where any part will intrude into the *exclusion zone* for an *authorised person* unless the *electrical equipment* is *isolated*, proved *de-energised* and where required, *earthed*. This includes a person working in an *elevating work platform* (EWP), any hand tools or other equipment held by any person involved with the operation or the load being moved.

Exclusion zones must be maintained in accordance with legislative requirements.

Legislative requirements

Electrical Safety Code of Practice 2020 (QLD) Working near overhead and underground electric lines
Electrical Safety Regulation 2013

2.20.1 Earthing of *Powered mobile plant* and *Vehicles*

When operating on *the Network* and *Associated Sites*, all *Powered Mobile Plant must* be connected to the earthing system. *Vehicles* do not require connection to the earthing system but *must not* be operated in a manner where they could enter an *exclusion zone*.

The connection *must* be made using an appropriately rated *MATE* as soon as is practicable, and, in any event when it is operating in the *Safety Observer Zone*.

The *MATE* used *must* be capable of carrying the maximum prospective fault current for that location to ensure correct operation of protection. In some cases, this may require the use of a second *MATE* in parallel. The use of a second *MATE* will provide a fault current rating of 1.8 times the individual *MATE* rating. If a second *MATE* is applied, it *must* be connected as close as possible to the first *MATE* at both the *plant/vehicle* and the point of connection to earth.

Where it is not possible to apply a *MATE* due to the nature of the work (e.g.: bobcat spreading rock), other suitable control measures *must* be identified and applied as part of the risk assessment process.

2.20.2 Elevated Work Platforms (EWPs)

Power tools and *electrical equipment must not* be operated from the basket of an EWP via extension leads run from a ground source in any position where there is a possibility that the basket, its contents or extension leads can come within an *exclusion zone* to *HV* equipment, or there is any possibility of mechanical damage to leads.

Any tools or equipment *must* be firmly secured to ensure that they do not fall and cause *electrical risk* or impact hazard.

2.21 Operation of Drones

The operation of drones in a substation environment and in proximity to transmission lines *must* be undertaken in accordance with Powerlink Requirements. Drones *must not* be operated within six metres of a transmission line or a substation and *must not* fly over a substation unless authorised by Powerlink and *approved* by Powerlink's Chief Remote Pilot.

Only persons authorised by Powerlink's Chief Remote Pilot to operate a drone in or around *the Network* and *Associated Sites* are permitted to do so and *must* follow the Minimum Drone Approach Distances (MDAD) in accordance with Powerlink requirements.

The standard operating conditions apply to recreational and basic commercial operations involving drones <2kg. Operating under a Remotely Piloted Aircraft Operator's Certificate (ReOC), a person can perform operations outside these conditions, so long as they are included in the organisation's Civil Aviation Safety Authority (CASA) *approved* operations manual. Drone operators *must* ensure that they are meeting the regulatory requirements set by CASA.

Powerlink Requirements

Aircraft Operations Standard and Remotely Piloted Aircraft (RPA) in Substation and Transmission Line Easement – Procedure

PART 3

Electrical Work

3.0

Electrical Work

3.1 Inspection and Testing of Electrical Safety Equipment and Tools

All electrical safety equipment and tools *must* be inspected and tested in accordance with legislative requirements and applicable Australian standards.

Insulating gloves, *test sticks*, ladders, portable platforms, linespersons' safety belts, and belts and harnesses contained in rescue kits *must* be inspected and/or tested at intervals not exceeding 6 months and carried out by a *competent person.*

Each item *must* be labelled by the *competent person* in an *approved* manner to indicate when the next test is due and any other information required to be included. Equipment *must not* be used unless a valid tag is attached.

Equipment *must* also be visually inspected prior to use and any safety equipment found to be unserviceable *must* be suitably tagged and removed from service immediately.

Legislative Requirements

Electrical Safety Act 2002

Australian Standards

AS/NZS 3760 In-service safety inspection and testing of electrical equipment
AS/NZS 3012 Electrical Installations - Construction and demolition site

3.2 *Low Voltage* Portable *Electrical Equipment*

All portable *electrical equipment* must be protected by an appropriately rated and *approved* portable Residual Current Device (RCD) between the power source and the *electrical equipment*, where there is any doubt that RCD protection has been installed at the power outlet.

Prior to use, all portable *electrical equipment must* be visually inspected for damage or deterioration. All portable *electrical equipment must* comply with Australian Standards.

Australian Standards

AS/NZS 3760 In service safety inspection and testing of electrical equipment and RCDs

3.3 Labelling for Identification

The identity of all switches, transformers, links, feeders etc. *must* be clearly established by a consistent means of labelling and signage. Reference *must* be made to the relevant Powerlink Requirements in relation to the types of labelling and signage required.

Where the identity of cables, end boxes, terminations, or other *electrical equipment.* is not obvious, they *must* also be clearly labelled.

When the connections to *electrical equipment* are altered, the labels *must* be changed at the same time as the connections to *electrical equipment*, and as soon as reasonably practicable after the connections of *electric lines*.

Powerlink Requirements:

Signage at Substations, Transition and Telecommunications Sites – Specification

3.4 Current Transformer (CT) Circuits

The secondary circuit of a CT *must not* be opened whilst the primary circuit is *energised* unless the secondary winding of the CT has been short-circuited at suitable terminals on the CT side of where the open point is to be made. The CT secondary circuit *must* remain *earthed* (a temporary earth may need to be applied at suitable terminals if the permanent CT secondary earth is on the load side where the open point is to be made).

When measuring CT secondary currents in service, fused leads or meters with fused inputs *must not* be used.

When terminating CT wiring, terminations *must* be made using an appropriate crimping tool and terminals *must* be tightened to manufacturers' specification and in accordance with Standard Cable Type and Termination Drawings – A1-H-132091 – 021/022/023.

3.5 Working with Batteries

Battery circuits *must not* be broken while batteries are charging or under load.

Tools and links/bridges used to make or break connections *must* be insulated and not be able to create a short between polarities or other cells.

3.5.1 Single-Flooded Wet Cell Batteries

Persons working with Single Flooded Wet Cell Batteries e.g. standby generators must:

- Wear appropriate PPE;
- Avoid contact with any wet areas on the battery;
- Ensure naked flames and smoking are strictly prohibited;
- Avoid allowing highly corrosive acids from cells to come in contact with the skin or clothing;
- Carry the cell in an upright and secure position;
- Ensure the correct procedures are followed for "topping up" cells; and
- Ensure spills are cleaned up appropriately and any waste generated from the clean-up is to be disposed of in accordance with hazardous substance clean up processes.

3.5.2 Valve Regulated Lead Acid (VRLA) Batteries

Any batteries that are damaged, bulging or leaking (generally a greenish gel) *must* be replaced.

Persons *must*:

- Wear appropriate PPE;
- Avoid contact with the gel;
- Clean up spills appropriately; and
- Ensure any waste generated from the clean-up is disposed of in accordance with hazardous substance clean up processes.

3.6 Voltmeters, Ammeters and Other Items of Test Equipment or Instruments

Test equipment *must* be procured in accordance with Powerlink Requirements.

The test equipment or instrument *must* be calibrated and maintained in accordance with the manufacturers' requirements. A pre-use inspection *must* be carried out to ensure electrical integrity and the *electrically safe* operation of the item. All test equipment and instruments *must* only be used within its designed specifications and intended use.

Any test instrument capable of producing *lethal current must* be labelled as such. At a minimum, Category III or above instruments *must* be used for measuring *LV* voltages and currents in accordance with Australian Standards.

Test instrument category and typical use

For electrical safety, the combination of leads and instruments used should be capable of withstanding the highest voltages which occur at the test location. The table below lists the categories and their typical use.

Over-voltage category	Circuit voltage	Suitability	Examples
I	ELV	Measurements on circuits not directly connected to mains	ELV DC circuits, ELV lighting
II	LV	Measurements on equipment directly connected to an LV installation	Appliances
III	LV	Measurements performed on an LV installation	Final subcircuits, distribution boards, submains, LV DC circuits
IV	LV	Measurements performed at the source of an LV installation	Mains and main switchboards

Powerlink Requirements

Plant and Work Equipment Standard

Australian Standards

AS4836:2023 Safe Working on or near low-voltage and extra-low voltage electrical installations and equipment

3.6.1 Use of Tong or Clip-On Ammeters

Tong or clip-on ammeters are generally used on *LV Electric Lines*, or if suitable for the purpose, they may also be used on *de-energised HV Electric Lines* under an *Access Permit* or *Test Permit*.

In either case, testing with tong or clip on ammeters is *live work* and the user *must* have been suitably instructed in the precautions to be taken when using them in accordance with *approved* procedures and these Rules.

3.7 Extension Cords

Extension cords *must* be protected from mechanical damage and *exclusion zones must* be maintained.

The distance an extension lead needs to be run to reach the work area *must* be minimised to the shortest length practicable. This may require the use of a portable generator.

A person must not run an extension cord from inside to outside the substation fence or vice versa as this poses an unacceptable transfer potential risk. (Refer Section 18).

The maximum length of a flexible cord, for a given *conductor* cross-sectional area, *must* comply with Australian Standards.

Australian Standards

AS3012 Electrical Installations – Construction and Demolition Sites

3.8 Power Boards

Double adapters and other types of domestic multi-socket power boards *must not* be used on *the Network* and *Associated Sites*. Only use multi-socket portable devices that comply with Australian Standards and are an industrial type protected by over current and RCD.

3.9 *Low Voltage*

All *LV electrical equipment* must be treated as *live* until the *LV electrical equipment* is *isolated* and proved *de-energised*.

Work on or *work near energised LV electrical equipment* is only permitted in accordance with legislative requirements. All work that is to be carried out *on or near exposed energised LV electrical equipment must* be *authorised*, planned, and appropriate records kept in accordance with legislative requirements.

Electrical work *must not* be performed or supervised by a person unless they hold an appropriate electrical workers licence (or exemption, if applicable) in accordance with legislative requirements.

Legislative Requirements

Electrical Safety Act 2002
Electrical Safety Regulation 2013
Managing electrical risks in the workplace Code of Practice 2021

3.9.1 *Work on or Work Near De-Energised Low Voltage Electrical Equipment*

Before starting *work on* or *work near de-energised LV electrical equipment*, an *authorised person must* have:

- Positively identified the *electrical equipment*, all its energy sources and the most appropriate point of isolation, by applying danger or warning tags;
- *Isolated* and where necessary, discharged the *electrical equipment* from all sources of supply;
- Secured the *LV isolation point*;
- Proved *de-energisation* of all *electrical equipment* and *conductors*; and
- Identified the safe area of work.

The safe area of work *must* be identified by erecting barriers or warning signs or by other *approved* means if necessary. All persons who are to work in the safe area must be advised of its limits.

In some unusual situations, *LV electrical equipment* may need to be *earthed* and short-circuited using *approved* equipment.

3.9.2 Working on *Energised Low Voltage Electrical Equipment*

Work on Energised LV electrical equipment is only permitted in accordance with legislative requirements.

Prior to *work on energised LV electrical equipment* the following *must* be completed and available and where relevant, records kept:

- A risk assessment is completed and carried out, clearly identifying *isolation point*s, safety observer requirements and emergency response processes;
- Ensure that the point at which the *electrical equipment* can be disconnected or *isolated* from its electricity supply is clearly marked or labelled and clear of obstructions and the area is restricted to *authorised persons*;
- Inadvertent contact with *live exposed conductors* is removed through the *insulated mats*, *covers or sleeving*, or *Insulated gloves*;
- An appropriate emergency response and first aid plan is in place for the work being conducted, in accordance with Powerlink Requirements (e.g. L.V. Rescue Kit, an Automated External Defibrillator (A.E.D) and appropriate first aid equipment);
- Tools, testing equipment and PPE are available, suitable, tested, properly used and maintained; and

Where it is reasonably considered that the *approved* control measures applied do not reduce the risk to acceptable levels to be *Free from Electrical Risk*, work will not continue. Electrical work will only continue when control measures are applied that reduce the risk to an acceptable level. This may mean that *electrical equipment* is *isolated* and that work is required to be rescheduled as a result.

Legislative requirements

Electrical Safety Regulation 2013

Managing electrical risks in the workplace Code of Practice 2021

Powerlink Requirements

Emergency Management and First Aid - Standard

3.9.3 *Work On Exposed Energised Low Voltage Electrical Equipment*

Work on or work near exposed Energised LV electrical equipment is only permitted in accordance with legislative requirements.

For work to commence the following *must* be completed:

- A risk assessment is completed and carried out in accordance with an *approved* SWMS, clearly identifying *isolation points*, safety observer requirements and emergency response processes;
- Ensuring that the point at which the *electrical equipment* can be disconnected or *isolated* from its electricity supply is clearly marked or labelled and clear of obstructions to allow for easy access and exit by the worker who is to carry out the electrical work or any other *competent person* and capable of being operated quickly;
- Ensuring that tools, testing equipment and PPE are available, suitable, properly tested and maintained and used properly;
- Inadvertent contact with *live exposed conductors* is removed using guards, barriers, or Insulated gloves; and
- Only *Authorised persons* are permitted to enter the work area.

Legislative requirements

Electrical Safety Regulation 2013

3.9.4 Identification and removal of *Low Voltage* Cables

A Cable *must not* be worked on unless it has been positively identified. Identification and disconnection *must* be undertaken in accordance with Powerlink Requirements

Powerlink Requirements

Decommissioning of Secondary Systems – Guideline

3.9.4.1 Removal of cables

- Disconnection *must* be independently confirmed and removed from in-service panel/kiosk at cable ends prior to removal activities and subsequently identified, labelled, and delineated.
- Cable is then to be pulled back and removed in full lengths where possible.
- Cutting of cable is only permitted once the above steps have been completed and the cable to be cut is segregated ensuring that the cable to be removed is always labelled and delineated. If the cable is not removed in full the cable ends *must* be capped and treated in accordance with Powerlink Requirements

Powerlink requirements

Decommissioning of Secondary Systems - Guideline

3.9.5 Isolation of *Low Voltage Electrical Equipment*

LV isolation *must* be secured to ensure *work on electrical equipment* and/or installations cannot be inadvertently *energised*.

LV isolation methods including the placement and removal of *Personal Danger Tags must* be done in accordance with Powerlink Requirements.

Powerlink Requirements

Application of Lockout Equipment When Isolating Low Voltage Electrical Plant – Work Instruction

3.9.5.1 Securing *Low Voltage* Isolation as Part of a *High Voltage Switching* Activity

When applying lockouts as part of a *switching* sheet, follow clause 3.9.5 for the application of the lockout devices and testing to prove *de-energised,* however, the padlocks that are applied to the lockout devices *must* be *HV* system padlocks.

When applying locking devices to *plant* (e.g. during isolation and locking of voltage transformer (VT) fuses), rather than locking each VT fuse separately it is permissible to lock the entire VT fuse box only if the VT fuse box will not need to be accessed for any other purpose during the work.

Example: If the VT fuse box contains other circuits that may need to be accessed, each VT fuse *must* be locked out separately. It is not permissible to apply the lock to the VT fuse box in this case.

3.9.6 Out-of-Service Tags

Out-of-service tags are used to identify faulty or unsafe equipment or machinery placed out of service, thereby preventing damage to *plant* and equipment or injury to persons.

Note: Out-of-service tags do not provide specific personal protection.

3.9.6.1 Placement

When equipment is being installed, altered, or maintained, the person doing the work *must* fix an out-of-service tag in a suitable position on the equipment.

The tag *must* have the name of the person (printed and signed), the date of placement and why the equipment has been placed out of service.

3.9.6.2 Removal

An out-of-service tag *must not* be removed until the person who placed the tag has been advised that the equipment has been cleared for safe operation.

In general, only the person who placed it can remove the tag. If this person is absent, an *authorised person* may remove a tag after a full investigation. If the relevant equipment is intended to be *energised*, the *authorised person* must:

- Check that all equipment is safe to be *energised*.
- Notify everyone involved that the work area is to be *energised*.

3.9.7 Testing of *Low Voltage* Switchgear Busbars

Multimeters or other portable *electrical equipment must not* be used directly to indicate or measure voltage on *energised*, high capacity, *LV* busbars or their direct connections unless *approved* fused leads are used that are in accordance with the manufacturer's code of use and fuses of the correct current and voltage rating are used.

3.10 *High Voltage*

All *HV electrical equipment must* be treated as *live* until it is *isolated*, tested and proved *de-energised*, *earthed*, or short-circuited in accordance with Powerlink Requirements.

Work requiring any part of a person, their clothing, or any object that will be used to come within the *minimum exclusion zone* distances in Appendix 1, *must* be performed by *authorised persons* in accordance with Powerlink Requirements.

All *HV switching must* be carried out in accordance with Powerlink Requirements and follow an *approved switching* sheet. All other isolation methods *must* be *approved* by the *PICEE*.

Work *must not* be undertaken on the primary part of any *HV* equipment being used as a *HV Isolation Point* (except for tasks performed as per requirements of Section 3.10.26). Secondary System related tasks, which do not impact the integrity of the *HV Isolation Point* can be undertaken as long as adequate mechanical and electrical controls are in place.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus
Management of Not Electrically Connected Apparatus – Procedure
Non Access Work in High Voltage Substations and Transition Sites – Procedure
Electrical Authorisation Governance Framework

3.10.1 Work around *Energised High Voltage Electrical Equipment*

All work around *energised HV electrical equipment* is prohibited, except for persons who hold an *authorisation* from the *PICEE* to perform *Live Line Work* or *HV* testing in accordance with Powerlink Requirements and legislative requirements.

Powerlink Requirements

Electrical Authorisation Governance Framework
High Voltage Live Line Work Governance - Framework

Legislative Requirements

Electrical Safety Regulation 2013

3.10.2 *Exclusion Zone to Exposed Live High Voltage Electrical Equipment*

A person, including any part of the body, clothing or conductive object being carried, *must not* come within the *exclusion zone* of *exposed energised HV electrical equipment*, in accordance with Powerlink Requirements or legislative requirements, whichever prescribes the greater distance. If it is necessary to enter the *exclusion zone*, the *electrical equipment must* first be *isolated* from all points of supply, proved *de-energised* and *earthed*. An *Access Permit*, *Test Permit*, or other *authorisation* as appropriate, *must* then be issued before entry into the *exclusion zone* may take place.

Powerlink Requirements

Appendix 1 – Exclusion Zone Distances

Legislative Requirements

Electrical Safety Regulation 2013

3.10.3 Emergency De-energisation

In an emergency, the SAHVEA requirements may be waived for the purpose of saving life or preventing damage to *plant* or property. A *competent person* may *de-energise electrical equipment* without prior instruction.

Any action taken under such circumstances *must* be reported as soon as possible to:

- A *Switching Coordinator* in the case of the Transmission System; and
- Where required, persons responsible for third party *HV* sites.

HV electrical equipment de-energised in an emergency *must not* be *re-energised*, except under instruction of a *Switching Coordinator*.

Where the *electrical equipment* is situated in areas within, or in areas which interface between a Generator or Transmission system or Distribution system, or Customer system, *de-energisation, must* be in accordance with Powerlink Requirements.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

3.10.4 Overhead Lines

Operator earths must be placed on *electric lines* at each *isolation point* before work commences. In addition, *working earths must* be placed at each tower or structure where work is to be performed. However, if the *electric lines* are to be broken or let down for examination etc., *working earths must* be placed at the nearest tower or structure on each side of the work area. Each *HV exposed* part *must* be *earthed* after being *de-energised*.

At any work location, irrespective of the number of phases being worked on, all three phases *must* be *earthed*. Trifurcated earths *must* not be used for this purpose. Bundled *electric lines* do not need to be individually *earthed* unless they are not physically connected together at the structure where work is being carried out.

With regards to *de-energised* and/or *decommissioned* assets that are still established, earthing requirements *must* be in accordance Powerlink Requirements and as per an *RPEQ Engineer approved* earthing plan.

All persons working aloft *must* descend to ground level prior to the initial energising of an overhead circuit, or the re-energising of a circuit.

Powerlink requirements

Portable Earth Devices Required for Transmission Lines Southern Region – Specification

Portable Earth Devices Required for Transmission Lines Central Region – Specification

Portable Earth Devices Required for Transmission Lines Northern Region – Specification

Lines Use and Application of Portable Earths on Transmission Structures

3.10.4.1 Work around Multiple Circuit Overhead Lines with One Circuit *Energised*

Work around one circuit of a multiple circuit overhead line whilst the other circuit remains *energised*, *must* be undertaken in accordance with Powerlink Requirements:

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

Management of Not Electrically Connected Apparatus - Standard

3.10.4.2 Maintaining Adequate *Electric Line* Clearance with other Overhead Lines

Overhead *electric lines* that may be displaced during the course of work *must* maintain adequate clearances to other *energised* overhead lines in the vicinity.

Where work is to be carried out on overhead *HV* circuits that are erected above other overhead circuits, and it is apparent that clearances between the two *electric lines* during the course of the work will be less than those specified for the relevant voltages and situations, the following precautions *must* be observed:

- If the work is to be carried out on *electric lines* which form part of *HV* circuit erected on the same structure/s as and above other *HV* circuits, the lower *HV* circuits *must* be *de-energised, isolated*, and *earthed*. *LV Electric Lines* erected on the same structure/s and located within the work area *must* either be covered with *approved* matting or be *de-energised*;
- If the work is to be carried out on *electric lines* which form part of a *HV* circuit that crosses above other *HV* circuits, not erected on the same structure/s but located under either span adjoining the work area, the lower *HV* circuits *must* be made *de-energised* and be *isolated* and *earthed*; and
- Where *LV Electric Lines*, not erected on the same structure/s but located under either span adjoining the work area, cross beneath *HV Electric Lines* that are to be worked on, the *LV Electric Lines must* be either made *de-energised* or protected by erecting suitable hurdles or by substituting underground cables for the *LV Electric Lines*.

3.10.4.3 Overhead Line Rescue Kits

Rescue kits adequate for the work being undertaken *must* always be immediately accessible and readily available for use when persons are working on transmission structures.

In preparation for work, a *competent person must* inspect the kit to ensure that all items are present and in good order. Each item is to be visually inspected for any damage or defects. The due date for test *must* be checked to ensure currency.

If the equipment has any defect or is out of test date, it *must* be withdrawn from service, tagged as faulty, and not used until repaired and/or tested. If not repairable, it *must* be destroyed.

Where work is being carried out on a structure, the rescue equipment and procedures dealing with rescue from structure *must* be provided.

Rescue kits, and components thereof, *must* be used only for rescue work, for training purposes, a special kit marked 'for training purposes only" is to be used. This kit is not to be used for rescue work.

Any rope line used for rescue purposes *must* be inspected and replaced if required as soon as practicable after use.

3.10.4.4 Earthing Overhead Lines

Operator earths must be placed on *electric lines* at each *isolation point* before work commences. In addition, *working earths must* be placed at each tower or structure where work is to be performed. However, if the *electric lines* are to be broken or let down for examination etc., *working earths must* be placed at the nearest tower or structure on each side of the work area. Each *HV exposed* part *must* be *earthed* after being *de-energised*.

At any work location, irrespective of the number of phases being worked on, all three phases *must* be *earthed*. Trifurcated earths *must not* be used for this purpose. Bundled *electric lines* do not need to be individually *earthed* unless they are not physically connected together at the structure where work is being carried out.

With regards to *de-energised* and/or *decommissioned* assets that are still established, earthing requirements *must* be in accordance Powerlink Requirements and as per an *RPEQ Engineer approved* earthing plan.

All persons working aloft *must* descend to ground level prior to the initial energising of an overhead circuit, or the re-energising of a circuit.

Powerlink requirements

Portable Earth Devices Required for Transmission Lines Southern Region – Specification

Portable Earth Devices Required for Transmission Lines Central Region – Specification

Portable Earth Devices Required for Transmission Lines Northern Region – Specification

Lines Use and Application of Portable Earths on Transmission Structures

3.10.5 *High Voltage* Electrical Testing

HV testing *must* be performed in accordance with Powerlink Requirements.

A *test permit* may allow the following actions within the *isolated* section of a current *switching* sheet without continual referral to the *Switching Coordinator*:

- The operation of switches and;
- The removal and re-application of earth connections; or
- The application of testing supplies,

unless those actions would connect the *isolated* section to the *HV* system.

Testing on *electrical equipment*, which is not connected to the *HV* System and cannot be connected via a normal *switching* operation and not under the control of a *Switching Coordinator/Operator must* be tested in accordance with Powerlink Requirements.

Switching to issue a *test permit must* be undertaken in accordance with Powerlink Requirements.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

3.10.5.1 General Precautions

When testing *HV electrical equipment,* the following precautions *must* be observed:

- A *competent person must* conduct a risk assessment in relation to the proposed electrical work;
- Electrical work around *energised electrical equipment must* be carried out in accordance with an *approved* Safe Work Method Statement (SWMS) prepared for the work;
- The work area in which equipment is to be *energised* at *high voltage* for test *must* be enclosed on all sides:
- By permanent walls or fences with doors or gates which can be securely closed before the equipment is *energised*; or
- By temporary, rope or barricades where it is impracticable to use a permanent test enclosure;
- *Warning notices must* be securely attached to each side of the area which may be approached;
- The area where the work is to be carried out is clear of obstructions so as to allow for easy access and exit;
- All persons *must* be warned before the equipment is *energised*;
- One or more Safety Observer - Electrical Work *must* be nominated (See Appendix 2);
- Where testing is frequently performed at a permanent enclosure, additional safeguards such as flashing lights and interlock switches to *de-energise* equipment on the opening of doors and gates *must* be provided. When testing is carried out in a temporary enclosure, a portable warning beacon system *must* be used;
- The point at which the *electrical equipment* can be disconnected or *isolated* from the test supply is clearly marked or labelled, clear of obstructions and is capable of being operated quickly;
- Tools, testing equipment and PPE are available, suitable, properly tested and maintained;
- Earthing connections *must not* be removed from equipment until all persons, other than those engaged in removing the earthing connections, have left the area, and applied when persons are allowed to enter the area again;
- Any earth grid testing *must* follow *approved* procedures;
- Except where the nature of the test dictates otherwise, a person *must not* enter a testing enclosure after the removal of earthing connections from the equipment under test, except to re-apply earthing connections after *de-energising* of the equipment; and
- Immediately after *de-energising*, all equipment which has been *energised* during the test *must* be discharged and connected to earth by securely attached earthing connections, which *must not* be disconnected except under instruction from the *Recipient* or *Testing Officer in Charge*. It is essential that both the *electrical equipment* supplying the test voltage and the equipment subjected to it be discharged and *earthed*, since a lethal charge could be retained by either item.

3.10.6 *Switching* Operations

HV switching operations *must* be carried out in accordance with Powerlink Requirements and by reference to an *authorised switching sheet*, a copy of which *must* be available at each location involved.

Exceptions to this rule may be as follows:

- Emergency *de-energisation* in accordance with **3.10.3** in this book;
- *Operational Switching*; or
- *Emergency Switching*.

When undertaking *emergency switching* in circumstances where a *switching* sheet cannot be prepared in advance, the *Switching Coordinator*, issuing the instruction, *must* record the *switching* operations and issue them to the *Switching Operator* who *must* document them.

Upon completion of the instructed *switching* sheet items, the *Switching Operator must* contact the *Switching Coordinator* and inform them of the time/s of the previous *switching* operations.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

3.10.7 *Portable Earthing Device (PED)*

*PED*s used in place of fixed *earthing switches must* have clamps of an *approved* type, mechanically suitable for the *electrical equipment* on which they are to be used. Clamps and flexible cable *must* be of adequate capacity to withstand normal short circuit current conditions without damage to themselves or to the *electric lines* at their points of attachment.

*PED*s *must* be placed on *approved* stirrups where provided. Where stirrups are not provided, *PED*'s *must* only be placed on attachment points identified in accordance with Powerlink Requirements.

The earth clamp *must* be affixed to an *approved* permanent earth such as a substation earthing system, a transmission tower leg, a transmission pole earth wire, or the general earth mass.

Where an *approved* permanent earth point is not available and a connection to the general earth mass is required, the tail/s of the *PED*s may be connected to an *approved* earth electrode driven into the ground to a minimum depth of 1.2m. This method is not permitted where a substation earth grid is present.

Each electrode *must* consist of a metal rod not less than 13mm in diameter, or a metal stake of equivalent cross-section, driven at least 1.2m vertically into the ground at the base of the pole, tower, or structure or as close as possible to the work site.

Where soil conditions are such that earthing is likely to be poor, each temporary earth *must* consist of at least two electrodes, the distance between spikes being approximately 2m.

The *approved* earth electrode *must* be tested to ensure an appropriate low resistance is achieved as required by advice from an Engineer.

When earth connections are being applied, the leads *must* be attached to the earth system before being secured to the *electric lines* or *electrical equipment*. Attachment of the phase clamps to the *electric lines* or *electrical equipment must* be by means of an *approved* stick, the clamp being applied firmly and without hesitation, and being briefly maintained in firm contact with the *electric lines* or *electrical equipment* prior to being tightly secured.

When raising the clamps to the *electric lines, exclusion zones must* be maintained between the earthing connections and any adjacent *live HV electric lines*. Earthing leads *must not* be applied in any cell or compartment in which there is any *exposed live high voltage conductor*. Persons applying (or reapplying) the earths *must* keep clear of the suspended flexible cables. When earth connections are being removed, the phase clamp connection *must* be removed from *electric lines* or *electrical equipment* before the connection of the earth system is removed.

Where the conductive parts are required to be *earthed* for a period greater than that indicated on the "Next Test Date" label on the *PED*s, a permanent bolted earth connection *must* be installed.

Powerlink Requirement:

Primary Services - Applying Earths to Substation Plant - Work Instruction

3.10.7.1 Before Use Inspection of *Portable Earthing Devices (PEDs)*

Prior to use, *PEDs must* be inspected for any obvious signs of damage, deterioration, or faulty connection. The due test date *must* be checked to ensure currency.

When used in a substation application, the *PED* short circuit current rating *must* be checked against the Substation Fault Level Sign to ensure it will not be exceeded.

If a *PED* has any defect that is likely to cause or has caused functional failure, or is out of test date, it must be *de-commissioned*, tagged as faulty, and not used until repaired and tested.

3.10.7.2 *Working Earths*

Where there is an identified risk of induced voltages, a *working earth must* be applied. This *should* be a fixed earth switch or a *Portable Earthing Device* wherever possible. When a *Working Earth* is applied it *must* be adequate to discharge stored or induced charge and to limit the rise in potential difference at the work area.

3.10.8 Earthing of Enclosed Sub-Transmission Voltage Switchgear

Enclosed Sub-Transmission voltage switchgear *must* be *earthed* by *approved* appliances. Hands or tools *must not* be inserted into switchgear spouts.

3.10.9 Busbar Spouts

When work is to be carried out on busbar spouts, the following operations *must* be carried out in strict sequence:

- The section of busbar(s) on which work is to be carried out *must* be *de-energised* and *must* be *isolated* from all points of supply in accordance with Powerlink Requirements;
- The isolating arrangements and the shutters of *live* spouts *must* be locked so that they cannot inadvertently be operated. A *"DO NOT OPERATE" Board* must be affixed or displayed at all *isolation points*;
- The busbar(s) *must* be checked and proved *de-energised* by means of an *approved* voltage detector. Correct operation of the voltage detector *must* be verified immediately before and after proving *de-energised*. Checking with a voltage indicator *must* be done on the panel where earths are to be applied and also on the panel on which work is to be carried out;
- The *isolated* section of the busbar(s) *must* be *earthed* with *approved* earthing equipment at a panel other than that at which work is to be done and, where practicable, the point of work. *"DO NOT OPERATE" Boards* must be applied to all *operator earths*; and
- An *access permit* or *permit to work*, as appropriate, *must* be issued.

Powerlink Requirements:

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

3.10.10 Feeder and Voltage Transformer Spouts

When work is to be carried out on feeder and voltage transformer spouts, the following operations *must* be carried out in strict sequence:

- The circuit *must* be *isolated* and proved *de-energised* as per Powerlink Requirements;
- The isolating arrangements and the shutters of energised spouts *must* be locked so that they cannot inadvertently be operated. A *"DO NOT OPERATE"* Board/*Permit to Work*/*personal danger tag* must be affixed or displayed at all *isolation points*;
- The circuit *must* be checked and proved *de-energised* by means of an *approved* voltage detector. Correct operation of the voltage detector *must* be verified immediately before and after proving *de-energised*;
- The circuit *must* be *earthed* with *approved* earthing equipment at all *isolation points* and where practicable, also at the point of work. Where the switchgear forms part of an overhead circuit on which there is any likelihood of dangerous induced voltages, *working earths must* be effectively connected at the nearest point to the point of work; and
- An *access permit* or *Permit to Work*, *must* be issued.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

3.10.11 Busbar Chambers

Where covers are to be removed to provide access to busbar chambers, the associated feeder terminations *must* also be made *de-energised* and *isolated* from all possible sources of supply in accordance with Powerlink Requirements.

If the associated feeder cannot be made *de-energised*, a *warning notice must* be placed to ensure that the cover cannot be removed.

Powerlink Requirements

Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus

3.10.12 Trifurcated Earths

Trifurcated Earths *must not* be used on *the Network* unless:

- They are required by a manufacturer for specific use on the manufacturer's equipment; or
- The use has been approved by an RPEQ Engineer – Non-Standard Earthing Advice who is an authorised person for the specific task.

Where the use of trifurcated earths is *approved*, persons *must* be trained in their use.

3.10.13 Induced Voltages and Currents or Residual Voltages

Induced voltages *must* be controlled to create an *electrically safe* work.

Induced voltage and/or current may be present in a *de-energised conductor* / line, due to the presence of *energised high voltage* lines or *electrical equipment*. The induced voltages and or currents are caused by electro-magnetic fields, which are either electric or magnetic fields or any combination of the two. This is particularly relevant to long *HV* transmission lines as the induced voltages can be quite high in *de-energised* circuits even with both ends of the *de-energised* circuit *isolated* and *earthed*. Significant current can be flowing through these *earthed conductors*.

Earths, where required, are applied to safely discharge induced or residual voltages at the work area under an *access permit* or *test permit* in accordance with SAVHEA. The application of additional *working earths* may be required on each remaining section of *conductor* to avoid serious injury or death due to dangerous induced or residual voltages. These earths *must* be applied as close as practical to the *electrical equipment* being worked on and the *disconnection points*.

PEDs must be applied to control induced voltages in situations where *plant* has been removed or *de-commissioned*, and there is a need to control the risk of induced voltages on un-*earthed* conductive parts. In such cases the *PED must* only be used as a temporary measure.

3.10.14 *Insulating Mats, Covers and Sleeving*

Insulating Mats, Covers and Sleeving other than *HV live line* coverings are NOT suitable for use as *insulating covers* on live *HV electric lines* and *electrical equipment*.

Insulating Mats must comply with Australian standards. The due date for test *must* be checked to ensure currency (within 6 months). *Insulating covers* for electrical purposes *must* comply with Australian standards.

If the equipment has any defect, or is out of test date, it *must* be *de-commissioned*, tagged as out of service, and not used until repaired and/or tested.

Before each use, every *insulating mat, cover, or sleeving must* be examined with attention to the following:

- Blisters, cracks, cuts, and holes;
- Embedded foreign matter; and
- Defective fastenings.

During this check, the area being examined *must* be stretched. This may be achieved by flexure of the material.

When not in use, covers and mats *must* be stored to protect against damage and deterioration.

Australian standards

AS/NZS 2978: 1995 Insulating Mats for Electrical Purposes
AS 4202-1994 Insulating covers for electrical purposes

Note: The yellow mats used to indicate which electrical cabinet is being worked on *must not* be used as an *insulating mat*.

3.10.15 *Test Sticks*

Note: The following does not include *HV live line* and *live* substation work sticks and tools.

Test sticks must only be used and stored in accordance with the manufacturer's instructions, unless there is an *approved* Powerlink Requirement that stipulates other instructions. In the case of sectionalised sticks, the container for each set of sticks *must* be clearly marked to show the minimum number of sections that must be required for use on each of the different voltages for which the set is suitable.

All *test sticks*, when not in use, *must* be kept in a clean dry place and in special containers and/or on special supports where these are provided. *Test Sticks must* be handled to prevent damaging their surfaces, which can degrade their dielectric performance.

Test sticks must not be placed on the ground as they can become contaminated with dirt and be *exposed* to higher levels of moisture etc. In addition, there is a risk of the sticks being damaged.

3.10.16 *Not Electrically Connected* Apparatus

Work being undertaken in a *not electrically connected* area within an *energised* substation *must* be undertaken in accordance with Powerlink Requirements.

Powerlink requirements

Management of Not Electrically Connected Apparatus – Procedure

Management of Not Electrically Connected Apparatus – Procedure

3.10.17 *Non-Access Work*

A *Non-Access Work* (*NAW*) clearance can be issued to perform minor work around *electrical equipment* where the electrical equipment is not subject to an *access permit* issued under SAHVEA and *exclusion zones* are maintained in accordance with Powerlink Requirements.

Powerlink Requirements

Non Access Work in High Voltage Substations and Transition Sites – Procedure

3.10.18 Transmission Line Easements

All *work on* Transmission line easements *must* be notified to the *OFLS* and carried out in accordance with Powerlink requirements.

All persons carrying out such work *must*:

- Be trained in these Rules and
- Be trained in Land Access Protocol (LAP); and
- Have received Powerlink Contractor Induction training (if the person is a contractor).

OR

- Be supervised as an instructed persons by someone meeting the above requirements.

Powerlink Requirements

Biosecurity Management Procedure
Land Access Protocol

3.10.19 Bus Zone Protection

At least one high-speed (primary) bus zone protection *must* be in service when people are working in the switchyard or whenever *switching* is in progress.

Where work is being carried out on the bus zone protection schemes, requiring all protection for a bus to be out of service at the same time, only persons involved in the bus zone protection work are permitted in the switchyard. The duration of this work *must* be kept to a minimum.

3.10.20 Work in the Vicinity of Electrical Storms

The presence of electrical storms is to be monitored using appropriate lightning tracking devices or through maintaining contact with Network Operations.

If the work being undertaken presents a risk of injury through lightning strikes, then that *work* must be suspended. Work can only resume once it is confirmed that the electrical storm no longer presents a risk.

3.10.21 Equipment that can be remotely or automatically controlled

Work *must not* be undertaken on the primary part of any *HV* equipment being used as an *HV Isolation Point* (except for tasks performed as per requirements of Section 3.10.26). Secondary System related tasks, which do not impact the integrity of the *HV Isolation Point* can be undertaken as long as adequate mechanical and electrical controls are in place.

3.10.22 Equipment Operated by other than Electrical Energy

Before work is carried out on a circuit breaker or other *HV electrical equipment* operated by a means other than electrically (e.g. spring mechanism, compressed air, or compressed nitrogen/hydraulic), the operating energy source *must* be suitably discharged and either disconnected from the *electrical equipment* or made inoperative in accordance with manufacturer's instructions.

Where the energy source is required to perform the work, suitable control measures *must* be applied to reduce the likelihood of injury to people. All persons involved in the work *must* be informed of the hazard and control measures to be used.

3.10.23 Ground Disturbance, Earth Penetration or Excavation

All work that increases risk to Powerlink *Underground Cable Systems (UGC)* including excavation, ground disturbance or earth penetration *must* be risk assessed and have the hierarchy of controls applied in accordance with Powerlink Requirements.

Ground disturbance, earth penetration or excavation *must not* take place when it will be within or have the potential to come within 1m of *UGC*, unless safety advice has been provided by a Regional Contact Representative who is an *Authorised Person* for that purpose in accordance with Powerlink Requirements.

Note: For the purpose of this section only, Earths Grids are considered *UGC*.

Powerlink Requirements

Risk Management Procedure
Excavation Procedure
Electrical Authorisation Governance Framework
Application for Safety Advice – Procedure

3.10.24 *High Voltage Underground Cable Systems (UGC)*

HV UGC can be wholly or partly located inside substations. These cables can be located between substations and transition sites, or between transition sites, or used to connect customer infrastructure.

Substation *HV* underground cables are typically for connections of substation *electrical equipment* inside the same substation.

Transmission Voltage Feeder *UGC* carry a numbered feeder and are installed predominantly between transition sites and/or substations through land not controlled by Powerlink.

UGC Cable sheaths (armour) help prevent mechanical damage and are always metallic on *the network*. Typical materials used for the sheath include lead, corrugated aluminium, corrugated stainless steel and copper (both flat and corrugated).

Cable sheaths/screens are *earthed* in several ways to provide a fault current earth return path during fault conditions on *the Network*. The *earthing* also reduces the magnitude of (but does not eliminate) induced sheath voltage from any adjacent *HV conductors*. Consequently, the screen *must* be rated to withstand the full prospective fault current until cleared by the circuit protection.

The sheath bond lead connection to *earth must not* be disconnected from the conductive screen of an *energised HV* cable at any time.

Due to the potential of circulating currents in the sheath, even when the *UGC* is *de-energised,* control measures *must* be applied when contacting metal sheath or sheath bonding components or breaking the sheath connection under an *Access Permit* or *Test Permit*. Sheath Voltage Limiters (SVLs) are installed on some *UGCs* to limit circulating currents in the sheath by clamping the voltage in the sheath. Control measures *must* be applied when contact with the sheath side of an SVL or other metallic components is required.

If a *UGC* is to be repaired, cut or re-joined, then all metal components on both sides of the work site *must* be effectively bonded to an established common earth in accordance with Powerlink Requirements.

When an established local *earth* is not available, a temporary local *earth must* be established in accordance with Powerlink Requirements or under advice from an *RPEQ engineer.*

UGC maintenance *must* be undertaken in accordance with Powerlink Requirements.

Where performing *UGC* repair on the underground section of the *UGC* or where a *UGC* location is required as a control measure for work in proximity to the *UGC*, labels on cables or drawings *must not* be relied upon individually as a positive means of identification. Prior to work around a *UGC* an *approved* method of positive identification *must* be used.

Powerlink Requirements

Primary Services Underground Cable Sheath Resistance test – Work Instruction

Primary Services Inspection Test Plan Form – Sub-transmission UG Cable (Level2)

3.10.25 Climbing Wooden Poles Carrying *High Voltage Electric Lines*

Before any wooden pole supporting *HV Electric Lines* is climbed, a visual inspection of the insulation *must* be completed, where signs of damage or deterioration are identified a test for leakage current *must* be carried out in accordance with engineering advice.

When the inspection and/or tests reveal that a dangerous potential exists, the wooden pole *must not* be climbed until the appropriate action has been taken in accordance with engineering advice.

3.10.26 Live High Voltage work

Live Work on Powerlink's *HV electrical equipment* (Overhead Transmission Lines or Substations) *must* only be performed by persons who hold an authorisation from the *PICEE* and in accordance with Powerlink Requirements.

Powerlink Requirements

Electrical Authorisation Governance Framework

High Voltage Live Line Work Governance – Framework

APPENDIX I

Exclusion Zone Distances

APPENDIX 1

Exclusion Zone Distances

Table 1 ***Authorised/Instructed persons* approach limits to *Exposed HV Conductors***

Nominal Voltage	Exclusion Zone - Powerlink (mm)
> 1000 V and ≤ 33 kV	700
66 kV	1000
110 kV	**1000**
132 kV	**1200**
220 kV	**1800**
275 kV	2300
330 kV	3000
500 kV	**3900**

LEGEND

BOLDED ITEMS indicate a revised distance from previous edition of Safety Rules

indicates an expanded or revised category not tabulated in the previous edition of Safety Rules

Table 2 *Plant* and *Vehicle* approach limits to *Exposed HV Conductors*

Nominal Voltage	Operating Plant - Authorised Person with Safety Observer (mm)	Operating Vehicle - Authorised Person with Safety Observer (mm)	Operating Plant - Authorised Person without Safety Observer (mm)	Operating Vehicle - Authorised Person without Safety Observer (mm)
1000 V	1000	600	3000	600
> 1000 V and ≤ 33 kV	1200	700	3000	900
66 kV	1400	**1000**	3000	2100
110 kV	1800	**1000**	3000	2100
132 kV	1800	**1200**	3000	2100
220 kV	2400	1800	6000	2900
275 kV	3000	2300	6000	2900
330 kV	3700	3000	6000	3400
500 kV	4600	3900	8000	4400

LEGEND

BOLDED ITEMS indicate a revised distance from previous edition of Safety Rules

indicates an expanded or revised category not tabulated in the previous edition of Safety Rules

APPENDIX 2

Safety Observer

APPENDIX 2

Safety Observer

This appendix covers the two types of Safety Observers (Relating to Electrical Safety) within Powerlink:

- Safety Observer- Electrical Work
- Safety Observer

Restrictions on Safety Observers may apply to authorisation categories outlined in relevant Powerlink Authorisation Specifications.

The person in charge of work who appointed the safety observer *must*:

- Identify the safety observer to the work group.
- Instruct the work group to follow directions of the safety observer.

Electrical Authorisation Specification
Electrical Authorisation Specification for Contractors

Type 1 – Safety Observer – (*Low Voltage* and *Extra Low Voltage* Electrical Work)

A person who is trained and *competent* to observe *work on energised Low* and *extra low Voltage electrical equipment* to prevent inadvertent contact with *live* parts. In the case of contact with *exposed energised* parts, the safety observer will perform *Low Voltage* rescue and resuscitation, in accordance with legislative requirements and Australian Standards.

Pre-Requisites

The person appointed as an Safey Observer – Electrical Work *must* ensure that the following pre-requisites have been met prior to performing the role:

- Currency of Powerlink *approved* training and competency in CPR and LVR.

Where Required

A Safety Observer – Electrical Work *must* be appointed by the person in charge of work when *work on energised low voltage electrical equipment* is required, unless the work only involves testing of *electrical equipment* and a documented risk assessment by a *competent person* shows no serious *electrical risk* is associated with the proposed testing work.

For *extra low voltage* work a safety observer *must* be appointed by the person in charge of work unless a risk assessment by a *competent person* shows no serious *electrical risk* is associated with the proposed work.

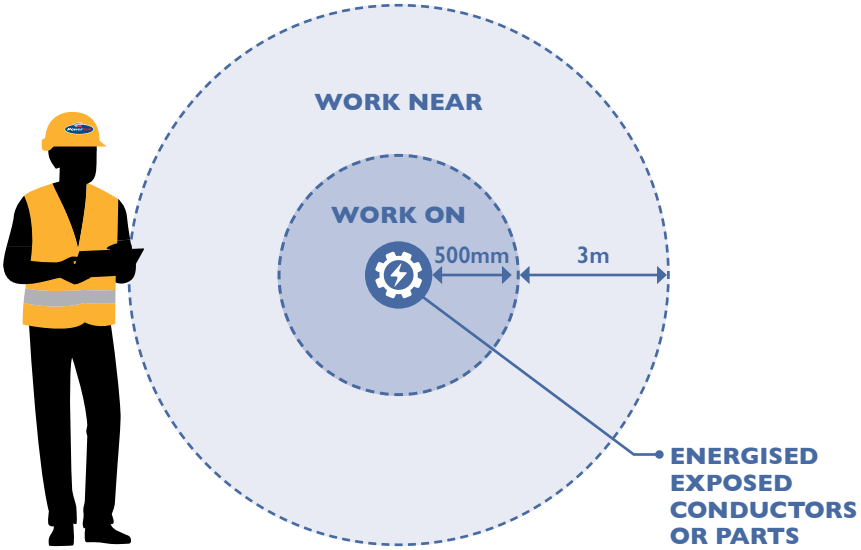
For *HV* testing at all locations including depots, warehouses, under *test permits* and test authorities.

Duties

The duties of a Safety Observer – Electrical Work are as follows:

- Inform and warn of any dangers and stop the work in progress where necessary;
- Participate in the risk assessment;
- Understand the content of the relevant SWMS;
- Physically capable and willing to perform the rescue (Not have any temporary or permanent disability that would adversely affect the rescue and resuscitation);
- Be positioned outside of the *work near exclusion zone* (See figure 1) with a clear line of site to the worker and any associated hazards;
- Not carry out any other work or function that compromises their role (one task at a time);
- Be able to communicate quickly and effectively with workers undertaking the work;
- Wear the correct PPE; and
- Have clear access to the rescue kit appropriate to the task being performed.

Figure 1 Illustration of 3m *exclusion zone*, *work on* and *work near*



Legislative Requirements

Electrical Safety Regulation 2013

Managing electrical risks in the workplace Code of practice 2021

Australian Standards

AS/NZS 4836:2023 Safe Work on or near low-voltage and extra-low voltage electrical installations and equipment

Type 2 – Safety Observer

A person who is trained and *competent* that has been appointed to observe *powered mobile plant, vehicles* or people and effectively communicate warnings to prevent entry into the *exclusion zone* in accordance with legislative requirements.

Pre-Requisites

The person appointed as a Safey Observer *must* ensure that the following pre-requisites have been met prior to performing the role:

- Currency of Powerlink *approved* training and competency in Safety Observer

Where Required

A Safety Observer *must* be appointed by the person in charge of the work when:

- Work has the potential to come within an *exclusion zone*.
- *Powered mobile Plant* is operating in the Safety Observer Zone (See Fig 2)
- *Vehicles* are required to be within the *exclusion zone* identified in Appendix 1
- A risk assessment or work instruction identifies a need to observe an *authorised* or *instructed person*.

Duties

The duties of a Safety Observer are as follows:

- Not perform any other work, or be otherwise distracted, during the period while acting as safety observer;
- Stop any work where any person or *powered mobile plant* could come within an *exclusion zone* and report any stoppage to the person in charge of the work;
- Notify the person in charge of the work on site should the safety observer have to leave the work area. All work related to the safety observer *must* cease until the safety observer returns to the work area or a new safety observer is appointed;
- Where practical, mark the border of the *exclusion zone* with suitable markers e.g. red warning tapes, which can be easily viewed by the person operating *powered mobile plant;*
- Be able to effectively communicate with the worker(s). Specialist equipment may be needed where there is a barrier to communication;
- Only observe one task at a time;
- Understand what work is to be performed and the relevant *exclusion zone*;
- Not be located in the work basket of an elevating work platform;
- Ensure the *MATE* remains connected throughout the entirety of the task.

Legislative Requirements

Electrical Safety Code of Practice-Working near overhead and underground electric lines

Safety Observer Zone

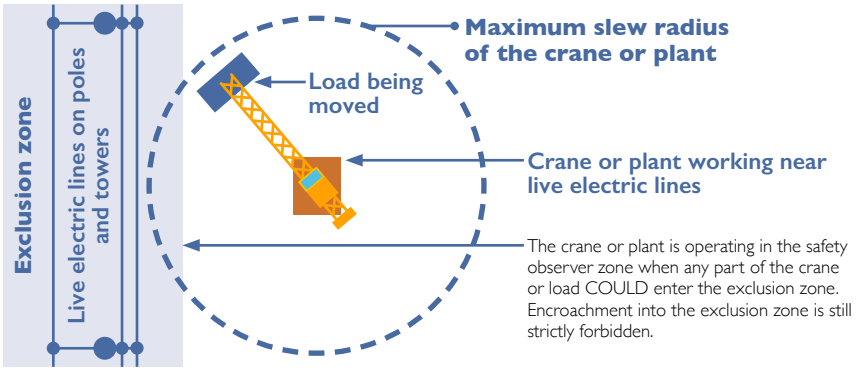
Powered Mobile Plant is in the safety observer zone when the operation of the *powered mobile plant* creates the potential that the following could enter the *exclusion zone* of *live electrical equipment:*

- Any part of the *powered mobile plant*;
- Any person on *powered mobile plant;*
- Any hand tools or other equipment held by anyone involved with the operation; and
- The load being moved.

Powered mobile plant is not operating in the safety observer zone when:

- *High voltage electric lines* have been *de-energised, earthed* and the person or operator has access to the conductors under an *approved* safe system of work and there is no risk of coming within the *exclusion zone* of any other *HV*;
- Limiting devices have been installed to warn the operator or prevent any part of the *powered mobile plant* or load being moved from entering the *exclusion zone*;
- Any part of the *powered mobile plant* or load being moved is prevented from entering the *exclusion zone* by physical barriers.

Figure 2 Safety Observer zone for overhead *electric lines*



APPENDIX 3

Network Barrier Chart

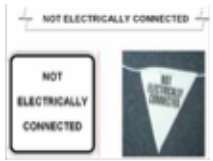
APPENDIX 3

Network Barrier Chart

Type	Exposure/ Risk	Purpose	Barrier Type	Barrier Description	Substation/ Communication/ Transmission Lines Use	Reference Document	Securing Method	General Comments
1	**Physical Hazards (Open Excavations)**	Highlight hazard and physical barrier. Designates Caution	  	Orange Barrier mesh is used to warn others when construction activities may introduce hazards such as an open trench or excavation/s. Where Barrier mesh is not deemed appropriate other methods may be used, e.g. Orange flag bunting, rigid plastic barriers, steel mesh panels or cones and barricade rails. Signage to be placed in relation to the barriers installed	Substation (Required) Communication (Required) Lines (Required)	*Substation Civil Temporary Fences Detail (Drawing A3-H-114035-11).* *Workplace Safety Procedure – Excavation (HSE-PRO-A2540237)*	Traffic Cones, Plastic bollards, Structures or other approved method, and erected as required for site activities.	*To be installed and maintained, as required, during the course of works.* *If authorised, a risk assessment must be performed prior to the use of star pickets in substation yards.* ***CAUTION: Powerlink's earth grid design and performance requirements mean that underground services within the substation perimeter are only required to be a minimum of 300mm below the ground.***
2	**Electrical Hazards and/ or Security**	Distinct construction site delineation and/or security.		Steel mesh panels with signage 'Danger Construction Site' are often used to delineate areas and prohibits unauthorised entry, used as security or to warn of Electrical Hazards. Earthing or isolation panels need to be determined on assessment.	Substation (Required) Communication (Required) Lines (Optional)	*Substation Civil Temporary Fences Detail (Drawing A3-H-114035-11).*	Self-supporting using heavy bases. Erected as indicated on the 'Plan View Drawing'. Where gates have been established standard security padlocking processes apply.	Plan diagram highlighter colour **BLUE** Any new hazards generated by barrier type must be identified and assessed. For additional security, three (3) rows of barbwire may be extended above the Steel Mesh Panels For shared sites, electricity entities locks shall be clearly identifiable on the 'Plan View Drawing'.

Type	Exposure/ Risk	Purpose	Barrier Type	Barrier Description	Substation/ Communication/ Transmission Lines Use	Reference Document	Securing Method	General Comments
3	Construction Site & Electrical Hazards	Designates construction site zone		Green Flagging with the text 'Construction Site' as well as signage stating 'Danger Construction Site Authorised Persons Keep Out' denoting a construction area beyond requiring permission to enter such areas (the green and pink barriers are often back to back so when approaching a construction area you will only see the green bunting advising of an area under construction).	Substation (Required) Communication (Required) Lines (Optional)	*Substation Civil Temporary Fences Detail (Drawing A3-H-114035-11).* *Workplace Safety Procedure – Excavation (HSE-PRO-A2540237)*	Plastic bollards, structures or other approved method Erected as indicated on the 'Plan View Drawing'.	Plan diagram highlighter colour **GREEN** When required, Barrier Type 3 may be combined with Barrier Type 4. If authorised, a risk assessment must be performed prior to the use of star pickets in substation yards. ***CAUTION: Powerlink's earth grid design and performance requirements mean that underground services within the substation perimeter are only required to be a minimum of 300mm below the ground.***
4	Live Exposed Parts	Designates Live exposed parts		Pink Flagging with the text 'Live Exposed Parts' denoting live exposed parts beyond (the green and pink barriers are often back to back so when in a construction area you will only see the pink bunting advising of exposed live parts)	Substation (Required) Communication (Required) Lines (Optional)	*Substation Civil Temporary Fences Detail (Drawing A3-H-114035-11).* *Workplace Safety Procedure – Excavation (HSE-PRO-A2540237)*	Plastic bollards, structures or other approved method Erected as indicated on the 'Plan View Drawing'.	Plan diagram highlighter colour **PINK** Signage "Danger Live Exposed Parts" may be incorporated upon assessment. If authorised, a risk assessment must be performed prior to the use of star pickets in substation yards. ***CAUTION: Powerlink's earth grid design and performance requirements mean that underground services within the substation perimeter are only required to be a minimum of 300mm below the ground.***
5	HV Access/ Test Permit Work Area	Awareness, limited access to authorised personnel and instructed persons/ visitors under supervision of authorised person		Yellow rope denoting an Access Area under the control of a recipient - under no circumstance may you enter without the recipient's permission. In addition to the rope, you will also find a work area sign displayed at the entrance to the work area	Substation (Required) Communication (N/A) Lines (N/A)	*Queensland Electricity Entity Standard for Safe Access to HV Electrical Apparatus, Part 10, Appendix A.*	Designated freestanding devices supplied on site and or structures.	Electricity Entity specific use only, no unauthorised access
6	HV Live Substation Work (Not applicable to Live line work)	Awareness, limited access to authorised personnel only		Blue Rope denoting 'Live Substation Work' under no circumstances shall you enter this area and if required only communicate with the team leader who is identified by wearing a blue hard hat.	Substation (Required) Communication (N/A) Lines (N/A)	*HV Live Substation Work Conditions– Specification (ASM-SPE-A925080) Section 4.3.5.2 LW zone delineation.*	Designated free standing devices supplied on site and or structures	Electricity Entity specific use only, any discussions with this crew are to be conducted with the Team Leader only (Blue hardhat).

Type	Exposure/ Risk	Purpose	Barrier Type	Barrier Description	Substation/ Communication/ Transmission Lines Use	Reference Document	Securing Method	General Comments
7-1	Restricted Access Zone (RAZ) (Powerlink)	Designates the boundary of the RAZ and may be established around an area within a site, a transmission tower or pole or section of transmission line or easement. A barrier shall be affixed across an access gate where entry is required. When more structural barriers are required the red and white barrier is to be applied around the top edge of the structural barrier.	  	Red or Red and white alternative flags with colour on both sides connected by a 6 or 8mm rope. Can have no printing on any flags, may have 'Danger' printed one or more of the white flags, may have 'RAZ' printed on one or more of the white flags. All forms are to be regarded as having the same function. Signage to be placed in relation to the barriers installed as per *Management of a Restricted Access Zone Procedure (ASM-PRO-A508899)*.	Substation (Required) Communication (Required) Lines (Required)	*Management of a Restricted Access Zone Procedure (ASM-PRO-A508899)*	Structures, bollards or other approved method	This is installed and removed by Electricity Entity personnel only
7-2	Network Access Restriction (NAR) (Ergon Energy/ Energex)	A Network Access Restriction is an engineering assessment of an asset condition where a heightened risk of injury to staff may be identified. The NAR requires a suite of control measures to be identified and a Risk Management Hazard Zone established wherein the control measures must be applied. A NAR is unique to the circumstances of the Risk	 	Red and White waring sign established on all entrances to fenced areas that contain a NAR. Red or Red and white alternative flags with colour on both sides connected by a 6 or 8mm rope. Can have no printing on any flags, may have 'Danger' printed one or more of the white flags, may have 'NAR' printed on one or more of the white flags. All forms are to be regarded as having the same function	For information only, used on other Entities Assets.	*Information Only*	Structures, bollards or other approved method	For information only, used on other Entities Assets. This is installed and removed by Electricity Entity personnel only

Type	Exposure/ Risk	Purpose	Barrier Type	Barrier Description	Substation/ Communication/ Transmission Lines Use	Reference Document	Securing Method	General Comments
8	Not Electrically Connected	Electrical apparatus disconnected from all sources of supply by the total removal or absence of conductors appropriate to the voltage and insulating medium and not able to be energised by switching and identified in accordance with approved procedure.		Rope supported white flag bunting with "Not Electrically Connected" in black text on one side of every 5th flag. In a Substation Environment: Flagging denotes NEC area under the control of an Authority Holder. Under no circumstances may you enter the area without the Authority Holders Permission. In addition to bunting you will also find a "Not Electrically Connected" Sign displayed at the entrance of the Work Area.	Substation (Required) Communication (N/A) Lines (Required)	*"Management of Not Electrically Connected Standard A5264374* *Management of Not Electrically Connected Apparatus – Procedure A5264653* *Creation of Disconnection Point Standard A5264333*	Structures, bollards or other approved method	This is installed and removed by Electricity Entity personnel only CAUTION: Powerlink's earth grid design and performance requirements mean that underground services within the substation perimeter are only required to be a minimum of 300mm below the ground Note: Not all NEC apparatus will have Bunting/ signage Installed. Bunting and signage signifies active works managed under an Authority. Refer to Management of Not Electrically Connected Apparatus -Procedure A5264653 for Long Term disconnected/mothballed apparatus.
9	Drop zone / No Go Zone (Working at heights)	Identifies a Drop Zone where 'Work at heights' is being undertaken.	 	Red / White Danger tape used to delineate a Drop Zone / No Go Zone. Signage to be placed in relation to the barriers installed. Traffic cones. Eg Delineation of the Drop Zone can be achieved by using one, or combination of; traffic cones, bollards, barriers, chains or ropes.	Substation (Required) Communication (Required) Lines (Required)	*Management of Drop Zones Guideline (HSE-GDL-A2951541)* *Energex / Ergon – Gravitational Hazards (EX WP1037 / EE BS001401R181)*	Traffic Cones, Plastic bollards, Structures or other approved method, and erected as required for site activities.	To be installed and maintained, as required, during the course of works. If authorised, a risk assessment must be performed prior to the use of star pickets in substation yards. ***CAUTION: Powerlink's earth grid design and performance requirements mean that underground services within the substation perimeter are only required to be a minimum of 300mm below the ground.***
10	Low Voltage Electrical work and other electrical testing practices	Identifies an area where electrical testing is underway.		Red / White Danger tape used to delineate a test area. Signage to be placed in relation to the barriers installed.	Substation (Required) Communication (Required) Lines (N/A)	*Electrical Safety Rules (HSE-STD-A04944596)*	Traffic Cones, Plastic bollards, Structures or other approved method, and erected as required for site activities.	To be installed and maintained, as required, during the course of works. If authorised, a risk assessment must be performed prior to the use of star pickets in substation yards. ***CAUTION: Powerlink's earth grid design and performance requirements mean that underground services within the substation perimeter are only required to be a minimum of 300mm below the ground.***
11	Equipment Equipotential Bonding Mat	Highlight electrical hazard and provide physical barrier.		Barrier is created from orange bunting. Signage to be placed in relation to the barriers installed.	Substation (N/A) Communication (N/A) Lines (Required)	*Transmission Line Stringing Standard Brake or Winch Site Earthing Arrangement (Drawing A3-H-119539-02).*	Traffic Cones, Plastic bollards, Structures or other approved method, and erected as required for site activities.	To be installed and maintained, as required, during the course of works.

Type	Exposure/ Risk	Purpose	Barrier Type	Barrier Description	Substation/ Communication/ Transmission Lines Use	Reference Document	Securing Method	General Comments
12	Live Line Step & Touch	Highlight electrical hazard and provide physical barrier.		Barrier is created from orange bunting. Signage to be placed in relation to the barriers installed.	Substation (N/A) Communication (N/A) Lines (Required)	*Lines Live Line Barehand Access to Conductors Using an Insulated Boom Elevated Work Platform - Work Instruction* *Lines Live Line Displacement of Conductors using a Crane on Suspension Structure - Work Instruction*	Traffic Cones, Plastic bollards, Structures or other approved method, and erected as required for site activities.	To be installed and maintained, as required, during the course of works.

Powerlink QUEENSLAND

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