

Electrical Safety Rules

Document No. ESR2022/1

October 2022[®]



Emergency Phone Numbers

Ausgrid	Number
Emergency number	13 13 88
General enquiries	13 13 65
Environmental emergency number	02 9394 6659 or 0412 070 574 (after hours)

Service	Number
Ambulance, Fire, Police	(0) 000 (or 112 from a mobile phone)
Poisons information centre	13 11 26

Preface

Ausgrid's Electrical Safety Rules set out the controls required to manage the electrical risks involved in working on, near, or in the vicinity of the Ausgrid electricity distribution network.

They form part of Ausgrid's Electricity Network Safety Management System which is designed to conform to the Electricity Supply (Safety and Network Management) Regulation 2014.

They are based on industry codes of practice with suitable inclusions to meet the context of Ausgrid's network.

They apply to all persons carrying out work on, near, or in the vicinity of Ausgrid's electricity distribution network, under the Electricity Supply (Safety and Network Management) Regulation.

All workers must comply with these Rules and have a copy readily available at the work site.

Junayd Hollis

Executive General Manager - Asset Management

October 2022

Version history

Version	Release date	Changes
2022/0	29/04/2022	Amendments to Clause 9.5.1. and Figure 103 replaced. Amendments shaded in grey and detailed in ESR Amendment Advice No. 2022/0.
2022/1	October 2022	Amendments shaded in grey and detailed in ESR Amendment Advice No. 2022/1.

Contents

1	Application	8
1.1	Application and Important Notes	8
2	Emergencies	11
2.1	Emergencies and Reporting	11
3	Authorisation	16
3.1	Authorisations for Work	16
3.2	Operating Authorities	20
4	Network Connections and Alterations	29
4.1	Network Access Request Procedures	29
4.2	System Alteration Orders	31
4.3	Commissioning and Phasing	32
5	Permits and Folders	33
5.1	Access Authorities/Permits and Folders	33
5.2	How to use Access Authorities/Permits	40
5.3	Access Permit for Work	46
5.4	Restricted Access Permit for Work	53
5.5	Access Permits for Test and Ancillary Work	58
5.6	Clearance to Work	64
5.7	Operating Agreement	72
5.8	Equipping Permit	75
5.9	Folders	80
6	Working on the Network	91
6.1	Working Safely on or near the Ausgrid Network	91
6.2	PPE, Tools and Equipment	92
7	Minimum Safe Working Distances	106
7.1	Minimum Safe Working Distances for Workers	106
7.2	Reduced Minimum Safe Working Distances	109
7.3	Absolute Limit of Approach	109
7.4	Fixed Clearances	110
7.5	Mobile Plant	110
7.6	Vehicles	115
7.7	Drones	116
7.8	Scaffolding	116
7.9	Street Lighting	119
8	Designated Work Areas	121
8.1	Safe Work Areas	121
8.2	Applying a Safe Work Area Using Barrier-in Method	125
8.3	Applying a Safe Work Area using Barrier-out Method	126
8.4	Labels, Warning Tags and Signs	129
9	Access the Network	135
9.1	Work On or Near Mains and Apparatus	135
9.2	Low Voltage Work - Isolated	138

9.3	Low Voltage Work - Cables.....	140
9.4	Low Voltage Work - Connection and Disconnection.....	143
9.5	Low Voltage Work - Live Low Voltage	144
9.6	High Voltage Work - Isolation.....	151
9.7	High Voltage Work - Proving De-energised	154
9.8	High Voltage Work - Earthing and Short Circuiting.....	154
9.9	High Voltage Work – Cables	161
9.10	Specified Customers	164
9.11	Earth Potential Rise and induced Voltage Mitigation	165
10	Task Specific.....	176
10.1	Safe-to-touch Testing of Network Assets.....	176
10.2	Working on or near Overhead Mains and Apparatus.....	176
10.3	Work on or near Street Lighting Circuits	178
10.4	Mains and Apparatus that are not Connectable.....	179
10.5	Vegetation Management.....	181
10.6	Applying Test Voltages	189
10.7	Tong or Clip-on Ammeters	191
10.8	Paralleling and Phasing	192
11	Site Specific	193
11.1	Confined Spaces	193
11.2	Indoor Distribution Substations	193
11.3	Working in Battery Rooms	194
11.4	Conductive Materials, Storage and Firefighting	195
11.5	Working on Specific Substation Equipment.....	196
11.6	Community Batteries.....	199
11.7	Stand Alone Power Systems.....	200
11.8	High Voltage Customer Equipment.....	200
12	Interconnected HV Mains and Apparatus	201
12.1	Ausgrid Requesting Isolation by Another NSW Network Operator or HV Generator	201
12.2	Ausgrid Requesting Isolation by a HV Customer.....	202
12.3	Another Organisation Requesting Isolation by Ausgrid	203
12.4	Isolation of Privately Owned Parallel Generation Plants	203
13	Working in Electrical Stations Controlled by other Organisations	205
13.1	Working in Transgrid Electrical Stations	205
13.2	Working in Electrical Stations Controlled by another Organisation – other than Transgrid.....	206
14	Working on, near, or in the vicinity of another Organisation’s Mains and Apparatus.....	208
14.1	Other NSW Network Operators.....	208
14.2	Organisations other than NSW Network Operators	210
15	Work by Other Organisations On, Near, or in the Vicinity of Ausgrid Mains and Apparatus	212
15.1	Other NSW Network Operators.....	212
15.2	Organisations other than other NSW Network Operators.....	212
16	Glossary – Personnel.....	214
17	Glossary - General.....	217
18	Terminology	236

	18.1 Abbreviations and Acronyms	236
19	References	241
20	Index	243

1 Application

1.1 Application and Important Notes

This section provides:

- the purpose and scope of the Ausgrid Electrical Safety Rules (the Rules); and
- a description of the relationship between the NSW Electricity Supply (Safety and Network Management) Regulation 2014, the Ausgrid Electricity Network Safety Management System and the Rules; and
- details on employer and worker responsibilities; and
- details of other relevant documents; and
- notes relating to the availability and accessibility of these Rules.

1.1.1 Purpose

The purpose of these Rules is to set out the controls required to manage the electrical risks involved in working or testing on, near, or in the vicinity of, the Ausgrid network associated with the distribution of electricity.

These Rules form part of the Ausgrid Electricity Network Safety Management System, which is designed to fulfil Ausgrid's obligations under the Electricity Supply (Safety and Network Management) Regulation 2014.

Intended Purpose Disclaimer

This document is produced by Ausgrid for work on or near Ausgrid's network and specific adjacent or interconnected systems and other work as indicated in the document. Ausgrid accepts no responsibility or liability resulting from any usage of these Rules for other than their intended purpose.

1.1.2 Scope

These Rules apply to anyone who intends to undertake work* on, near, or in the vicinity of, Ausgrid's electricity network, as required by the Electricity Supply (Safety and Network Management) Regulation.

This includes but is not limited to:

- Employees of Ausgrid;
- Employees of any contractors to Ausgrid and their sub-contractors; and
- Employees of any Accredited Service Provider (**ASP**).

*Work includes the construction, operation, testing and maintenance of mains and apparatus.

These Rules apply to all mains and apparatus forming part of Ausgrid's electricity network, including those parts that are in-service, out-of-service, or under construction. And they apply regardless of whether the electricity network is in a normal, abnormal, or emergency state.

In some areas of these Rules, specific requirements apply to specific persons or roles. Where these specific persons or roles are not stated, the Rules apply to all workers.

These Rules also include additional notes on procedures for working at installations and on mains and apparatus owned by others.

Ausgrid employees must observe these Rules at all times when working on or near the network, or when carrying out work related to network activities on customer installations.

1.1.3 The Electricity Supply (Safety and Network Management) Regulation 2014

The Electricity Supply (Safety and Network Management) Regulation 2014 (the Regulation) requires each network operator to comply with certain conditions granted in an Electricity Distributor's Licence. Each network operator must implement an Electricity Network Safety Management System describing how it will manage and operate its supply network.

The Electricity Network Safety Management System provides a framework for Ausgrid to manage a network that has, as far as reasonably practicable, the capacity, reliability, supply quality and safety to meet the needs of our customers. This framework has been developed by undertaking safety assessments for the asset life cycle of mains and apparatus on the electricity network, taking into account interactions between

the network and workers, the general public and the environment, both built and natural. From these safety assessments, controls have been developed to minimise the network's safety and management risks as low as reasonably practicable for all credible circumstances. These Rules are a key control implemented in these safety assessments.

1.1.4 Responsibilities of Employers and Workers

All employers and workers involved with work on or near the Ausgrid network are required to manage the risks and hazards in accordance with their organisation's applicable safe system of work and in accordance with WHS risk management principles.

In managing risks to health and safety arising from work on or near the Ausgrid network, risks and hazards are required to be eliminated so far as is reasonably practicable. If it is not reasonably practicable to eliminate risks to health and safety, those risks must be minimised so far as is reasonably practicable through the application of the hierarchy of control measures.

Workers must not perform work on, near, or in the vicinity of mains and apparatus unless they are authorised in accordance with these Rules (refer to Chapter 3 Authorisation).

All persons who plan, or carry out, work on or near Ausgrid electrical mains and apparatus, must observe these Rules to ensure:

- the safety of people;
- the safeguarding of Ausgrid's mains and apparatus and other property; and
- the continuity of supply.

1.1.5 Other Relevant Documents

These Rules must be observed in conjunction with:

- any other relevant regulation (e.g. NSW Work Health and Safety Regulation 2011); and
- Ausgrid Network Standards (refer to the Ausgrid website or intranet); and
- the Ausgrid High Voltage Live Work (HVLW) Manual - for the controls required for working on or near live exposed high voltage conductors; and
- specific instructions relating to work practices provided by an employer.

For Ausgrid employees these specific instructions include, but are not limited to, the following:

- Low Voltage Live Work (LVLW) Manual;
- technical guides;
- distribution guides;
- operating advices;
- work instructions; and
- safe work method statements

Note: If compliance with specific instructions issued by an employer will conflict with, void, or diminish any requirement of these Rules, the current Rules shall prevail over any conflicting information in any other document.

1.1.6 Availability and Accessibility of The Rules

The current version of these Rules must be readily available at each worksite.

These Rules may be amended at various times. Therefore, users of these Rules **must** confirm that the version they are using is the current version with the latest amendments.

Note: The current version of these Rules is always available in electronic form on Ausgrid's website or intranet.

1.1.7 Governance of the Electrical Safety Rules

The Governance of these Rules is described in the Company Procedure HS000 – P0038 “Amendment, Distribution and Communication of Electrical Safety Rules” (Procedure).

This Procedure describes the process to be followed for the amendment, distribution and communication of these Rules and the obligations of authorised persons, their supervising managers and ASPs in this regard.

A person requesting a clarification of, exemption to, or amendment to these Rules should email electricalsafetyrules@ausgrid.com.au.

The Electrical Safety Rules Committee (comprising management and employee representatives of Ausgrid) meets periodically to review the content of these Rules.

The Electrical Safety Rules Committee Charter describes the purpose and function of this committee.

2 Emergencies

2.1 Emergencies and Reporting

This section identifies whom to call and what to do in emergency situations (i.e. situations that present an immediate threat to life or property). Providing assistance and basic life support procedures are also described, as well as how to deal with operating switches and fallen conductors during an emergency.

2.1.1 What to do in an Emergency

If you find conditions which may be a danger to people in a public place (such as damaged live mains and apparatus, fallen mains, leakage current on poles, etc), you must initially remain:

1. well clear of the mains and apparatus (at least 8m for fallen HV or unidentified conductors), and
2. in a position to warn people until the danger has been removed. If you cannot do this, you must arrange for another responsible person to do so.

You must then do one of the following:

- contact the appropriate System/Area Operator
- report the matter to Ausgrid's Emergency telephone number (See Page 2)
- arrange for someone to make the telephone call for you.

An authorised person attending such a situation may leave the site for the purpose of controlling the hazard by de-energising the mains and apparatus, if:

- the hazard is not able to be effectively controlled at the site, and
- the person has the ability and equipment required to de-energise the mains and apparatus from a network point of isolation.

Reporting

You must report the following types of incidents to the Control Room:

- any incident that affects network supply
- any injury or near-miss involving the network.

Ausgrid employees must also refer to the reporting requirements of the Ausgrid Health and Safety Management System.

Numbers to Call in an Emergency

Use the Control Room emergency numbers (first page of this document) for an immediate response from Ausgrid.

Depending on the situation, you may need to call emergency services such as Fire, Ambulance or Police on 000.

2.1.2 Assisting in a Network Emergency

Electrical Hazards or Emergencies with Public Risk

During a network emergency, the System/Area Operator may call on any appropriately authorised worker to do any repair or other work necessary to restore or maintain supply (see Clause 2.1.6 for more details).

Only persons with an appropriate operating authority may carry out operating work unless there is an immediate risk to life or property. Where the emergency situation presents an immediate risk to life or property and you do not have an operating authority, you may only de-energise the mains and apparatus.

An access permit is required for any work on or near exposed mains and apparatus, except when there is an immediate risk to life or property and the emergency work is carried out under the supervision of the operator (who makes sure that the necessary procedures for isolating, proving de-energised, earthing and short-circuiting the mains and apparatus are carried out according to these Rules). See Clause 5.2.1 for more details.

If repair work is necessary at more than one point (or on more than one item of mains and apparatus), the System/Area Operator has the authority to determine the order in which the work must be done.

2.1.3 Basic Life Support Emergency Procedure

In all emergency situations you must:

- assess the situation quickly
- look for hazards
- put controls in place for the hazards
- ensure safety of rescuer(s), bystander(s) and victim(s)
- call for help (Phone 000)
- commence appropriate treatment (e.g. follow the process in Figure 1).

A Guide to CPR

RESUSCITATION




ELECTRIC SHOCK RESCUE: REMEMBER - THE PERSON IS ELECTRIFIED UNTIL RELEASED.

Take precautions against receiving a shock yourself by immediately switching off the electricity where practical. The person must be pulled or pushed clear of the conductor using DRY non-conductive material. DO NOT USE METAL OR ANYTHING MOIST. SEND FOR AN AMBULANCE. If someone collapses...

DANGER

Check for Danger

TO SELF / TO BYSTANDERS / TO CASUALTY / REMOVE HAZARDS

RESPONSE

Shout "ARE YOU OK?"

SQUEEZE THE CASUALTY'S SHOULDERS AND ASK CAN YOU HEAR ME? / OPEN YOUR EYES / SQUEEZE MY HANDS

SEND

Send for help

CALL 0-000 FOR AN AMBULANCE OR ASK A BYSTANDER TO CALL 000 AND ASK IS A DEFIBRILLATOR AVAILABLE.

AIRWAY

Check and clear

POSITION CASUALTY ON BACK, SUPPORT HEAD, TILT SLIGHTLY, CHECK AND CLEAR MOUTH

BREATHING

Are they breathing normally?

SUPPORT HEAD AND JAW, USING BACKWARDS HEAD TILT TO OPEN THE AIRWAY.



If Yes

PLACE IN RECOVERY POSITION.



If No

COMMENCE CPR.



CPR

Commence CPR

30 Compressions followed by 2 breaths

CPR

FIND THE CENTRE OF THE CHEST. PLACE THE HEEL OF YOUR HAND ON THE COMPRESSION POINT WITH THE FINGERS PARALLEL TO THE RIBS AND SLIGHTLY RAISED. PLACE YOUR OTHER HAND ON TOP OF THE FIRST.

30 Compressions followed by 2 breaths

30 COMPRESSIONS FOLLOWED BY 2 RESCUE BREATHS. DELIVERING APPROXIMATELY 5 CYCLES IN 2 MINUTES. COMPRESS TO APPROXIMATELY 1/3 DEPTH OF CHEST. CONTINUE UNTIL SIGNS OF LIFE RETURN.

FOR INFANTS (BIRTH - 1 YEAR): DO NOT TILT HEAD BACK. COVER BOTH NOSE AND MOUTH FOR RESCUE BREATHS. USE TWO FINGERS TO COMPRESS CHEST 1/3 OF DEPTH.

DEFIBRILLATION

Early defibrillation

INCREASES A CASUALTY'S CHANCE OF SURVIVAL. IF A DEFIBRILLATOR IS AVAILABLE ATTACH AS SOON AS POSSIBLE AND FOLLOW THE PROMPTS.



ANY PERSON WHO HAS REQUIRED RESUSCITATION MUST BE TAKEN TO HOSPITAL.

EMERGENCY CONTACTS

Ambulance, Police, Fire Brigade & Rescue Service External Dialling
Phone **000**

Ausgrid Internal Dialling
Phone **0000**

International Mobile
Phone **112**

Figure 1 – Basic life support in the event of electric shock

The D-R-S-A-B-C-D Check List

D—DANGER
R—RESPONSE
S—SEND
A—AIRWAY
B—BREATHING
C—CPR
D—DEFIBRILLATION

2.1.4 Electric Shock

Any worker who receives an electric shock from a source with a nominal voltage greater than 50V ac or 120V dc must be immediately transported to a hospital or medical centre for assessment and/or treatment.

2.1.5 Talking to the System/Area Operator

When speaking with the System/Area Operator via a radio or telephone, you must:

- identify yourself (e.g. “I am Lineworker Smith from Oatley depot”)
- identify your reason for calling (e.g. “I need an operator to return and modify the AP area”)
- provide the suburb, the street name and the nearest crossroad (where appropriate, give the name and number of the substation or load control point— e.g. Michaels St Oatley near David Road and/or Substation 12660 Michaels College)

2.1.6 Working on or Near Fallen Conductors



All fallen conductors must be regarded as live until identified, isolated and proved de-energised.

High Voltage Conductors

Fallen high voltage (HV) conductors must be identified, isolated, proved de-energised, earthed and short-circuited. Except when there is an immediate risk to life or property (see Clause 2.1.2) an access permit must be issued and received before any work is done. Refer to Section 9.6 for more details.

When dealing with fallen HV conductors that are in contact with low voltage (LV) conductors, the HV must be identified, isolated, proved de-energised, earthed and short-circuited and an access permit issued. The LV conductors must also be isolated and proved de-energised before work is carried out.

Note: Interphase connections, or back-feeding through a transformer, may make fallen HV conductors live even where they appear to have no connection to the HV network.

Low Voltage Conductors

In many cases, fallen LV conductors may still be live until isolated. The fault current may not be enough to cause the operation of the distributor fuse and it is also possible that the conductors may be back-fed from another source.

Fallen LV conductors must be identified, and:

- isolated from all possible sources of supply, and proved de-energised; or
- isolated from network sources of supply, proved de-energised, and shorted in accordance with Clause 9.2.3;

Except when there is an immediate risk to life or property, workers must sign onto a relevant access permit or clearance to work before any work is done.

Exemption: Fallen LV insulated service conductors that have not been isolated may be cut away by authorised persons who have completed the Ausgrid Storm Responder training course, provided the live LV controls detailed in Clause 9.5.4 are applied.

Proving De-energised

To prove fallen conductors in contact with the ground are de-energised (if you are using a device requiring an earth connection), you must use a temporary earth stake. Drive the stake 0.6m into the ground (clear of

other cables or services) and at least 1.5m from any fallen wires. This ensures there is a sufficient voltage gradient to be detected.

Check the tester immediately before and after each time it is used.

Refer to Clause 9.2.2 for the requirements for proving LV mains and apparatus are de-energised.

Fallen conductors that cross other live exposed conductors

If the fallen conductors remain electrically connected to overhead spans that are not lowered to the ground, and those spans cross or share a common span with live exposed LV conductors, the controls of Clause 9.1.5 must also be implemented.

2.1.7 Operating Switches During an Emergency

During an emergency, a competent person may operate switches to de-energise mains and apparatus for the purpose of saving life or property (see Clause 2.1.2).

Where mains and apparatus have been de-energised during an emergency, the System/Area Operator must be notified as soon as possible. The System/Area Operator must give approval before re-energising the mains and apparatus de-energised in the emergency.

2.1.8 Communicating Unplanned Operating Work

Information from the System/Area Operator

(Where unplanned operating work is to be carried out under the direction of the System/Area Operator and a written switching instruction is not used).

The operator in the field must record, as a minimum, the following information provided to them by the System/Area Operator and repeat what they have recorded back to the System/Area operator:

- specific switch identification numbers that are to be operated; and
- the required final state of that switch (open/closed).

The System/Area Operator providing the verbal information must confirm whether the information recalled by the operator in the field is correct.

Following completion of the operating work, the operator in the field must notify the System/Area Operator as soon as is reasonably practicable.

Information to the System/Area Operator

(Where operating work is carried out by an operator in the field without having received specific instruction from the System/Area Operator e.g. in emergency situations).

As soon as reasonably practicable after carrying out the operating work, the operator in the field must provide the System/Area Operator with the following information as a minimum:

- specific switch identification numbers that have been operated; and
- the final state of that switch (open/closed).

The System/Area Operator must repeat back the information provided by the operator in the field, and the operator in the field must confirm that the recalled information is correct.

2.1.9 Substation Emergencies

Before entering a substation or a switching station, ensure you know how to call for help in an emergency.

If an emergency occurs:

- Call the appropriate emergency service immediately. Dial (0)000 (or 112 from mobile phones) and ask for the service you need (police, fire, ambulance). Make sure you have the following information:
 - exact address with suburb, street and nearest crossroad
 - type of installation (e.g. substation, chamber, switching station)
 - type of emergency (e.g. fire, explosion, electric shock)
 - number of casualties and types of injuries.
- For emergencies affecting the network, call the System/Area Operator or the Ausgrid emergency telephone number (refer to the emergency telephone phone numbers on page 1).

- For emergencies in a confined space, refer to the emergency procedure developed as part of the confined space entry permit.

Emergency switches

Distribution substations in the Sydney CBD are fitted with emergency switches to summon help. These switches are coloured red, and are mounted at waist height, just inside the substation door. To use the emergency switch, you must press it firmly. You will hear a two-tone alarm cycling on and off. The tone changes to a continuous two-tone alarm when the System/Area Operator acknowledges the call.

The acknowledgment tone is automatically silenced after 30 seconds.

Note: The operator will ring the substation to check whether the alarm is genuine. If there is no answer, the operator assumes the alarm is genuine and dispatches an ambulance.

Cancelling a False Alarm

To cancel a false alarm, reset the switch knob by turning it clockwise. The spring-loaded button will pop out. To avoid having an ambulance dispatched unnecessarily, immediately contact the System/Area Operator and confirm the false alarm.

If you reset the alarm within 10 seconds, no alarm will be raised in the System Control room.



Figure 2 – An emergency switch in a Sydney CBD distribution substation

2.1.10 Unusual Conditions in a Substation

If you observe any of the following conditions in a substation, immediately report them to the System/Area Operator:

- a circuit breaker is tripped as a result of an emergency or any other cause (leave switch open)
- any audible or visual alarms, and the operation of any protection relays
- unusually high air temperature which may indicate an electrical overload or a ventilation problem
- any other dangerous conditions (e.g. unusual noises, a burning smell, abnormal electrical discharges, oil spills, or unguarded open trenches)
- any limitations on the operation of mains and apparatus, either during the work, or on completion of the work.

Report any significant substation damage to the System/Area Operator. This includes damage caused by fire, flood, storm, lightning strike, accident or vandalism. Depending on the circumstances, the System/Area Operator may instruct you to remain at a substation until assistance arrives.

3 Authorisation

3.1 Authorisations for Work

This section describes the requirements for the following authorisations required for work on the Ausgrid network:

- Work on, near, or in the vicinity, of mains and apparatus
- ASP authorisation
- Enter substations (or other areas where there are live exposed conductors)
- Carry out operating work
- Issue access authorities/permits
- Receive access authorities/permits
- Submit network access requests
- Work on or near live exposed HV
- Work on or near live exposed LV
- Operate mobile plant
- Authorisation to identify cables
- Vegetation control

3.1.1 Authorisation to Work on, Near, or in the Vicinity of Mains and Apparatus

Work on, near, or in the vicinity of, Ausgrid mains and apparatus may only be undertaken by:

- authorised persons; or
- instructed persons, who are under the direct supervision of an authorised person; or
- persons authorised by other electricity network operators; or
- external parties working under the WorkCover NSW Code of Practice – Work Near Overhead Powerlines;

as detailed below.

Note: The authorisation to work on, near, or in the vicinity of Ausgrid mains and apparatus, is a prerequisite for the authorisations in the following clauses within this section (except for the special authorisation to receive access permits).

Authorised Persons

Authorised persons may carry out work, under these Rules:

- in the vicinity of mains and apparatus; or
- on or near isolated exposed mains and apparatus, under an access authority/permit; or
- on mains and apparatus that are insulated (as defined by these Rules); or
- on any structure that contains or supports mains and apparatus.

Authorised persons may be:

- Ausgrid employees; or
- Ausgrid contractors/partners; or
- Accredited Service Providers (see Clause 3.1.2).

To be authorised to work on, near, or in the vicinity of mains and apparatus as defined above, workers must:

- be trained and qualified for the work in accordance with the requirements of the Ausgrid Electricity Network Safety Management System (ENSMS); and
- be physically capable to do the work safely; and
- be initially trained in and demonstrate competence in these Rules; and
- be initially trained in and demonstrate competence in approved procedures for release, rescue and resuscitation; and
- on an annual basis* receive appropriate instruction and demonstrate competence in these Rules; and
- on an annual basis* receive appropriate instruction and demonstrate competence in approved procedures for release, rescue and resuscitation.

*Training anniversaries can be a retained fixed date and month of the year, provided refresher training and competency assessment has occurred within one month prior or after the anniversary date.

Workers with language and literacy limitations may use a mentor or interpreter to read and translate information for competency training and assessment in the above. Once on the worksite, these workers must have a mentor or interpreter in their workgroup who can read and translate permits, Rules, standards and instructions given by operators, safety advisors and other authorised personnel.

Ausgrid allows the use of interpreters but does not supply the service. Where required, the employer or contractor must provide the interpreter.

Instructed Persons

Instructed persons may carry out work as defined in this clause, provided they are under the direct supervision of an authorised person.

Refer to the Glossary – Personnel, for the definition of an instructed person.

Other Electricity Network Operators

Persons who are authorised to work on, near, or in the vicinity of mains and apparatus owned or operated by another Electricity Network Operator (e.g. Transgrid, Endeavour Energy, Essential Energy, Sydney Trains) may carry out work on, near, or in the vicinity of Ausgrid mains and apparatus when:

- They are carrying out work on their mains and apparatus which requires them to work on, near, or in the vicinity of Ausgrid mains and apparatus. (Refer to the operating protocols between Ausgrid and the other Network Operator for further information); or
- They are assisting Ausgrid with the restoration of the network following major storms or other emergency events. (Refer to the Energy Network Association Memorandum of Understanding for further information).

External Parties

External parties who are working under, and are accredited in accordance with, the WorkCover NSW Code of Practice – Work Near Overhead powerlines, may carry out work in the vicinity of live exposed mains and apparatus – within the “Accredited Person Zone” as defined by the Code of Practice.

Where work near Ausgrid mains and apparatus under the above-mentioned Code of Practice requires mains and apparatus to be isolated, as specified by the Industry Safety Steering Committee Guide ISSC32, the work must be carried out under an access authority/permit that is issued in accordance with these Rules.

External parties are not permitted to carry out work on Ausgrid mains and apparatus.

3.1.2 Accredited Service Provider (ASP) Authorisation

ASPs must be authorised by Ausgrid to work on, near, or in the vicinity of Ausgrid mains and apparatus.

Refer to the Ausgrid Customer Supply Standard ES4 - Accredited Service Provider Authorisation, for information on the scope and application of ASP authorisation for the Ausgrid network.

ASPs may only carry out work within the limits of their authorisation as defined in ES4.

3.1.3 Authorisation to Enter Substations (and Other Areas with Live Exposed Conductors)

Persons must not gain access to or enter substations and other areas where there are live exposed conductors unless they are:

- Authorised by Ausgrid to enter substations, or
- Accompanied by an Ausgrid stand-by person who meets the requirements of point 1 above and who has specifically and clearly instructed the person about the following:
 - the limits of the area they can access or enter; and
 - electrical hazards and any other possible hazards associated with substation entry; and
 - the controls required to manage the risks arising from those hazards.

This requirement applies to all types of substations, switching stations, and any other areas where live exposed conductors are present.

3.1.4 Authorisation to Carry Out Operating Work

See Section 17 Glossary - General, for the definition of operating work.

Only the following workers (who must be authorised to work on, near, or in the vicinity of mains and apparatus) may carry out operating work on the Ausgrid network:

- Workers with an appropriate operating authority (see Clause 3.2 Operating Authorities); or
- Workers who are undertaking training for the purpose of obtaining an operating authority and who are under the direct supervision of a worker with the appropriate operating authority; or
- Electrically qualified workers who are carrying out operating work on behalf of, and under the direct supervision of, an operator who holds an operating authority which is appropriate for the operating work being carried out.

Note: Workers carrying out operating work in this situation are not authorised to:

- issue access authorities/permits; or
- work under the reduced minimum safe work distances from live exposed HV mains and apparatus of Clause 7.2);
- Where the emergency situation presents an immediate risk to life or property, electrically qualified workers may de-energise the mains and apparatus, if they are able to do so safely.
- An interim exemption remains in place, as set out in Clause 5.6.1, allowing electrically qualified Ausgrid employees to carry out operating work on low voltage network distributors and street lighting circuits, to isolate those mains and apparatus for work carried out by their workgroup. (This does not include the operation of switches in substations that control low voltage network distributors).

3.1.5 Authorisation to Issue Access Authorities/Permits

An access authority/permit may only be issued by a person who holds an appropriate operating authority.

See Section 5.1 -Access Authorities/Permits and Folders, for information on the purpose and application of an access authority/permit.

3.1.6 Authorisation to Receive Access Authorities/Permits

Access Permits

Access permits must only be issued to persons who are authorised by Ausgrid to receive access authorities/permits.

These persons include:

- Ausgrid employees;
- Accredited Service Providers (ASPs);
- employees or electrical contractors employed by a HV customer;
- individuals specially authorised to accept an access permit for a particular location and conditions as detailed in Clause 3.1.7 below.

Access permits may also be issued to employees, or contractors of other electricity network operators who are authorised in access permit procedures (e.g. Transgrid, Sydney Trains).

Clearances to Work

Clearances to work must only be issued to persons who are authorised by Ausgrid to receive access authorities/permits, except when the clearance to work is issued for:

- work on secondary systems - under Class 5B, 5C, 5E & 5G operating authorities (where the operator issues the clearance to work to themselves); or
- work by an electrical contractor on customer LV equipment - where Ausgrid controls a point of isolation; or
- external parties working near LV mains and apparatus under the WorkCover NSW Code of Practice – Work Near Overhead Powerlines

Maintenance of Authority

To maintain authority to receive access authorities/permits, authorised persons must complete annual refresher training. (Proof of completion is an endorsement on their network/skills passport).

3.1.7 Special Authorisation to Receive Access Permits

A special authorisation to receive access permits may be given to external party individuals who intend to work in the vicinity of Ausgrid HV mains and apparatus, under the WorkCover Code of Practice – Work Near Overhead Power Lines. This authorisation (by the Executive General Manager – Field Operations) involves on-site training on the specific mains and apparatus and the access permit process. The training specifically includes the daily cancellation of an access permit at the end of the day's work, as well as re-issue procedures. The access permit must be handed directly to the specially authorised person on each occasion.

Training for the special authorisation to receive access permits specifies that if the mains and apparatus are not earthed and short-circuited, and no access permit is provided, the HV mains and apparatus must be treated as live.

If an individual is specially authorised to receive access permits, the authorisation is limited to suitable circumstances (i.e. where the need for a stand-by person to receive the access permit is not necessary to ensure the safety of the personnel involved in the work).

3.1.8 Authorisation to Submit Network Access Requests

Network Access Request (NAR) Authorisation is required for the following activities:

- submit requests for the disconnection reconnection of mains and apparatus;
- submit HV live work requests;
- submit close approach vegetation control requests;
- submit system alteration orders (SAO); and
- issue equipping permits.

There are three levels of NAR authorisation as set out below in Table 1:

Table 1 - Authorisation levels and conditions for NAR authorisation

Authorisation Level	Conditions
Network Access Request Level 1 (NAR1)	Can prepare NARs but they must be checked and countersigned by a person holding current NAR2 authority and who has a thorough understanding of the work concerned.
Network Access Request Level 2 Restricted (NAR2-R)	Can prepare, sign and submit NARs for work they thoroughly understand. They are not authorised to countersign NARs prepared by other persons.
Network Access Request Level 2 (NAR2)	Can prepare, sign and submit NARs for work they thoroughly understand. They can also check, and countersign NARs prepared by NAR1 authority holders if they have a thorough understanding of the work concerned.

NAR authorised persons advance from Level 1 to Level 2 after satisfying predetermined criteria and submitting an application to the Head of Operating, Installations & Emergency Response.

The minimum timeframe to progress from Level 1 to Level 2—Restricted is 12 months. The minimum timeframe to progress from Level 2—Restricted to Level 2 is 6 months.

NAR authorised persons are required to undertake an annual **knowledge** assessment in submitting NARs.

3.1.9 Authorisation to Work on or Near Live Exposed HV

Work on or near live exposed HV conductors may only be carried out by persons who are authorised by Ausgrid in accordance with the HVLW Manual.

3.1.10 Authorisation to Work on or Near Live Exposed LV

Work on or near live exposed low voltage mains and apparatus may only be carried out by persons who are authorised in accordance with Clause 9.5.2 - Authorisation for Live LV Work.

3.1.11 Authorisation to operate mobile plant

Workers must be authorised to operate mobile plant near, or in the vicinity of, exposed mains and apparatus as required by Section 7.5.

3.1.12 Authorisation to Identify Cables

Identification of underground cables using signal generation and detection methods may only be carried out by workers who have completed the Ausgrid training course - advanced cable identification.

Verification of the cable identification using signal generation and detection methods may be carried out only by workers who have completed either the basic or advanced cable identification Ausgrid training courses.

3.1.13 Authorisation for Vegetation Control

Ausgrid contractors carrying out vegetation control must be authorised in accordance with Section 10.5 - Vegetation Management.

3.1.14 Authorisation Records

Authorisations, training and skills are recorded in one of the following:

- a network passport (personal training records); or
- a national skills passport; or
- a training or authorisation card; or
- an authorisation letter (for persons who are specially authorised to receive access permits); or
- an Ausgrid electronic authorisation register.

The documents listed above must be shown if requested by an authorised officer of Ausgrid.



Figure 3 - National skills passport

3.2 Operating Authorities

This section describes the various classes of operating authority and the skill assessment periods applying to each class of operating authority.

3.2.1 Manager Responsibilities

Managers of workers involved in operating work must make sure the workers are appropriately trained and authorised to carry out the operating work assigned to them.

3.2.2 Operator Responsibilities

An operator must be appropriately trained, assessed as competent, and currently authorised, before carrying out operating work.

An operator must only carry out operating work within the scope of their operating authority.

3.2.3 Operating authorities

Details of the scope of the different operating authorities are provided in the following tables as follows:

- Class 1 (A, B, C, D) – Table 2
- Class 6A (System Operator), Class 6B (Area Operator) – Table 3
- Class 2 (A, B, C, D, E, F, G) – Table 4
- Class 3 – Table 5
- Class 4 (A, B, C) – Table 6
- Class 5 (A, B, C, D, E, F, G, H, P) – Table 7.

Table 2 - Summary of Class 1 Operator authorities and conditions

Class 1 Operators		Authorised to operate switches on the Ausgrid network within the nominated geographic area and issue access authorities/permits to another authorised person (but not themselves).
Category	Location	Subscripts and Notes
1A	Sydney	Subscripts: l - overhead lines s - substations (specific substations may be specified) Notes: 1. Class 1A and 1B are referred to as Class 1 unlimited Operators. Class 1C and 1D Operators with no subscript (or descriptive limitation) are also referred to as Class 1 unlimited Operators. Class 1C and 1D Operators with a subscript (or descriptive limitation) are referred to as Class 1 limited Operators. 2. If a reference in these Rules to Class 1 Operators does not specify unlimited or limited, then the reference includes all Class 1 Operators. 3. Class 1 unlimited operators are authorised to receive access authorities/permits from another authorised operator. 4. The subscript 'l' does not permit the operator to by-pass regulators. 5. Class 1 Operators are authorised to operate all switches in their nominated geographic area unless their authorisation indicates limitations as follows: • may not by-pass regulators • switching up to and including 66kV only • may not operate switches in zone substations (with the exception of feeder switches) • operating on overhead networks only • operating on underground networks only. Exemptions: When directed by System Control – • Class 1C operators may carry out operating work on mains and apparatus they are competent to operate within the Upper Hunter area. • Class 1D operators may carry out operating work on mains and apparatus they are competent to operate within the Lower Hunter area.
1B	Central Coast	
1C	Lower Hunter (Newcastle CBD, Newcastle and Maitland)	
1D	Upper Hunter (Muswellbrook, Singleton)	

Table 3 - Summary Class 2 operator authorities and conditions

Class 2 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 Allows the authorised operator to operate switches as set out in the following categories and issue restricted access permits to another member of the same workgroup.
Category	Apparatus	Authorised to:
2A	HV overhead lines - excluding steel tower lines	On overhead HV mains and apparatus that are isolated under an isolation folder: • Prove de-energised; and • apply earthing and short-circuiting equipment; and • issue a restricted access permit. using the isolation folder procedure (see Clause 5.9.3).
2At	HV overhead lines - including steel tower lines	On overhead HV mains and apparatus that are isolated under an isolation folder: • Prove de-energised; and • apply earthing and short-circuiting equipment; and • issue a restricted access permit. using the isolation folder procedure.
2B	Low voltage (LV) fuse replacement (overhead)	Replace LV fuses on predominantly overhead distributors after investigating the cause of interruption. The work is carried out under the direction of the System/Area Operator.
2Cc	Distribution substations – Sydney CBD triplex substations only	Operate distribution transformer switches (HV & LV). Operate LV circuit breakers supplying direct distributors.
2Cs	Distribution substations - Suburban areas only	Operate distribution transformer circuit breakers (HV & LV). Operate LV circuit breakers supplying direct distributors. Excludes: • switches in single circuit breaker type substations; and • HV feeder switches
2D	Overhead networks	Authority during planned or routine work for the operation of: • air break switches, including load break air break switches, up to and including 33kV • links on radial or radialised lines, up to and including 33kV • drop-out fuses, up to and including 33kV • LV fuses at pole transformers. This authorisation includes: • providing approval for making/breaking bonds/taps by HVLW methods; • confirming points of isolation at open bonds/taps; • maintaining LV supply with LV parallels (or motor generators if running isolated) in conjunction with the operation of the network. For Hunter workers only: • change open points to radialise HV feeders

Class 2 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 Allows the authorised operator to operate switches as set out in the following categories and issue restricted access permits to another member of the same workgroup.
Category	Apparatus	Authorised to:
		- maintain LV supply with motor generators in conjunction with the operation of the network - replace 11kV drop-out fuse elements - replace LV fuses following fault operation (overhead distributors only). The following subscripts are required for the operation of specific apparatus: (recl.) - authorised to make reclosers non-auto (cap.) - authorised to operate 11kV pole-mounted capacitors
2Dh	Overhead networks - Hunter only	In addition to the scope of the 2D authority, carry out the following: - operate 66kV air break switches - operate links to sectionalise a feeder prior to restoring supply - replace 33kV drop-out fuse elements - make feeder reclose functions non-auto where there is no Supervisory Control and Data Acquisition (SCADA).
2Eh	Underground networks – Hunter only	Operate HV ring main units (RMUs) and fuse switches in suburban distribution substations. This includes the isolation and earthing of HV cables and distribution transformers. Commission new distribution substations and recover equipping permits on LV extensions.
2Et	Underground networks – transmission cables	For transmission cable technicians and jointers—Authorised to work on gas or oil cable charging systems and sheath cross bonding connections of underground transmission cables, under isolation folder procedure. This excludes work on the cores of the cable.
2Fh	Overhead networks -Hunter only	Carry out the following: - Replace 11kV drop-out fuse elements - under the direction of the System/Area Operator. - Switch to isolate, prove de-energised and earth at pole-mounted substations, and issue a restricted access permit.
2Fh(r)	Overhead networks -Hunter only	Carry out the following, under the direction of the System/Area Operator: Replace 11kV drop-out fuse elements.
2Gh	Substations (zone and STS) Hunter only	Operate HV equipment up to and including 132kV (as defined) in a substation for the purpose of scheduled maintenance or repairs and includes the following: - feeder switches and isolators, transformer circuit breakers and isolators, bus section switches and bus isolators. - racking of withdrawable voltage transformers (VTs). - removing audio frequency plant from service for maintenance, repairs and like-for-like replacement. This authority does not allow for the connection of new equipment. A Class 2Gh Operator may (within their level of authorisation) isolate and earth mains and apparatus and issue an access permit for test and ancillary work to another member of the same workgroup.

Class 2 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 Allows the authorised operator to operate switches as set out in the following categories and issue restricted access permits to another member of the same workgroup.
Category	Apparatus	Authorised to:
		The operator must then sign on the permit under 'Sign On' and remain at the worksite until the access permit for test and ancillary work has been cancelled by the recipient.

Table 4 – Summary of Class 3 Operator authorities and conditions

Class 3 Operators	Not currently in use.
-------------------	-----------------------

Table 5 - Summary of Class 4 Operator authorities and conditions

Class 4 Operators		Special Authorities.
Category	Activity	Authorised to:
4A	Emergency conditions	Note: The Executive General Manager – Field Operations may authorise a person for a specific period to carry out specific operating work.
4B	Training	Carry out operating work and supervise others carrying out operating work, for the purpose of training. The scope of the operating work that may be carried out by or under the supervision of the 4B operator is defined within the specific authority of each operator.

Table 6 - Summary of Class 5 Operator authorities and conditions

Class 5 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 - Restricted Operating Authorities. For issuing of clearance to work only.
Category	Activity	Authorised to:
5A	De-energising and energising LV mains	De-energise and isolate sections of LV network distributors and street lighting circuits. Issue and recover a clearance to work to external parties working near the LV mains and apparatus under the WorkCover NSW Code of Practice "Work Near Overhead Powerlines". Re-energise the mains and apparatus on completion of the work. This authorisation excludes the operation of switches in substations that control LV network distributors.
5B	Protection checks	Carry out work and trip checks on in-service protection schemes. This includes protection pilot checks. Subscripts: • (cb) – Authorised to (with the approval of the Area/System Operator) close circuit breakers that have been intentionally tripped by the above protection checks.

Class 5 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 - Restricted Operating Authorities. For issuing of clearance to work only.
Category	Activity	Authorised to:
5C	Telecontrol work / SCADA	Carry out work on telecontrol schemes and associated SCADA systems.
5D	Operate direct distributors	Operate LV switches controlling direct distributors at substations. Operate specified customer's LV switches associated with the isolation where specifically authorised by the customer. This excludes bolted fuses and switches controlling busbar supplies from substations. Issue and recover a clearance to work to themselves (as the recipient) and/or to electrical contractors who are required to work on the specified customer's mains and apparatus controlled by Ausgrid's equipment.
5E	Work on in-service transformers	Carry out voltage regulation (VR) work on VR panels and motor boxes associated with in-service transformers.
5F(old) pre 2021 training	Operation of the LV network by Compliance Officers for contestable work, or by Contract Officers for work on the network by Ausgrid contractors	<i>(For operators who completed 5F operator training prior to June 2021)</i> Operate the LV network to allow contestable work to be carried out by Accredited Service Providers (ASPs), or to allow work on the network by Ausgrid contractors. This operating work shall be carried out by the Compliance or Contract Officers, however, they may use suitably qualified persons under their direct supervision to assist. The Compliance or Contract Officer must work to an approved work instruction and must contact the Control Room prior to commencing any switching to issue a clearance to work. Notes: This authorisation does not permit the operation of switches in substations that control LV network distributors. Contact with the Control Room is not required where the operating work involves street lighting circuits only (does not involve other circuits).
5F post 2021 training	Operation of the LV network by compliance officers or contract officers for contestable work, or work on or near the network by Ausgrid contractors	<i>(For operators who have successfully completed 5F operator training post June 2021)</i> Carry out operating work on low voltage network distributors (up to a maximum of two (2) that are electrically inter-connectable) and street lighting circuits. Issue and recover clearance to work(s). This authorisation includes: - the operation of switches in substations controlling LV network distributors; - the commissioning of new or replacement mains and apparatus (other than new LV distributors); - the replacement of LV distributor fuses under fault conditions. This authorisation excludes: - any operating work that creates a parallel between any substations connected to the Sydney CBD triplex network. - operating work on direct distributors. The following subscripts are required for the operation of specific apparatus. (cbd) authorised to operate LV apparatus in the Sydney CBD,

Class 5 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 - Restricted Operating Authorities. For issuing of clearance to work only.
Category	Activity	Authorised to:
		• (cp) authorised to operate switches in commercial pillars, • (lb) authorised to operate switches in underground link boxes, • (op) authorised to operate LV apparatus in the Sydney Olympic Park precinct
5G	Work on metering equipment	Carry out work on revenue and statistical metering equipment, metering panels, instrument transformers and other equipment associated with electricity metering.
5H	LV underground distributors	Carry out operating work on LV underground distributors and street lighting circuits, up to and including UGOH connections to overhead mains. Issue and recover a Clearance to Work to a member of the same workgroup. The operator must sign onto the clearance to work as a member of the workgroup and remain at the site until the clearance to work is cancelled. This authorisation includes: • the operation of switches in suburban distribution substations that control LV network distributors; • the commissioning of new or replacement mains and apparatus (other than new LV distributors); This authorisation excludes: • operating work on direct distributors; • the replacement of LV distributor fuses under fault conditions.
5P	LV distributors	Carry out operating work on low voltage network distributors (up to a maximum of two (2) that are inter-connectable) and street lighting circuits. Issue and recover a clearance to work to another member of the same workgroup. The operator must sign onto the clearance to work as a member of the workgroup and remain at the site until the clearance to work is cancelled. This authorisation includes: • the operation of switches in substations controlling LV network distributors; • the commissioning of new or replacement mains and apparatus (other than new LV distributors); • the replacement of LV distributor fuses under fault conditions. This authorisation excludes: • any operating work that creates a parallel between any substations connected to the Sydney CBD triplex network; • operating work on direct distributors. The following subscripts are required for the operation of specific apparatus. • (cbd) authorised to operate LV apparatus in the Sydney CBD triplex network, • (cp) authorised to operate switches in commercial pillars, • (lb) authorised to operate switches in underground link boxes,

Class 5 Operators		Restricted operating authorities - subject to the requirements for restricted operators as set out in Clause 3.2.4 - Restricted Operating Authorities. For issuing of clearance to work only.
Category	Activity	Authorised to:
		(op) authorised to operate LV apparatus in the Sydney Olympic Park precinct.

Table 7 - Summary of Class 6 Operator authorities and conditions

Class 6 Operators		Authorised to operate the Ausgrid network from the Sydney or Wallsend control room.
Category	Activity	Description
6A	System Operator	This operating authority does not include any other operating authorisation (such as field operating work or issue of access permits or restricted access permits for work).
6B	Area Operator	Class 6 operating authority is divided as follows; - System Operators hold a Class 6A operating authority - Area Operators hold a Class 6B operating authority Area Operators who are trained to act as System Operators are deemed to also hold a Class 6A operating authority during the time they are acting as System Operators. Class 1 Operators who are trained to act as Area Operators are deemed to also hold a Class 6B operating authority during the time they are acting as Area Operators.

3.2.4 Restricted Operating Authorities

Class 2, and Class 5 operating authorities are referred to as restricted operating authorities, and operators with these authorities are referred to as 'restricted operators'.

Restricted operating authorities are issued for a period of 12 months.

Restricted Operator Limitations

Class 2 restricted operators may only issue a restricted access permit, or clearance to work to another member of the same workgroup. They must then sign onto the restricted access permit or clearance to work under 'Sign On' and remain at the worksite until the restricted access permit or clearance to work is cancelled by the recipient. The restricted operator may then recover the restricted access permit or clearance to work and return the mains and apparatus to service.

Class 5H and 5P operators may only issue a clearance to work to another member of the same workgroup. They must then sign onto the clearance to work under 'Sign On' and remain at the worksite until the clearance to work is cancelled by the recipient.

A restricted operator cannot commission new high voltage (HV) equipment or HV network extensions except when carrying out repairs involving like-for-like replacements or uprating pole transformers.

A restricted access permit for work, or a clearance to work, must not be issued by a restricted operator if one of the points of isolation will form a common point of isolation with other isolated mains and apparatus, except for the following situation:

- Restricted access permits for work may be issued under an isolation folder that shares a common point of isolation with other isolated mains and apparatus.

Note: Restricted operators must stop and seek further information if they are uncertain how to correctly and safely carry out operating work they are called upon to conduct.

Notifying System Control

Restricted operators must notify the System/Area Operator as follows.

1. For restricted operating work under an isolation folder:
 - a) Before signing onto the isolation folder
2. For restricted operating work on mains and apparatus, other than street lighting circuits for repairs:
 - a) Prior to commencing operating work to isolate mains and apparatus;
 - b) After the issue of any access authority/permit;
 - c) Prior to commencing operating work to energise/re-energise mains and apparatus;
 - d) After the completion of operating work to energise/re-energise mains and apparatus.

These notifications must occur as close as reasonably practicable to the time of the commencement or completion of the operating work described above.

Restricted operators are not required to notify the System/Area Operator for operating work that is carried out on street lighting circuits only (does not involve other circuits).

Maintaining Competency

Limited and restricted operators must maintain competency by regular use of their operating authority, since there are distinct differences between tasks involving operating work and normal work.

Managers of restricted operators must make sure that the restricted operators (other than a limited Class 1) use their skills at least four times a year (i.e. once per quarter) to maintain competency. Operators with a limited Class 1 operating authority must use their skills at least ten times a year to maintain competency.

Competency can be determined by one of the following two methods:

1. Using Class 1 limited, Class 2, 3, 4 or 5 operating authority to confirm competency by issuing the relevant access permit (cancelled and recovered permits are to be submitted to Operating, Installations, and Emergency Response).
2. Using a Class 1 limited, Class 2, 3, 4 or 5 operating authority to confirm competency by recording sufficient details of each operation in their log book. The log book is submitted to Operating, Installations, and Emergency Response at the operator's annual re-authorisation.

Each authority is issued for a period of twelve months and renewal is subject to continuing demonstrated competency of the operator.

Note: In this clause, Hunter refers to Upper Hunter and Lower Hunter areas.

4 Network Connections and Alterations

4.1 Network Access Request Procedures

This section describes the requirements for completing a NAR.

4.1.1 Authorisation

You must be trained and authorised before submitting a NAR (see Clause 3.1.8).

4.1.2 When a Network Access Request is required

A NAR must be submitted prior to:

- Work on or near exposed mains and apparatus under an access authority/permit (as required by Clause 5.2.1);
- Work on or near live HV mains and apparatus, in accordance with the HVLW Manual;
- Close Approach Vegetation Control (CAVC);
- Work on the secondary systems of mains and apparatus where a Clearance to Work is required by Clause 5.6.1; or
- Where there is reasonable possibility of the work causing:
 - protection systems controlling the mains and apparatus to operate; or
 - alarms on systems monitored by System Control

Exemptions

A NAR is not required to be submitted for the following:

- Emergency situations (i.e. situations that present an immediate threat to life or property); or
- The isolation and re-energisation of street lighting circuits only (where no other circuits are involved).

4.1.3 Completing a NAR

NARs must be submitted using the appropriate online system in accordance with the System Control document NSEC 007 "Submitting Network Access Requests".

4.1.4 Co-ordinating Associated Work

If you are submitting a NAR, determine from other workgroups if they propose to carry out work on the same mains and apparatus. If there is associated work, then follow either of these procedures:

- If you initiate the NAR:
 - send it to associated personnel involved to complete the details of their involvement
 - get the details from the associated personnel involved, fill in the NAR and list all the people who will be given the information. Everyone approached about the work must have their identity recorded in the spaces provided on the NAR even if they are not directly involved in the work.
- Each person organising the work may send a separate NAR for their work to the Outage Co-ordinator, naming a contact person for each of the workgroups that will be working together. A Control Room copy of the NAR must be sent to each contact person.

4.1.5 Cancelling Network Access Requests

On the day of work, the System/Area Operator may cancel the work planned. The System/Area Operator must then notify everyone named on the NAR of the cancellation.

When another person (apart from the System/Area Operator) is going to cancel an order, they must discuss the proposed cancellation with all the contact officers nominated on the NAR before advising the System/Area Operator.

4.1.6 Additional Work After Disconnection

If additional work must be done by another workgroup on the disconnected mains and apparatus after they have been isolated, then the person responsible for the additional work must ask for another access permit to be issued.

The second workgroup must wait until another access permit is issued before starting the work.

An extension of the isolation beyond the mains and apparatus specified in the original disconnection and reconnection order is only allowed if required to complete the work covered by the original order. In this case, the initial access permit must be cancelled, and a new access permit issued for each workgroup for the changed conditions.

The work must be clearly defined, and all workgroups identified on the NAR and access permits. If this is not done, the work must not be carried out unless the documents are formally amended with System Control.

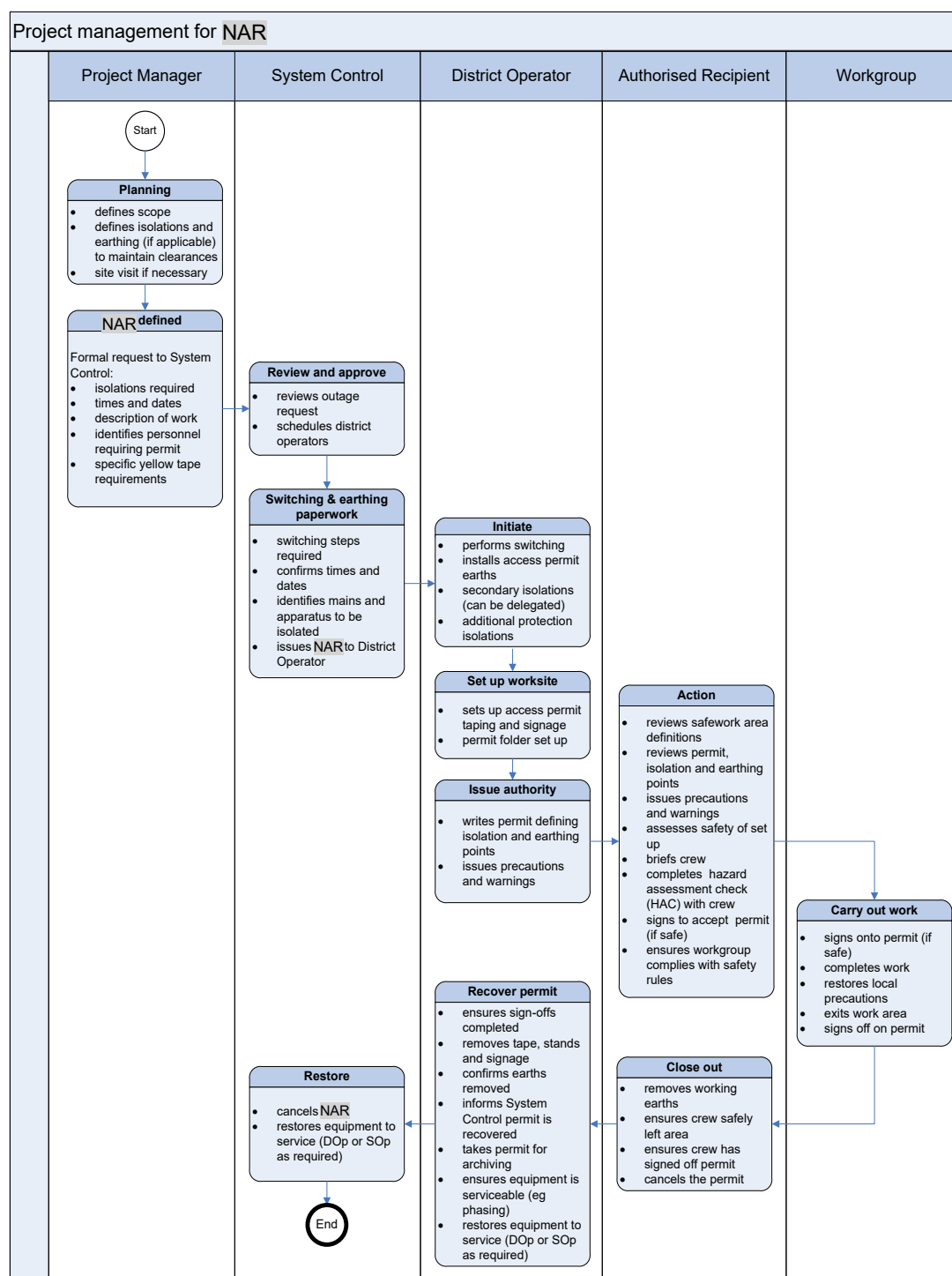


Figure 4 – Process for Network Access

4.2 System Alteration Orders

This section describes when to use a system alteration order (SAO), the details that must be included, and how to complete the order.

4.2.1 SAO Overview

You must be trained and authorised (see Clause 3.1.8) before submitting a SAO. All SAOs must comply with the requirements of the System Control document NSEC 007 “Submitting Network Access Requests” and these Rules.

A SAO is used for the following:

- providing details of new mains and apparatus
- ordering the connection of altered mains and apparatus to the network
- cancelling equipping permits on new mains and apparatus
- cancelling access permits issued on existing mains and apparatus which are isolated so that new connections can be made
- advising of the time and details of planned alterations or additions to the network
- advising of any alterations to the ratings of mains and apparatus
- advising of any alterations to the labelling of mains and apparatus
- advising of any alterations to protection systems (including relay settings).

When there is a change to the network, a disconnection and reconnection order is submitted, and the reconnection details are specified on a SAO. The disconnection should be cross-referenced to the SAO.

A single line diagram of the new or altered connections must be drawn on (or attached to) the SAO.

Pot ends must be shown on the single line diagram where the pot end is more than two metres away from a tee joint, unless the cable and pot end can be visually traced.

The SAO must include the project number for projects where one is allocated as specified in Ausgrid Network Standard - Specification for Network Project Design Plans (NS 104).

All SAOs must comply with the requirements specified in the Ausgrid System Control document NSEC 007 “Submitting Network Access Requests”.

4.2.2 Completing a SAO

Complete the following steps using the appropriate online system:

1. Identify the new sections of mains and apparatus and all other ancillary equipment connected to the network.
2. Enter the time when all access permits and equipping permits are recovered.
3. Briefly describe what change has occurred (in the past tense, because it is read and interpreted by the Class 1 Operator after the connection has been made).
4. Complete a single line diagram of the new or altered connections on (or attached to) the SAO. Pot ends must be shown on the single line diagram where the pot end is more than two metres away from a tee joint, unless the cable and pot end can be visually traced.
5. Include the project number for projects where one is allocated as specified in Ausgrid Network Standard - Specification for Network Project Design Plans (NS 104).

If further work is necessary, new access permits must be requested on a new NAR. The request time is to follow on from the time other access permits and equipping permits were cancelled.

4.3 Commissioning and Phasing

This section describes the restrictions relating to commissioning and the key points relating to phasing.

4.3.1 Commissioning

The procedures for using equipping permits, system alteration orders and disconnection and reconnection orders must be followed to ensure that all persons working on the new mains and apparatus are clear of the mains and apparatus before the application of test voltages or network voltages.



Mains and apparatus become connectable once they can be made live, not necessarily when they are energised.

Once the mains and apparatus are connectable, those involved in the work must treat the mains and apparatus as live, and any further work on the mains and apparatus must be covered by an access permit, or clearance to work, as appropriate.

4.3.2 Phasing

Phasing is a test to prove that energised conductors on each side of a switch (or open point) can be safely joined by closing the switch (or open point). Refer to Clause 10.8.1 for details relating to paralleling.

To make sure there is no difference of potential at a connection, all new connections (or those disconnected during work) capable of interconnecting with another source, must be phased before the connection is closed.

Replacement transformers should be checked before phasing as they may be of a different phase vector group to the original, (e.g. Dyn1, replacing Dyn11).

Any de-energised mains and apparatus that are disconnected in some way (other than by the appropriate switches) must be phased before they are reconnected and returned to service.

Key Points

- Phasing must be checked from all possible sources of supply.
- Wherever reasonably practicable, phasing should be carried out using wireless HV phasing equipment, or on LV connections (using approved test lamps, indicating devices, or voltmeters) in preference to using wired HV phasing equipment.
- Where a HV source produces a LV potential via a permanently connected transformer, and the LV consistently phases with an existing reference source of LV supply, the corresponding HV sources are considered to be in phase.
- Phasing of HV connections on HV mains and apparatus must only be done by a Class 1 Operator using an approved device and method.

Exceptions:

- Phasing of HV connections on HV mains and apparatus may be undertaken by authorised HV Live Work workers under the direct supervision of a Class 1 Operator using an approved device and method that allows audible and visual indication to the Operator at ground level.
- Phasing is not required if there is no possibility of crossing phases. Examples include:
 - busbars associated with outdoor circuit breakers, transformers, etc.
 - restoring connections between sealing ends and bushings
 - repairs on a multi-core cable that do not involve new joints
 - repairs on a single core cable.

5 Permits and Folders

5.1 Access Authorities/Permits and Folders

Access authorities/permits form part of Ausgrid's safe system of work, for work on or near isolated mains and apparatus.

This section describes the issuing and receiving of Ausgrid's suite of access authorities/permits.

It also covers the procedures for using access permit folders, isolation folders, and clearance to work folders.

5.1.1 Ausgrid Access Authorities/Permits

Ausgrid's suite of access authorities/permits include:

- access permit for work
- restricted access permit for work
- access permit for test and ancillary work
- clearance to work.

Other documents in this section include:

- operating agreement
- equipping permit

Table 8 – Overview of access authorities/permits used by Ausgrid:

Name (colour)	Description
Access permit for work (yellow)	Used to allow work on or near: • HV mains and apparatus; and • LV mains and apparatus - where one or more of the points of isolation is a HV point of isolation. (As set out in Clause 5.3.1)
Restricted access permit for work (pink)	Used to allow work on or near mains and apparatus as per an access permit for work - but issued by an appropriately authorised restricted operator to another member of the workgroup.
Access permit for test and ancillary work (pale orange)	Used to allow the application of hazardous test voltages to HV or LV mains and apparatus. May also be used for ancillary work both before and after testing.
Clearance to work (yellow)	Used to allow work on or near the following: • LV network distributors – where all points of isolation are LV points of isolation. • LV direct distributors – where all points of isolation are LV points of isolation. • LV street lighting circuits. • LV mains and apparatus controlled by a LV switch labelled Warning Do Not Operate (WDNO). • the secondary systems of in-service apparatus associated with the network such as protection/SCADA/voltage regulation systems (for notification purposes only). • category 2 Specified Customer switchboards supplied by a direct distributor. • overhead LV mains and apparatus – by external parties working under the WorkCover Code of Practice - Work Near Overhead Power Lines.

Name (colour)	Description
Operating agreement (green-original, blue-duplicate)	An operating agreement does not, by itself, allow work on or near mains and apparatus. An operating agreement facilitates the issue of an access authority/permit for: • work on or near mains and apparatus that interconnect with other organisations; or • work on or near mains and apparatus in the vicinity of mains and apparatus owned or operated by another organisation. The purpose of the operating agreement is to secure the isolation and earthing that is under the control of another organisation. The authorised person issuing the operating agreement undertakes to ensure that the mains and apparatus specified will remain isolated, (or will remain isolated, earthed and short-circuited, as applicable) until the operating agreement is cancelled.
Equipping permit (white)	Used for work on or near new, or permanently disconnected, mains and apparatus that are intended to be connected to the network.

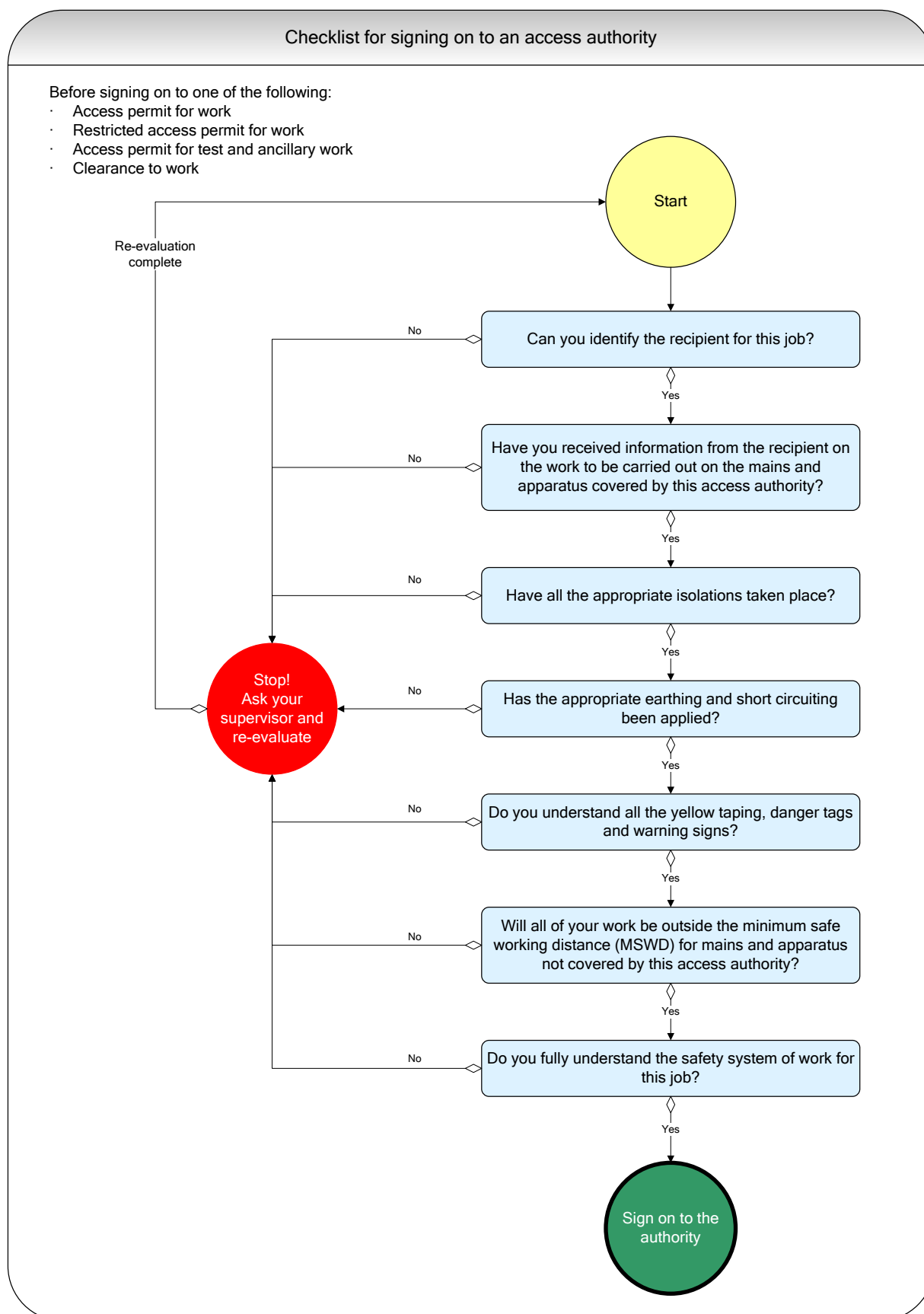


Figure 5 - Checklist prior to signing on to an access authority/permit

Note: Earthing and short circuiting and yellow taping may not be applicable in clearance to work (CTW) situations on LV.

5.1.2 Access Authorities/Permits

Issuing Access Authorities/Permits

Access authorities/permits must only be issued by persons authorised to do so.

Table 9 describes who can issue the various access authorities/permits.

Table 9 - Issuing access authorities/permits summary

Operating Authority	Description of the Access Authorities/Permits the Operator may Issue
Class 1 Operator	All
Class 2A, 2E, 2F, 2G Operator (within the scope of their authorisation)	Restricted access permit
Class 2C, 2D, 2Dh Operator (within the scope of their authorisation)	Restricted access permit, and/or clearance to work
Class 5 Operator (within the scope of their authorisation)	Clearance to work

Access Authority/Permit Recipients

The person who receives the access authority/permit is called the recipient.

Only persons who are authorised as an access permit recipient may receive an access authority/permit

Exceptions:

Recipient authorisation is not required for the issue of a Clearance to Work in the following situations:

- External parties who are working near overhead LV mains and apparatus under the WorkCover NSW Code of Practice – Work Near Overhead Power Lines;
- Electrical contractors who are working on a category 2 specified customer switchboard supplied by a direct distributor,

A person who is authorised to issue an access authority/permit is also authorised to receive an access authority/permit. However, they cannot issue an access authority/permit to themselves.

There are 2 levels of recipient authorisation:

- access permit receiver - unrestricted
- access permit receiver - restricted — restricts recipient to receiving access permits where tape barriers are not required at their worksite.

Recipient types include the following:

- electrically qualified - Ausgrid employee;
- electrically qualified - ASP or contractor to Ausgrid;
- non-electrically qualified - Ausgrid employee;
- non-electrically qualified - ASP or contractor to Ausgrid;
- a specially authorised person (authorised to receive Ausgrid access permits for a particular job at a specific location and for a limited time period).

There are different processes required for the issue of an access authority/permit depending on the recipient type.

The process for the various recipient types to receive an access authority/permit is described in Table 10.

Table 10 – Process for receiving an access authority/permit

Recipient Type	Details
Authorised recipient: Electrically qualified - • Ausgrid employee	These recipients can independently read, check, observe, and comply with the requirements of these Rules covering access authorities/permits. Access authorities/permits may be left for these recipients in a permit folder or permit receptacle. In this situation, only the recipient may retrieve the authority/permit from the folder or receptacle. See Clause 5.2.7 for the requirements for work extending over more than one day.
Authorised recipient: Electrically qualified - • ASP • Contractor to Ausgrid	These recipients can independently read, check, observe, and comply with the requirements of these Rules covering access authorities/permits. Access authorities/permits issued by Class 1 Operators may be left for these recipients in a permit folder or permit receptacle - under the following provisions. Any access authority/permit left for an ASP or contractor must be left at a nominated isolation point that is not normally accessible by the ASP or contractor (e.g. inside a kiosk substation.) An Ausgrid compliance or contract officer must attend the site to: • retrieve all required access authorities/permits and hand them to the recipient; and • provide the recipient with access to the current system diagrams; and • explain the purpose of the access authorities/permits. For work on underground cables, the Operator is to note “subject to cable identification by Ausgrid” in Section 2c) of the permit. See Clause 5.2.7 for the requirements for work extending over more than one day.
Authorised recipient: Not electrically qualified - • Ausgrid employee	These recipients must have the access authority/permit handed to them by an operator who will explain the precautions detailed on the access authority/permit. See Clause 5.2.7 for the requirements for work extending over more than one day
Authorised recipient: Not electrically qualified - • ASP • Contractor to Ausgrid	These recipients must have the access authority/permit handed to them by an operator who will explain the precautions detailed on the access authority/permit. See Clause 5.2.7 for the requirements for work extending over more than one day.
Specially authorised person	This special authorisation is given by the General Manager – Field Operations for a person to receive Ausgrid access permits for a particular job at a specific location and for a limited time period. A specially authorised person must successfully complete training in Ausgrid Access Permit procedures and be issued with a letter of authorisation. This authorisation letter must be shown to the operator to prove that they are authorised to receive Ausgrid access permits. The access permit must be handed directly to the specially authorised person by the Class 1 Operator who will explain the precautions detailed on the access permit. See Clause 5.2.7 for the requirements for work extending over more than one day.

5.1.3 Access Authority/Permit Issuers

Responsibilities

The operator issuing the access authority/permit must hold an Ausgrid operating authority and must do the following:

- make sure that they have taken all the necessary precautions to comply with the Rules before issuing an access authority/permit
- check that the details of the isolation, earthing and short-circuiting, LV shorting, and other precautions have been printed clearly (in blue or black ink) on the access authority/permit
- personally hand the access authority/permit to, non-electrically qualified recipients, and specially authorised persons explaining:
 - all the precautions that have been taken, such as points of isolation and the location of earthing and short-circuiting, and/or LV shorting equipment
 - if there are any live exposed conductors in the vicinity of the mains and apparatus to be worked on or tested.

Safety Obligations

An operator has specific rights and obligations related to safety when issuing an access authority or permit. An operator can refuse to do the following:

- leave an access authority/permit at a specified worksite if they think the details of the isolation, earthing or shorting of the mains and apparatus specified in the NAR are inappropriate for the work
- hand an access authority/permit to a recipient they think is incompetent, uninterested or inattentive
- hand an access authority/permit to a person who cannot produce documentary evidence that they are authorised to receive Ausgrid's access authorities/permits.

Restrictions on Transfer of Access Authorities/Permits

An access authority/permit cannot be transferred between contractors, non-electrical Ausgrid employees or specially authorised persons. When issuing an access authority/permit to persons in these categories, the operator must cross out the 'Transfer' section and write '*Not applicable*'. The operator must also cross out the 'Temporary Cancellation and Re-Issue' section.

5.1.4 Access Authority/Permit Recipients

Responsibilities Prior to Accepting the Access Authority/Permit

- the recipient must be authorised to accept access authorities/permits
- the recipient must check that:
 - the mains and apparatus to be worked on are clearly specified in the access authority/permit, and that the isolations, earthing and other precautions taken are appropriate for the work to be carried out
 - in a switchyard, any live HV mains and apparatus that pass over a taped safe work area must have 'Danger High Voltage Overhead' warning signs erected. Additional signs may be placed to indicate adjacent live equipment at the discretion of the recipient.
- tape barriers (when required) clearly define the safe work area and/or clearly identify other adjacent equipment, which must be treated as live. The tape must enable clear access to allow safe completion of the work.

Responsibilities After Accepting the Access Authority/Permit

- for work on or near isolated LV mains and apparatus where LV shorts are not installed at the worksite—the recipient must ensure the mains and apparatus are proved de-energised at the worksite before commencing work.

Note: This is not required for the excavation of faulted underground cables, as the cable cannot be proved de-energised at the worksite until the cable is uncovered.

- the recipient must ensure that every person signing on to the access authority/permit is aware of the mains and apparatus which are covered by the access authority/permit, the work to be done and the precautions in place

- the recipient must instruct and give face-to-face demonstration to all people who will sign on the authority/permit of the safety requirements of the access authority/permit
- the recipient must ensure that all those required to sign on the access authority/permit do so before they start work
- the recipient must ensure that every person signing on the authority/permit is aware of their obligations to notify the recipient when leaving and returning to the worksite. See Clause 5.3.5
- access authority/permit recipients can only be responsible for their own workgroup and must not allow any other person to sign on to the access authority/permit. Individual workgroups must sign on to separate access authorities/permits. See Chapter 16 for the definition of workgroup
- the recipient can only allow people carrying out work that directly relates to the purpose of the access authority/permit to sign on to the authority/permit as members of the workgroup
- before allowing workers with other work classifications to sign on to the permit, the recipient must know these tasks are covered by the access authority/permit and the workers will work in accordance with the access authority/permit conditions. If in any doubt, these workers are not allowed to sign on to the access authority/permit
- the recipient is responsible for safeguarding the access authority/permit. The recipient must return the authority/permit to the folder at the end of each day and at the completion of work
- the recipient must remain at the worksite or be travelling between locations within the worksite during the course of work, except when following the procedure for leaving the worksite detailed below. See Chapter 17 Glossary - General for the definition of worksite
- working earths must be recorded when connected and disconnected
- all of the working earths/shorts must be removed before the recipient cancels the authority/permit
- the recipient must ensure that everyone who signed onto the authority/permit has signed off before the access authority/permit is cancelled.

Safety Obligations

The recipient has the right to refuse to accept the access authority/permit to work on or near (or test on or near) the mains and apparatus if they consider the precautions detailed on the access authority/permit are inadequate to ensure safety, or do not comply with the Rules.

The recipient has the right to refuse to allow a person to sign on to the access authority/permit if they think the person is incompetent, uninterested or inattentive.

Recipient Leaves the Worksite

If a recipient must temporarily leave the worksite and intends to return, they must ensure one of the following:

- the access authority/permit is transferred to another authorised member of the workgroup
- the workgroup ceases work and stands-down in a safe location until the recipient returns. This is the only option available for non-electrically qualified workers and contractors.

If a recipient must leave the worksite and will not or might not return, they must ensure one of the following:

- The access authority/permit is transferred to another authorised member of the workgroup
- The workgroup ceases work, and all sign off the authority/permit.

The above requirements do not apply when the recipient is travelling between locations within the worksite.

Cancellation of Access Authorities/Permits

When the work is finished, the recipient can do one of the following:

- leave the cancelled access authority/permit in the access authority/permit folder or receptacle folder at the place of issue
- give the cancelled access authority/permit to the operator
- contact the System/Area Operator and ask permission to leave the cancelled access authority/permit in a safe, accessible location for the operator to collect (see Section 5.9 for more details).

If the mains and apparatus are not ready to return to service, the recipient must state so in the cancellation section of the access authority/permit.

For isolation folder procedures, the recipient can do one of the following:

- leave the cancelled restricted access permit in the isolation folder
- contact the System/Area Operator and ask permission to leave the cancelled restricted access permit in a safe and accessible place for the Class 1 Operator to collect.

5.2 How to use Access Authorities/Permits

This section describes how to use access authorities/permits including cross referencing, examining, altering, duplicating, continuing work and withdrawing. It also describes the procedure for mains and apparatus left ready for emergency services and returning mains and apparatus to service.

5.2.1 When an Access Authority/Permit is Required

An access authority/permit must be issued, accepted, and signed onto, before any work is done:

- on or near connectable or commissioned exposed mains and apparatus (other than by live work methods); and
- in the vicinity of mains and apparatus where there is a reasonable possibility of the work causing damage to the mains and apparatus.

Note: This includes mains and apparatus controlled by a switch labelled – Warning Do Not Operate (WDNO).

5.2.2 When an Access Authority/Permit is not Required

An access authority/permit is not required in the situations set out in Table 11 below.

Table 11 - When an access authority/permit is not required

Access Authority/Permit not Required
If workers are doing work outside the minimum safe working distances (MSWD).
If authorised workers are using approved live work methods.
If an authorised operator is performing operating work within the scope of their operating authority.
If authorised persons are carrying out operating work on behalf of, and under the direct supervision of, an operator. Note: This operating work must be carried out under the direct supervision of an operator who makes sure that the necessary procedures for isolating, proving de-energised, earthing and short-circuiting the mains and apparatus are carried out in accordance with these Rules.
When protection settings are adjusted at the direction of the System/Area Operator as a required step in switching operations.
If authorised persons have received written instruction and are working to reduced minimum safe working distances (see Clause 7.2.1).
In an emergency when there is an immediate risk to life or property. Note: The work must be carried out under the direction of the System/Area Operator who makes sure that the necessary procedures for isolating, proving de-energised, earthing and short-circuiting the mains and apparatus are carried out according to these Rules.
If work is being carried out under an equipping permit.
Where authorised persons are working on sub-circuits within substations. For example—substation light and power circuits, tap changer control circuits and customer load control equipment circuits.

5.2.3 Cross-Referencing Access Authorities/Permits

Operators have specific responsibilities for cross-referencing as detailed in Table 12.

Table 12 - Operator responsibilities for cross-referencing

Situation	Operator Actions
Where the work requires access to different sections of mains and apparatus - and separate access authorities/permits are issued for each section.	A Class 1 Operator is required to issue all access authorities/permits and cross-reference all access authorities/permits and associated access authority/permit folders. A Class 1 Operator must recover all access authorities/permits on the different sections that have been under access. Exemptions: • A Class 2D or 2Dh operator may issue both a restricted access permit for work and a clearance to work to another member of their workgroup. The restricted access permit and clearance to work must be cross-referenced. • Street lighting circuits – Where the work on street lighting circuits also requires access to other HV or LV circuits – Different operators may issue separate access authorities/permits on the street lighting circuit and the other HV/LV circuits. In this situation, the authorities/permits and folders need not be cross referenced. However, the exclusion of the street lighting circuit must be noted on the access authority/permit for the other HV/LV circuits, and the exclusion of the other HV or LV circuits must be noted on the access authority/permit for the street lighting circuit. These exclusions must be noted in the “additional precautions/warnings” section of the access authorities/permits.
Where a common point of isolation will be formed, the System/Area Operator notifies the Class 1 Operator	The Class 1 Operator must then cross-reference all access permit/clearance to work folders associated with the common point of isolation. • The existing access permit/clearance to work folder must first be cross-referenced with the new access permit/clearance to work folder before any earthing and short-circuiting equipment is applied and the new access permit issued. • The Class 1 Operator must write: ‘See separate access permits on mains and apparatus associated with this common point of isolation (identified by switch number)’. • The new access permit/clearance to work folder must be placed at the common point of isolation. • A separate danger tag is to be applied at the common point of isolation for each access permit/clearance to work covering different mains and apparatus. Note: Only Class 1 Operators can cross-reference another Class 1 Operator’s access permit/clearance to work folder at a common point of isolation.

Note: When more than one access permit has been issued on different sections of mains and apparatus, restricted access permits cannot be issued (except under an isolation folder).

5.2.4 Examining Access Authorities/Permits

Inspectors or auditors of regulatory bodies and the following Ausgrid officers may examine any access authority/permit issued, to ensure compliance with the Rules.

- Ausgrid management
- supervisors and managers of the workers
- health and safety officers and auditors

- electrical safety employees
- operating standards and training employees
- compliance officers
- project officers
- operators

5.2.5 Access Authorities/Permits on Issue Needing Alteration

These documents cannot be altered after being accepted by a recipient. These documents must be cancelled if the precautions recorded on the authority/permit must be changed to meet work requirements. A new access authority/permit is issued for the new precautions (which must comply with these Rules).

An access authority/permit must be cancelled and a new access authority/permit for work issued if new requests for disconnection of mains and apparatus overlap into the isolation of an existing access authority/permit.



It is not necessary to cancel an access permit (under approved circumstances) where earthing equipment is temporarily removed so that certain stages of the work or testing can proceed. (See Clause 9.8.4 for approved circumstances and Clause 4.1.6 for additional work after disconnection.)

If shorting recorded on a clearance to work needs to be removed or relocated to a different location, then the clearance to work must be cancelled and reissued with the new conditions.

5.2.6 Issuing a Duplicate Access Authority/Permit

A duplicate access authority/permit can be requested by the original access authority/permit (or supervisor of the recipient) if:

- The original access authority/permit is lost, destroyed or vandalised.
- A cancelled access authority/permit is lost, destroyed or vandalised. This ensures that a complete tracking of the process is maintained. The original recipient or supervisor must only accept and cancel the access authority/permit when satisfied the work is completed, and all workers from the workgroup have either signed on and off the document or have been notified that the mains and apparatus are being returned to service.

5.2.7 Work Involving an Access Authority/Permit Extending over more than One Day



Figure 6 - Access permit folder at a worksite

When work is continuing on mains and apparatus over a number of days, with no change to the conditions of the access authority/permit, the following requirements apply for the various types of permit recipients.

Electrically Qualified - Ausgrid Employees

For recipients who are electrically qualified Ausgrid employees -

It is not mandatory for Ausgrid employees to sign off the access authority/permit, or for the recipient to place the permit on transfer, at the end of work each day.

The recipient must leave the access authority/permit in the folder or receptacle at the place of issue at the end of work each day.

Before re-commencing work each day, the recipient must:

- identify the mains and apparatus that were being worked on and check that the access authority or permit covering those mains and apparatus is still valid; and
- ensure that all members of the workgroup notify the recipient before resuming work; and
- ensure that members of the workgroup who have previously signed off the access authority or permit have signed back on to the access authority or permit before re-commencing work.

See also Clauses 5.1.4 and 5.3.5 for further requirements.

Electrically Qualified - ASPs and Contractors to Ausgrid,

For recipients who are electrically qualified ASPs or contractors to Ausgrid:

- All workers must sign off the access authority/permit and the recipient must cancel it at the end of work each day.
- The recipient must return the cancelled access authority/permit to an operator or the compliance/contract officer.
- Multiple daily access authorities/permits (up to a maximum of five) may be left in a permit folder or receptacle. (Noting the requirement for the compliance or contract officer to hand the permit to the recipient).

Non-Electrically Qualified - Ausgrid Employees

For recipients who are non-electrically qualified Ausgrid employees, if the work is continuing for a number of days in identical circumstances:

- All workers must sign off the access authority/permit and the recipient must cancel it at the end of work each day.
- The recipient must leave the access authority/permit in the folder or receptacle at the place of issue.
- Multiple daily access authorities/permits (up to a maximum of five) may be left, in a permit folder or receptacle, for the same recipient after the initial issue.
- If the recipient is unavailable to accept the access authority or permit on any following day, then an appropriately authorised Operator must hand it to another authorised recipient for that day.

Non-Electrically Qualified – ASPs and Contractors to Ausgrid

For recipients who are non-electrically qualified ASPs or contractors to Ausgrid, if the work is continuing for a number of days in identical circumstances:

- All workers must sign off the access authority/permit and the recipient must cancel it at the end of work each day.
- The recipient must return the cancelled access authority/permit to an operator or the compliance/contract officer.
- Multiple daily access authorities/permits (up to a maximum of five) may be left in a permit folder or receptacle for the same recipient after the initial issue. (Noting the requirement for the compliance or contract officer to hand the permit to the recipient).
- If the recipient is unavailable to accept the access authority or permit the following day, then an appropriately authorised Operator must hand it to another authorised recipient for that day.

Specially Authorised Recipients

For specially authorised persons - if the work is continuing for a number of days, the access permit must be cancelled at the end of each day and a new access permit must again be handed directly to the specially authorised person by a Class 1 Operator on each subsequent day.

External Parties Working Near LV Under a CTW

External parties working near LV overhead mains under the WorkCover Code of Practice “Work Near Overhead Power Lines” may be issued a Clearance to Work for multiple days. There is no requirement to issue these workers a Clearance to Work each day.

Electrical Contractor Working on a Category 2 Specified Customer Switchboard

Electrical contractors working on a category 2 specified customer switchboard supplied by a direct distributor, may be issued a Clearance to Work for multiple days. There is no requirement to issue these workers a Clearance to Work each day.

5.2.8 Mains and Apparatus Left Ready for Emergency Service

To leave mains and apparatus ‘ready for service in an emergency’ at the end of each workday, the recipient must:

- ensure workers listed under ‘Sign On’ have signed off on the access authority/permit;
- write ‘*Ready For Service in an emergency*’ in the remarks section adding any other special conditions or instructions;
- cancel the access authority/permit; and
- return the cancelled documents to the place of issue.;

If mains and apparatus left ready for service in an emergency are required to be restored to service, a Class 1 Operator **must** recover all cancelled access authorities/permits and the associated folders. If mains and apparatus are not required to be restored to service, a Class 1 Operator **must** recover all cancelled access authorities/permits and re-issue new access authorities/permits for work to continue the next day.

When Workers are Unavailable for Sign Off

If a worker is unavailable for sign off, the standard procedure in Clause 5.3.5 must be followed.

5.2.9 Mains and Apparatus Left Unready for Emergency Service

If it is necessary during an emergency to place into service mains and apparatus (which are under an access authority/permit), the System/Area Operator must contact the supervisor to arrange for the following:

- completion of any work so the mains and apparatus can be safely placed in service
- cancellation of the access authority/permit.

When Workers are Unavailable for Sign Off

If it is not possible to get all workers to sign off the access authority/permit, then the recipient or supervisor may cancel the access authority/permit or clearance to work. The recipient or supervisor must use the declaration on the back of the access authority/permit or clearance to work to indicate workers not available for sign off.

I hereby state that whose signature/s appear/s under “SIGN ON” is unavailable to sign under “SIGN OFF” and has discontinued work on the mains and apparatus referred to in this Access Permit.
 Signed Print Name Time Date
 Witness (sgd) Print Name

Figure 7 - Declaration on back of access permit for personnel unavailable to sign off

Every worker who has not signed off the access authority/permit must be warned that the mains and apparatus are energised. The supervisor must co-ordinate the process and arrange for a responsible person at each worksite. The responsible person(s) must remain at the worksite until all the workers who were unable to sign off the authority/permit are warned. This warning must be acknowledged.



Only during an emergency situation can mains and apparatus be placed back into service without a witness signature. See Clause 5.2.12 for a detailed description of the procedure.

5.2.10 Withdrawing an Access Authority/Permit

Under the following situations, an access authority/permit (including clearance to work) must be withdrawn:

- If the recipient is unauthorised;

- If the recipient is behaving in an incompetent manner;
- If the workers are not complying with these Rules;
- If the access authority/permit is invalid (i.e. the isolations and precautions do not align with those recorded on the access permit or clearance to work).

Process

The process for withdrawing an access authority/permit or a clearance to work is as follows:

1. All workers who signed onto the access authority/permit must sign off;
2. The recipient must then cancel the access authority/permit.

An appropriately authorised operator must then:

3. Notify the System/Area Operator that the access authority/permit has been withdrawn;
4. Notify the recipient's supervisor and arrange to issue a new access authority/permit to an authorised recipient;
5. Write '*Withdrawn*' across the cancelled document and return it to the permit folder for the Class 1 Operator to recover and send to the relevant Field Operating Field Manager or "permits@ausgrid.com.au".
6. Report the incident as per Ausgrid's incident reporting policy.

5.2.11 Access Authorities/Permits that are not Accepted

When an access authority/permit (including clearance to work) has not been accepted (e.g. the job is cancelled), it may be withdrawn after consulting the supervisor of the workgroup.

The Class 1 Operator must write '*Withdrawn*' across the authority/permit and send it to the relevant Field Operating Field Manager.

5.2.12 Returning Mains and Apparatus to Service

Access Authority/Permit Procedures

Mains and apparatus which are under an access permit or clearance to work must not be re-energised until all associated access permits or clearance to work listed on the access permit or clearance to work folder, or isolation folder, have been cancelled, or withdrawn, and recovered. Any operating agreement (both original and duplicate) issued or accepted must also be cancelled.

Underground Cables

Access permits or clearance to work for work on underground cables must not be cancelled by the recipient unless:

- all new or repaired cables and joints, in joint holes, are backfilled, or sand-bagged and safely barricaded and protected.
- excavations in the immediate proximity of substations are backfilled
- all other excavations are safely barricaded and protected, and arrangements are in place for regular checking to ensure that they remain safely barricaded and protected.



Figure 8 - An open excavation with barricades

Lost, Destroyed or Vandalised Access Authority/Permit

Follow the instructions for issuing a duplicate access permit or clearance to work in Clause 5.2.6.

When a Recipient is Unavailable

If the recipient has not cancelled the access authority/permit and is not available to do so, then the supervisor must cancel the access authority/permit if satisfied that the mains and apparatus can be safely returned to service.

The supervisor must contact the recipient as soon as possible to tell them the mains and apparatus are returned to service. If the recipient cannot be contacted and the work is ongoing, the supervisor must ensure a worker at the worksite warns the recipient that the mains and apparatus are returned to service (and must be treated as energised) before it is time to start work again. This warning must be acknowledged.

When Workers are Unavailable for Sign Off

If a person who has signed under 'Sign On' is not able to sign under 'Sign Off' (i.e. due to injury or illness), then the recipient must sign for this person in the space provided, at the bottom of the section, and in the presence of a witness from the workgroup.

I hereby state that whose signature/s appear/s under "SIGN ON" is unavailable to sign under "SIGN OFF" and has discontinued work on the mains and apparatus referred to in this Access Permit.

Signed Print Name Time Date

Witness (sgd) Print Name

Figure 9- Declaration on back of access permit indicates a worker not available for sign off including witness signature.

If no witness from the workgroup is available, then the access authority/permit recipient must contact their supervisor or manager. The recipient, or the supervisor or manager, must contact the unavailable worker and tell them the mains and apparatus have been returned to service. This contact must be acknowledged.

Note: This procedure must not be used when a person who was able to sign has left the worksite without signing the 'Sign Off' column. Every effort must be made to have the person return and sign off the permit.

Every worker who has not signed off the access authority/permit must be warned that the mains and apparatus are returned to service. The supervisor must co-ordinate the process and arrange for a responsible person at each worksite. The responsible person(s) must remain at the worksite until all the workers who were unable to sign off the authority/permit are warned. This warning must be acknowledged.

When the Access Authority/Permit is Cancelled

When the access authority/permit is cancelled, the operator must return the original version of the access authority/permit (issued to the recipient) with all the other operating papers to the Head of Operating, Installations, and Emergency Response.

5.2.13 Restoration of Supply to Points of Isolation

No section of the network is to be restored up to a point of isolation (other than by automatic reclose) without first temporarily cancelling any access authorities/permits on issue. Permit recipients (and those signed on under issue) must stand aside before an operator re-energises any part of the network up to a point of isolation.

5.3 Access Permit for Work

This section describes how to complete and use an access permit for work.

5.3.1 When to use an Access Permit for Work

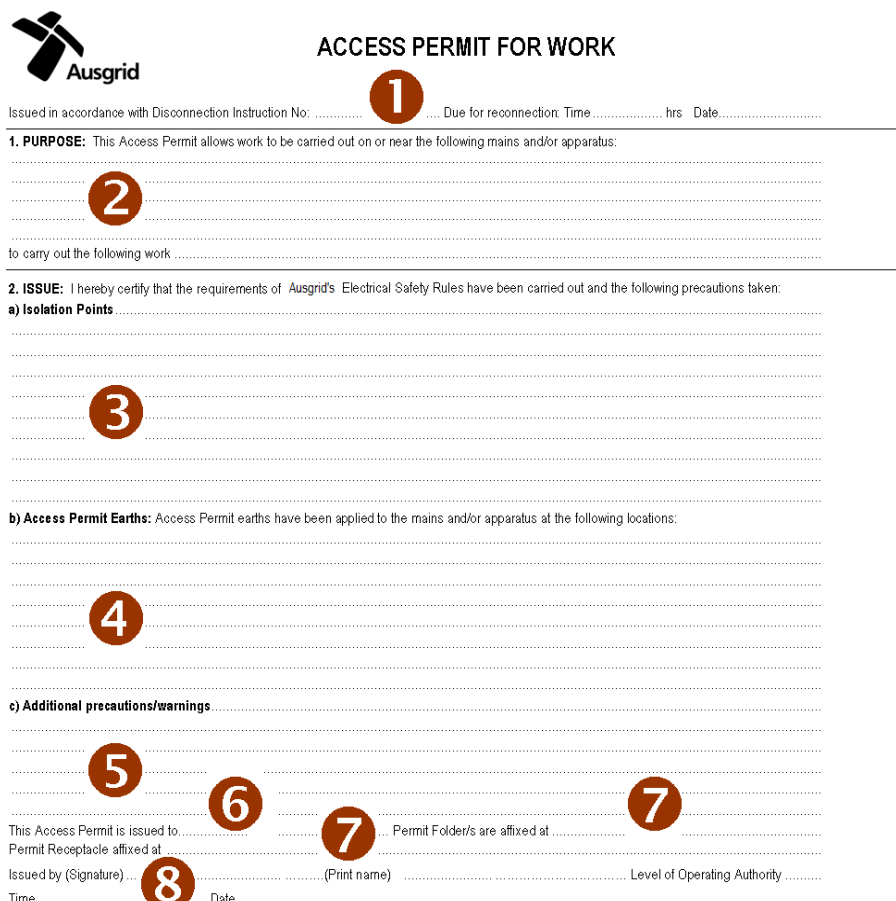
An access permit for work is required for work on or near the following:

- Connectable or commissioned exposed high voltage mains and apparatus.
- High voltage exposed mains and apparatus controlled by a switch labelled – Warning Do Not Operate (WDNO).
- Low voltage mains and apparatus where one or more of the points of isolation is a high voltage point of isolation.

Note: The low voltage mains and apparatus may be either isolated from all possible sources of supply, or isolated from network sources of supply and distributed energy resources greater than 10kW per phase, and shorted in accordance with Clause 9.2.3.

5.3.2 Completing the Class 1 Operator's Section

The access permit for work can only be issued by a Class 1 Operator who completes the first section (see Figure 10).



Ausgrid

ACCESS PERMIT FOR WORK

Issued in accordance with Disconnection Instruction No: **1** Due for reconnection: Time hrs Date

1. PURPOSE: This Access Permit allows work to be carried out on or near the following mains and/or apparatus:

2

to carry out the following work

2. ISSUE: I hereby certify that the requirements of Ausgrid's Electrical Safety Rules have been carried out and the following precautions taken:

a) Isolation Points

3

b) Access Permit Earths: Access Permit earths have been applied to the mains and/or apparatus at the following locations:

4

c) Additional precautions/warnings

5

This Access Permit is issued to **6** Permit Folder/s are affixed at **7**

Permit Receptacle affixed at **8**

Issued by (Signature) (Print name) Level of Operating Authority

Time Date

Figure 10 – First section of access permit completed by Class 1 Operator

Disconnection Instruction Number

- 1** Write in the Disconnection Instruction (Network Access Request) Number. If you are given the instruction verbally, then write 'verbal' on the permit.

Purpose

- 2** Complete the Purpose with a description of the mains and apparatus to be worked on, the location of the work, and a description of the work for the specific mains and apparatus.

Issue

Enter the following details:

- 3** The isolation points.
- 4** The location of access permit earthing, and/or LV permit shorts, applied.
- 5** Identify any precautions or warnings such as screens or yellow taped barriers or any other precautions taken. Identify any warnings given about live mains and apparatus in close proximity and specify any restrictions on where work can be done or precautions that must be taken by the recipient.

- 6 Write either the name or classification of the authorised person obtaining this access permit.
- 7 Write the location of the access permit folder and any receptacle folders issued for this work.
- 8 Print and sign your name. Write in your level of operating authority, the time and date when you signed the access permit.

Depending on the class of access permit recipient, the access permit must either be:

- handed to the recipient after explaining (and where possible physically pointing out) all the details described on the access permit
- put it into a permit/receptacle folder for the recipient to collect later.

5.3.3 Acceptance By Recipient

3. ACCEPTANCE BY RECIPIENT By signing below, I accept this Access Permit and state that I: Print name

- fully understand my responsibilities as an access permit recipient, and that all mains and apparatus, other than those covered by this Access Permit, are to be treated as alive,
- am aware of the nature and position of mains and apparatus covered by this Access Permit, and of the danger of contacting live mains and apparatus,
- am satisfied that I, and the persons whom I authorise to work with me, will have no difficulty in keeping clear of live mains and apparatus during the work,
- am satisfied that the precautions listed in Section 2 of this Access Permit will allow me to carry out my work in a safe manner,
- will be responsible for erecting and removing any working earths that will be required during the course of the work.

1
2

Recipient Signature Classification Contact phone number

Time..... **3** hrs Date

Figure 11 – Completion of the acceptance by recipient section

Read the declaration in this section. If you understand your responsibilities and are satisfied with the safety precautions listed on the permit, then:

- 1 Print and sign your name and include your classification to indicate acceptance of the conditions specified on the permit.
- 2 Write in a contact phone number
- 3 Complete the time and date.

You should also read and comply with Notes 1-3 listed on the back of the form.

- NOTES:
- (1) This Access Permit will remain valid until it is cancelled.
 - (2) The authorised person must sign as having received this Access Permit before commencing work on the mains and apparatus covered by this Access Permit. Persons under the control of the recipient of this Access Permit must sign under Sign On" before commencing work on the mains and apparatus.
 - (3) The Recipient is responsible for safeguarding the Access Permit.

Figure 12 - Notes for compliance by the recipient (back page of the access permit)

5.3.4 Transfer of Access Permit Section

This section allows transfer of the permit to another authorised recipient of the same workgroup.

- 1 If the recipient passes control of the work to another authorised recipient (before the work is finished), then the transferring recipient signs under the 'Transferred From' section.
- 2 The person accepting the transfer signs as the new recipient under the 'Transferred To' section. The transfer can continue from one authorised recipient to another of the same workgroup where necessary.
 - a) Where the transfer to the new recipient occurs in person and all people working under the access permit are on site, members of the workgroup are not required to sign off the access permit during the transfer process.
 - i) If the permit is transferred to a person who had previously signed under 'Sign On', that person must sign off before taking over as the transfer recipient.

Signing On

The recipient must make sure that all the people who will work on or near the mains and apparatus, and all the people who are part of the workgroup that is involved in working on or near the mains and apparatus (e.g. pole changeover crew, line work crew), have signed on the access permit under 'Sign On' before they start work (see Figure 15).

- 1 All persons working with the recipient must read the declaration in the 'Sign On' column.
- 2 When workers print their name, sign, and write in the time and date, it means that they understand and agree with the following:
 - a) have received information from the recipient about the work on the mains and apparatus which are covered by the access permit
 - b) are aware of the danger of contacting or coming near live mains and apparatus
 - c) can stay outside the relevant minimum safe working distance (MSWD) from live mains and apparatus.

Signing Off

- 3 When the work is completed or when an individual finishes the work, they must sign under the 'Sign Off' column on the same line as the first column.
When workers sign and write in the time and date, it means that they both understand and agree they:
 - a) have stopped work on the mains and apparatus
 - b) will treat the mains and apparatus as live.

Person unable to Sign Off

- 4 If any person who had previously signed on is not able to 'Sign Off' due to exceptional circumstances (for example, due to injury or illness) then:
 - a) the recipient must sign for this person in the space provided (at the bottom of the section) and in the presence of a witness from the workgroup
 - b) if no witness from the workgroup is available, the access permit recipient must contact their supervisor or manager
 - c) the recipient, supervisor or manager must contact and tell the absent person that the mains and apparatus are in service, and the contact must be acknowledged.

Person not Available to Sign Off

When a person who is able to sign has left the worksite without completing the 'Sign Off' column, every effort must be made to have the person return and sign off the permit.

Leaving and Re-entering an Access Permit Safe Work Area

Member of a workgroup

If you must temporarily leave the worksite while covered by an access permit and then return, you must:

1. Notify the recipient before leaving.
2. Notify the recipient on return.
3. Identify the mains and apparatus you were working on before you left.
4. Check with the recipient before re-commencing this work, that the access permit covering the identified mains and apparatus is still valid.
5. When taping is required, comply with the requirements of taping procedures used to designate safe work areas.

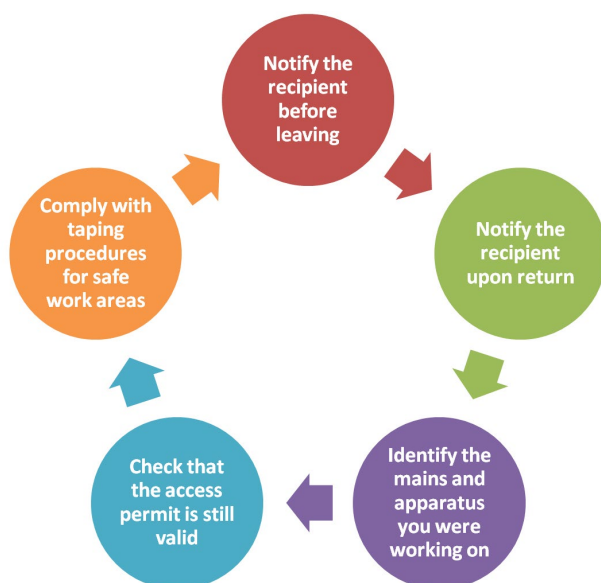


Figure 16 - Workgroup member actions before leaving the worksite and then returning

Access Permit Recipient

If the recipient needs to leave the worksite the workgroup must observe the procedures detailed in Clause 5.1.4.

Temporary Cancellation and Re-Issue Section

An access permit can be temporarily cancelled to allow high voltage (HV) testing or preliminary phasing. Everyone who has signed under 'Sign On' must also sign off under 'Sign Off' before the access permit can be temporarily cancelled.

TEMPORARY CANCELLATION AND RE-ISSUE OF ACCESS PERMIT FOR WORK

TEMPORARY CANCELLATION	RE-ISSUE
I hereby state that this Access Permit is temporarily cancelled and that I and all persons authorised by me to work are now clear of the mains and apparatus referred to.	I hereby state that this Access Permit has been re-issued to the recipient after temporary cancellation.
1 Recipient (sgd) Time Date Recipient (sgd) Time Date	2 Operator (sgd) Time Date Operator (sgd) Time Date

Figure 17 - Temporary cancellation section of access permit

- 1** The recipient must sign under the 'Temporary Cancellation' section.

Return the access permit to the place of issue during the temporary cancellation.

When the high voltage testing or preliminary phasing has been completed, the Class 1 Operator can then re-issue the access permit to the recipient.

- 2** The Class 1 Operator signs the 'Re-issue' section.

The recipient must then have all the personnel involved in the work complete the 'Sign On' process.

Note: If the Class 1 Operator is issuing an access permit to a contractor, a non-electrically qualified Ausgrid employee, or a specially authorised person, then the Class 1 Operator must draw a line through this section and write across it '*Not Applicable*'.

5.3.6 Working Earth Statement

For the working earth section:

- If no working earths were erected, then write '*Nil*' in this section.
- If only one set of working earths were erected, then record the set of working earths.
- If more than one working earth is used, complete a working earths form and write '*Refer Below*' in this section and record the form number.

WORKING EARTH STATEMENT

A working earth was erected at (Write "Nil" if no working earth erected
or "Refer Below" if multiple w/earths erected)

A separate Working Earths form* been used to record multiple working earths –	Working Earths form No.	#	Working Earth form to be returned with Access Permit
---	-------------------------	---	--

Figure 18 - Working earth statement in restricted access permit form

Working Earths Form

A working earths form is used if more than one set of working earths is required. The individual directly responsible for erecting the working earths must record them on the working earths form as they are erected and sign them off as they are removed. The working earths form must be returned (along with the access permit) to the access permit folder once all working earths have been removed and signed off.

	WORKING EARTHS FORM (This form is for recording the application and removal of working earths)	

Access Permit No:

Disconnection Instruction No:

Where working earths are applied, the location of each set of working earths is to be recorded in the table below, and each recorded location is to be signed and dated in the "applied by" column by the access permit recipient. The form shall then be placed in the access permit folder/receptacle.

Upon completion of the work and the removal of the working earths, the access permit recipient shall sign off and date the form in the "removed by" column, for each recorded location. The form shall then be returned to the access permit folder/receptacle.

LOCATION OF WORKING EARTHS	APPLIED BY		REMOVED BY	
	PRINT NAME & SIGN	DATE	PRINT NAME & SIGN	DATE

Figure 19 - Working earths form (more than one set of working earths)

5.3.7 Cancellation Procedure

Recipient

Check that everybody in the workgroup has signed off and is clear of the mains and apparatus.

CANCELLATION BY RECIPIENT

I hereby state that all persons authorised by me to work on the mains and apparatus covered by this Access Permit are now clear thereof.

I hereby state that where there were working earths erected, all working earths have been removed.

I hereby cancel this Access Permit and now regard the mains and apparatus as alive.

Special remarks by Recipient **1**

Recipient (sgd) **2** Print Name Time Date

Recovered by Operator (sgd) **3** Print Name Time Date

Figure 20 - Cancellation by recipient section of the access permit

- 1** For the "Special remarks by Recipient" section:
 - a) If you are cancelling permit and the mains and apparatus are not ready to be returned to service, you must write 'Not ready for service'.
 - b) If you have removed any access permit earths at the completion of work with the approval of the System/Area Operator (in accordance with Clause 9.8.4.) you must write the specific access permit earths you have removed. (e.g. AP earths No. 3 at Pole XY12345)
 - c) If you have removed LV permit shorts at the completion of work with the approval of the System/Area Operator (in accordance with Clause 9.2.3), you must write the specific LV permit shorts that have been removed. Directly below the "Recovered by Operator" or "Final Cancellation by Operator" line, you must write "Comments" with the LV permit short number(s) and LV short location(s) that have been removed. (As shown in the example in Clause 5.6.7 Figure 41).
 - d) Record any relevant special instructions for the Class 1 Operator. For example:

- i) 'In-service check to be carried out by operator'
- ii) 'Cable not to be energised until joint cool at ... hours'
- iii) 'Available for emergency service only'
- iv) 'Permit required for continuation of work tomorrow'.

- 2** Sign this section and hand the access permit to the Class 1 Operator or return it to the permit or receptacle folder for the Class 1 Operator to collect later.

Class 1 Operator

- 3** The operator recovering the access permit signs on the line 'Recovered by Operator' to show the permit is complete and has been cancelled properly.

Return the cancelled access permits to the access permit folder and complete the details on the permit folder.

The folder must be returned to the Head of Operating, Installations, and Emergency Response.

5.4 Restricted Access Permit for Work

This section describes how to complete and use a restricted access permit for work.

5.4.1 How to use a Restricted Access Permit for Work

The restricted access permit for work is a specially printed form used by authorised restricted operators.

A restricted access permit is issued to a person who is qualified as a recipient and from the same workgroup as the restricted operator.

Unlike the conventional access permit, the restricted access permit has no transfer or temporary cancellation provision. The restricted access permit for work is issued by a restricted operator in the following situations:

- The isolation is carried out by the restricted operator.
Note: In this situation, a restricted access permit for work must not be issued if one of the points of isolation will form a common point of isolation with other isolated mains and apparatus. As a restricted operator, if one of the points of isolation for your work is already danger tagged, you must contact the Area Operator to ascertain the purpose of the danger tag.
- When an Isolation folder is used (where the isolation is performed by a Class 1 operator)

5.4.2 Completing the Restricted Operator's Section of the Restricted Access Permit

The first section of the restricted access permit is completed by the restricted operator (see Figure 21).



RESTRICTED ACCESS PERMIT FOR WORK

1

In accordance with Disconnection Instruction/Isolation Folder No.

1. **PURPOSE:** This Restricted Access Permit allows work to be carried out on or near the following mains and/or apparatus:

.....

at

to carry out the following work.....

2

2. **CLEARANCE PER ISOLATION FOLDER – CROSS OUT THIS SECTION IF IT IS NOT APPLICABLE OR CROSS OUT (A) OR (B) AS APPLICABLE**

A) I have read and understood the information recorded on the Isolation Folder No. and I am satisfied that the isolation/information on it is adequate and appropriate for the work I will be carrying out.

I have contacted the System/Area Operator, and will give appropriate warnings and take local safety precautions necessary for proving that the mains and apparatus referred to on the Isolation Folder, are de-energised prior to the application of earthing and short-circuiting equipment.

B) I have received information from the System Operator of the isolation and any earthing that has been applied and I am satisfied that the isolation/information is adequate and appropriate for the work I will be carrying out. I will give appropriate warnings and take local safety precautions necessary for proving that the mains and apparatus referred to are de-energised prior to the application of earthing and short-circuiting equipment.

Authorised person issuing permit..... Signature (Print name)

Time Date

3

3. **ISSUE:** I hereby certify that the requirements of Ausgrid's Electrical Safety Rules have been carried out and the following precautions taken:

a) **Isolation Points**.....

.....

b) **Restricted Access Permit Earths:** Restricted Access Permit earths have been applied to the mains and/or apparatus at the locations

No	Location of Restricted Access Permit Earths	Operator to initial when earths removed

5

c) **Additional precautions/warnings**

.....

I issue this Restricted Access Permit to (Print Name) Classification)

Issued by (Print name)

Signature

Time hrs Date Level of Operating Authority

6

7

Figure 21 - First section—Restricted access permit completed by the restricted operator

Disconnection Instruction/Isolation Folder Number

1 Write in the disconnection instruction/isolation folder number. If you are given the instruction verbally, then write '*verbal*' on the permit.

Purpose

2 Complete the purpose with a description of the mains and apparatus to be worked on, the location of the work (i.e. after the word 'at'), and a description of the work for the specific mains and apparatus.

Clearance per Isolation Folder

3 This section applies when an isolation folder has been issued. Where an isolation folder is not involved with the work, you must cross this section out (i.e. when a Class 1 Operator has not carried out any of the isolation and all isolation is performed by the restricted operator).

- 2A - This part applies when you have gone to the isolation folder to record the details as required in Clause 5.9.3.
- 2B - This part applies when you do not go to the isolation folder but receive clearance directly from the System/Area Operator as allowed in situations 1 and 2 in Clause 5.9.3.

You must cross out whichever part is not relevant.

When you sign this section, it means you agree that the isolation is satisfactory for the work conditions and accept responsibility for the issuance of the restricted access permit.

Issue

The Issue section has three main areas for completion.

- 4 (a) Isolation points – list all the isolation points.
Note: If the restricted access permit is being issued under an isolation folder, the restricted operator must also write the words 'As per isolation folder No....' in this section of the permit.
- 5 (b) Restricted access permit earths (and/or LV shorts) - list the location of all the permit earthing, and/or LV permit shorts, applied by the restricted operator.
Note: If the restricted access permit is being issued under an isolation folder and a Class 1 operator has applied earthing and short-circuiting equipment for that isolation folder, the restricted operator must first record the earthing applied by the Class 1 operator in this section, as follows:

No.	Location of restricted access permit earths	Operator to initial when earths removed
' # '	'Class 1 operator applied earths at' (location)	'As per isolation folder'

Figure 22 – Recording earthing applied by a Class 1 Operator on a restricted access permit

- 6 (c) Additional precautions / warnings - list any screens or taped barriers erected, or any other precautions taken. Include any warnings about live mains and apparatus in the vicinity, any restrictions on where work can be done or precautions in place.

Issuers Details

- 7 Indicate the name of the recipient along with the restricted operator's name, signature, time, date and level of operating authority.

Note: The restricted operator must issue the restricted access permit, but another member of the same workgroup must serve as the recipient. The restricted operator must sign on the restricted access permit under 'Sign On' as a member of the workgroup and remain at the worksite until the restricted access permit has been cancelled.

5.4.3 Completing the Acceptance Section of the Restricted Access Permit

As the recipient, you must read the declaration in this section. If you understand and are satisfied with the safety precautions listed on the permit and your responsibilities, then:

- 1 Print and sign your name. Include your classification and contact phone number.
- 2 Write in the time and date to indicate that you can comply with the conditions on the permit.

4. **ACCEPTANCE:** By signing below, I accept this Restricted Access Permit and state that I- (Print name) 1

- fully understand my responsibilities as an access permit recipient, and that all mains and apparatus, other than those covered by this Restricted Access Permit, are to be treated as alive,
- am aware of the nature and position of mains and apparatus covered by this Restricted Access Permit, and the danger of contacting live mains and apparatus,
- am satisfied that neither I nor the persons whom I authorise to work with me will have any difficulty in keeping clear of live mains and apparatus during the work, and

– am satisfied that the precautions listed in Section 3 of this Restricted Access Permit will allow me to carry out my work in a safe manner and that I will be responsible for erecting and removing any working earths that will be required during the course of the work.

Accepted by: Signature 1 Classification phone number
Time ... 2 Date

Figure 23 – Second section - Acceptance section on restricted access permit for work form is completed by the recipient.

You should also read and comply with Notes 1-4 which are listed on the back of the form (see Figure 24).

- c) the recipient, supervisor or manager must contact and tell the absent person that the mains and apparatus have been returned to service and the contact must be acknowledged.

Note: If a person is able to sign off but has left the worksite, this procedure must not be used. Instead, make every effort to have the person return and sign off the permit.

5.4.4 Working Earth Statement

For the working earth statement:

- If no working earths were erected, then write 'Nil' in this section.
- If only one set of working earths were erected, then record the set of working earths.
- If more than one working earth is used, complete a working earths form and write '*Refer Below*' in this section and record the form number.

WORKING EARTH STATEMENT

A working earth was erected at (Write "Nil" if no working earth erected
or "Refer Below" if multiple w/earths erected)

A separate Working Earths form* been used to record multiple working earths –	Working Earths form No.	#
---	-------------------------	---

* Working Earth form to be returned with Access Permit

Figure 26 - Working earth statement for restricted access form

Working Earths Form

A working earths form is used if more than one set of working earths is required. The worker directly responsible for erecting the working earths must record them on the working earths form as they are erected and sign them off as they are removed. The working earths form must be returned (along with the access permit) to the access permit folder once all working earths have been removed and signed off (see Figure 19).

5.4.5 Completing the Cancellation Section of the Restricted Access Permit

Recipient

If the restricted access permit (see Figure 27) is used in conjunction with an isolation folder, the recipient must indicate:

- 1 If primary connection or bonds have been made or broken (yes / no).
- 2 If phasing is required (yes / no).
- 3 If the mains and apparatus are not ready to return to service, write '*Not ready for service*'. Write any special instructions to the restricted operator.
 - a) e.g. 'cable not to be energised until joint cool at ... hours' etc.

CANCELLATION OF RESTRICTED ACCESS PERMIT FOR WORK

I state that all persons authorised by me to work on the mains and apparatus designated on this Access Permit are now clear and I cancel this Restricted Access Permit and state that from now onwards the mains and apparatus as alive. I have designated the System/Area

Operator and state that all earthing and short-circuiting equipment removed. I have removed the earthing and short-circuiting equipment. YES / NO

Primary connections or bonds have been made or broken. YES / NO

Is phasing for reconnection required. YES / NO

Special Remarks by Recipient

Recipient (sgd) Print Name Time hrs Date

Recovered by Operator(s) (Sgd) Print Name

Figure 27 – Fifth section—Cancellation of the restricted access permit

- 4 The recipient and the restricted operator sign and complete the relevant fields in the cancellation section of the permit.

The restricted operator then removes any restricted access permit earthing and records the removal in Section 3b) of the restricted access permit.

If LV permit shorts have been applied to LV mains and apparatus covered by the restricted access permit, the restricted operator removes the LV permit shorts and records the removal in Section 3b) of the restricted access permit.

The restricted operator then performs one of the following:

- Where an isolation folder is used, the permit must be placed in the isolation folder, so the Class 1 operator can collect it later and send the folder and permit(s) to Operating, Installations, and Emergency Response.
- Where an isolation folder is not used, the permit must be sent to Operating, Installations, and Emergency Response.

5.5 Access Permits for Test and Ancillary Work

This section describes when to use the access permit for test and ancillary work and the workers responsible for issuing and receiving the permit. It also provides a description of how to complete the permit.

The access permit for test and ancillary work is a specially printed form which can only be issued by an authorised Operator within the limits of their operating authority (see Clause 3.2.4 for exceptions). The access permit for test and ancillary work differs from an access permit for work since it allows for the application of hazardous voltages for testing, as well as work before and after testing.

It is designed to facilitate routine testing of mains and apparatus and to speed up the test and repair process of faulty mains and apparatus (e.g. cable fault location and repair or 33kV circuit breaker bushing tests). This work may include temporary system alterations to facilitate restoration of supply before the repairs are completed.

5.5.1 When to use an Access Permit for Test and Ancillary Work

An access permit for test and ancillary work must be used for the application of the following voltages for testing purposes on connectable or commissioned mains and apparatus.

- High voltages;
- Hazardous voltages*; or
- Voltages which produce high or hazardous voltages on the mains and apparatus under test.

(*See Chapter 17 Glossary - General, for the definition of hazardous voltage).

Exceptions: An access permit for test and ancillary work is not required for:

- testing with an electronic insulation resistance (IR) tester capable of generating voltage greater than 1000V on apparatus where no cables or capacitors are subject to the test voltage; or
- the application of high or hazardous test voltages to secondary systems, where the secondary systems conductors to which the voltage is applied do not extend beyond the area under the control of the person applying the test voltages.
- The application of hazardous test voltages to network protectors and air circuit breakers in Sydney CBD distribution substations that are covered by a Restricted Access Permit for Work.

System alterations, outside the scope of repairing or replacing failed mains and apparatus, must not be carried out whilst the mains and apparatus are covered by an access permit for test and ancillary work.

No other access authority/permit may be issued on mains and apparatus covered by an access permit for test and ancillary work, except as detailed below.

Exception: As set out in Operating Protocols between NSW Network Service Providers. An access permit for test may be issued by each organisation on either end of interconnected mains and apparatus to facilitate testing. Controls must be in place to co-ordinate the testing between the organisations.

Refer to Table 13 for appropriate use of an access permit for test and ancillary work.

Table 13 – Appropriate use of an access permit for test and ancillary work

Condition Description	Permits Required
No ancillary work before or after the test by any other workgroup.	Test and ancillary permit only
More than one access permit is needed for work before or after testing.	Test and ancillary permit and access permit before and/or after

After the procedures for earthing and short-circuiting are completed, an access permit for test and ancillary work is issued.

Ensure all access permits for work (covering the mains and apparatus to be tested) are cancelled (or temporarily cancelled) before an access permit for test and ancillary work is issued.

Notes:

1. Care must be taken after applying insulation testing devices to cables or capacitors. Adequate time must be allowed for the cables or capacitors to discharge fully. Voltage recovery is possible when cables and capacitors are only momentarily discharged to earth.
2. Measuring the resistance of transformer windings with direct current can also generate HV momentarily when the circuit is interrupted.

Exception: If any components of the mains and apparatus can be isolated and removed and placed at a safe distance from the test area, then an access permit for work can be issued for that section provided the permit draws attention to the test area. The work and testing details must be printed on the access permits which are then issued in separate access permit folders. The access permit folders must be cross-referenced.

5.5.2 Responsibilities of the Recipient for the Test Section of the Permit

The recipient must be a person responsible for one of the following:

- applying the test voltages
- the safe co-ordination of the approved procedures when serving integrity testing of the underground HV cables.

The recipient must also ensure any persons assisting testing personnel complete the 'Sign On' section on the back of the access permit. These workers are under the control of the recipient until they complete the 'Sign Off' section.

Redefining the Permit

The permit can be redefined as a permit for test after the initial ancillary work. After the testing is completed, it can again be redefined so work can be finished.

Permits are redefined by the current recipient signing off their section of the permit. Once redefined for work after test, it cannot be returned to test status. If further testing is required, the permit must be cancelled and a new access permit for test and ancillary work issued.

Note: A permit recipient cannot make any alterations to the conditions, or to the work classification on a test and ancillary work permit.



Where mains and apparatus might be exposed, the person responsible for the testing must ensure appropriate precautions are taken to stop people coming within safe working distances of mains and apparatus that might become live. Stand-by personnel may have to be used.

5.5.3 Completing the Operator Section



ACCESS PERMIT FOR TEST AND ANCILLARY WORK

Issued in accordance with Disconnection Instruction No: **1** Due for reconnection: Time hrs Date

1. PURPOSE: This Access Permit allows ancillary work associated with testing prior to or following the application of high voltage for testing on the following mains and/or apparatus:

..... **2**

to carry out the following work:

2. ISSUE: I hereby certify that the requirements of Ausgrid's Electrical Safety Rules have been carried out and the following precautions taken:

a) Isolation Points

.....

b) Access Permit Earths: Access Permit earths have been **3** the mains and/or apparatus at the following locations:

.....

.....

c) Additional precautions/warnings

.....

This Access Permit is issued to 1* **4** 2* 3*

Permit Folders are affixed at **5** Signature **6** Level of Operating Authority

Time Date

Figure 28 - Completing an access permit for test and ancillary work (operator section)

Disconnection Instruction Number

- 1** Write in the disconnection instruction number. If you are given the instruction verbally, then write 'verbal' on the permit.

Purpose

- 2** Write a description of the mains and apparatus to be worked on and the location of the work.

Issue

- 3** Enter the following details:
 - a) the points of isolation
 - b) the location of earthing which has been applied
 - c) any screens and/or tape erected, or any other precautions taken; identify any warnings that need to be given about close-by live mains and apparatus and specify any restrictions to where work can be done or precautions that must be taken by the recipient.

Acceptance

- 4** Write in the name and/or work classification of the authorised person the permit will be issued to depending on whether this is: 'Work before test', 'test', or "work after test". Put 'NA' (Not applicable) in the other two positions.
If there is no 'work before test' or 'work after test', put a line through the non-applicable sections in the Recipient sections, as well as the Re-definition part if it is a test (see Note).
- 5** Write in the location of the access permit folder and the receptacle folder (if used) issued for this work/test.
- 6** Print and sign the permit and write your class of operating authority, the time and the date.

Give the access permit to the recipient or put it into the permit or receptacle folder for the recipient to collect later.

Note: Test with no work before or after - If there is no 'work before test' or 'work after test', write 'N/A' (not applicable) in positions 1 and 3.

c) Additional precautions/warnings

.....

.....

This Access Permit is issued to 1* **N/A** /2* /3* **N/A**

Permit Folder affixed at

Issued by (Print name) Signature Level of Operating Authority

Time hrs Date

Figure 29 - Test with No 'Work Before Test' or 'Work After Test'

Put a line through sections 1 and 3 and the Re-definition part of section 2 in the Recipient's section.

1* WORK BEFORE TEST	ACCEPTANCE BY (Print name) Signed
	Classification Phone # Time Date
	RE-DEFINITION - By signing I state that my duties have been completed and all persons I authorised to assist me now regard the mains and apparatus as alive under test conditions. Signature Time Date
2* TEST	ACCEPTANCE BY (Print name) Signed
	Classification Phone # Time Date
	RE-DEFINITION - By signing below I state that my duties have been completed and no further testing will take place and that all persons I authorised to assist me, now regard the mains and apparatus as earthed for the purposes of ongoing work. Print name Signature Time Date
3* WORK AFTER TEST	ACCEPTANCE BY (Print name) Signed
	Classification Phone # Time Date

Figure 30 – Re-definition section where there is a test with no 'work before test' or 'work after test'

5.5.4 Completing the Recipient Section for 'Work Before Test', 'Work During Test' and 'Work After Test'

3. ACCEPTANCE BY RECIPIENT
By signing below, I accept this Access Permit and state that I:

- fully understand my responsibilities as an access permit recipient, and that all mains and apparatus, other than those covered by this Access Permit, are to be treated as alive.
- am aware of the nature and position of mains and apparatus covered by this Access Permit, and of the danger of contacting live mains and apparatus.
- am satisfied that neither I nor the persons whom I authorise to work with me will have no difficulty in keeping clear of live mains and apparatus during the work.
- am satisfied that the precautions listed in Section 2 of this Access Permit will allow me to carry out my work in a safe manner and that I will be responsible for erecting and removing any working earths that will be required during the course of the work.

☐ **1*
WORK
BEFORE
TEST**

ACCEPTANCE BY (Print name) Signed
Classification Phone # Time Date
RE-DEFINITION - By signing I state that my duties have been completed and all persons I authorised to assist me now regard the mains and apparatus as alive under test conditions. Signature Time Date

☐ **2*
TEST**

ACCEPTANCE BY (Print name) Signed
Classification Phone # Time Date
RE-DEFINITION - By signing below I state that my duties have been completed and no further testing will take place and that all persons I authorised to assist me, now regard the mains and apparatus as earthed for the purposes of ongoing work. Print name Signature Time Date

☐ **3*
WORK
AFTER
TEST**

ACCEPTANCE BY (Print name) Signed
Classification Phone # Time Date

* Cross out if not applicable

Figure 31 - Completing an access permit for test and ancillary work (Recipient section)

Read the declaration in this section to confirm you understand and are satisfied with the safety precautions listed on the permit and your responsibilities. Print and sign your name (to indicate that you can comply with the conditions on the permit) and write the time and date in the area left blank by the Class 1 Operator.

You should also read and comply with Notes 1-5 which are listed on the back of the permit.

5.5.6 Transfer of Access Permit Section

If the recipient must leave the worksite before the work is finished, the 'Transfer of Access Permit' section must be completed by the transferring recipient and the transfer recipient. This section allows transfer of the permit to another authorised person of the same classification.

- 1 If the recipient passes control of the work or testing to another authorised person (before the work or testing is finished), then the transferring recipient signs under the 'Transferred From' section.
- 2 The person accepting the transfer signs as the new recipient under the 'Transferred To' section. The transfer can continue from one authorised person to another of the same workgroup where necessary.
 - a) Where the transfer to the new recipient occurs in person and all people working under the access permit are on site, members of the workgroup are not required to sign off the access permit during the transfer process.
 - i) If the permit is transferred to a person who had previously signed under 'Sign On', that person must sign off before taking over as the transfer recipient.
 - ii) The new recipient must inform all persons signed under 'Sign On' as soon as possible that the access permit has been transferred.
 - b) Where the transfer does not occur in person, or any person signed on the access permit is not on site, members of the workgroup must sign off the access permit during the transfer process.

NOTES:

- (1) This Access Permit will remain valid until it is cancelled.
- (2) The authorised person must sign as having received this Access Permit before commencing work on the mains and apparatus covered by this Access Permit. Persons under the control of the recipient of this Access Permit must sign under 'Sign On' before commencing work on the mains and apparatus.
- (3) The Recipient is responsible for safeguarding the Access Permit.

TRANSFER OF ACCESS PERMIT: I hereby state that this Access Permit is transferred:

TRANSFERRED FROM		TRANSFERRED TO	
From Sgd:	Time..... hrs Date	Transferred to Sgd:	Print Name:
	1	Time	hrs Date:
From Sgd:	Time..... hrs Date	Transferred to Sgd:	Print Name:
	2	Time	hrs Date:

Figure 33 - Transfer of access permit section

5.5.7 Redefining 'Work Before Test'

When the 'work before test' is finished and all those authorised by the recipient have signed under 'Sign Off', the access permit is redefined for Test. This is done by the recipient after reading and agreeing with the conditions. They then sign, print their name, and write the time and date.

This acknowledges that they will treat the mains and apparatus as live under test conditions.

5.5.8 Test

When the 'test' is finished and those authorised by the recipient have completed the 'Sign Off', the access permit can be redefined for 'work after test' by the recipient after reading and agreeing with the conditions, signing and printing their name, and writing the time and date.

By doing this, the recipient and all the people authorised by the recipient state that the testing is finished and that the mains and apparatus will remain earthed for the purposes of ongoing work.



Note: A new access permit for test must be issued if more testing is needed after the recipient has signed off this section.

5.5.9 Work After Test

When the 'work after test' is finished and all those authorised by the recipient have completed the 'Sign Off', the access permit can be cancelled.

By completing 'Sign Off' the recipient and all those authorised by the recipient confirm that the work is finished, and they will treat the mains and apparatus as live.

5.5.10 Working Earth Statement

WORKING EARTH STATEMENT

A working earth was erected at (Write "Nil" if no working earth erected
or "Refer Below" if multiple w/earths erected)

A separate Working Earths form* been used to record multiple working earths –	Working Earths form No.	#
---	-------------------------	---

* Working Earth form to be returned with Access Permit

Figure 34 - Working earth statement section

For the working earth statement:

- If no working earths were erected, then write 'Nil' in this section.
- If only one set of working earths were erected, then list the set of working earths.
- If more than one working earth is used, complete a working earths form and write 'Refer Below' in this section and record the form number.

5.5.11 Cancellation of Access Permit for Test and Ancillary Work

FINAL CANCELLATION OF ACCESS PERMIT FOR TEST AND ANCILLARY WORK

I hereby state that all persons authorised by me to work on the mains and apparatus covered by this Access Permit are now clear thereof. All working earths erected by me have been removed. I hereby cancel this Access Permit and will now regard the mains and apparatus as alive.

Special Remarks by Recipient **1**

Recipient (Print Name) (Sgd) Time hrs Date
Recovered by Operator (Sgd) Print Name **2**

Figure 35 - Cancellation of access permit for test and ancillary work

Recipient

The final permit recipient must check that everybody in the workgroup has signed off in the 'Sign Off' section and are clear of the mains and apparatus.

- 1** If the mains and apparatus are not ready to return to service, write 'Not ready for service'

Write any special instructions to the Class 1 Operator such as:

- 'In Service check to be carried out by operator'
- 'Cable not to be energised until joint cool at ... hours'
- 'Available for emergency service only'
- 'Permit required for continuation of work tomorrow'.

The final permit recipient signs the cancellation of the access permit for test and ancillary work (including time and date) and gives it to the Class 1 Operator or returns it to the specified location for the Class 1 Operator to collect later.

Class 1 Operator

- 2** The operator recovering the access permit signs on the line 'Recovered by Operator' to show the permit is complete and has been cancelled properly.

Cancelled permits and folders must be sent to the Head of Operating, Installations, and Emergency Response.

5.6 Clearance to Work

This section describes when to use a clearance to work and the workers responsible for issuing and receiving it. It also provides a description of how to complete the permit.

5.6.1 When a Clearance to Work is Required

A clearance to work is required for work on or near LV mains and apparatus, and secondary systems, as detailed in Table 14 below.

When used as a notification of work, a clearance to work folder is not required.

Table 14 – Types of work requiring a clearance to work

Type of Work	Description	Issued By
Work on or near LV direct distributors – where all isolation points are LV.	Work can be by Ausgrid employees at the distribution centre (on the load side of the distribution fuses/breaker), or on the actual distributor (overhead conductor or underground cable), or by the category 2 specified customer's electrician for work on the customer's main switchboard.	Class 1 Operators Class 5D Operators – within the limits of their operating authority. Class 2C Operators (who have completed 2C CTW training) – can issue on LV dedicated customer circuit breakers to another member of the same workgroup.
Work on or near LV network distributors – where all isolation points are LV.	The mains and apparatus may be either: - isolated from all possible sources of supply; or - isolated from network sources of supply and distributed energy resources greater than 10kW per phase, and LV shorts applied in accordance with Clause 9.2.3.	Class 1 Operators – can issue to all workers. Class 2D or 2Dh Operators (who have completed 2D/2Dh CTW training) – can issue on overhead circuits to another member of the same workgroup. Class 5A, 5F, 5H, 5P Operators – can issue within the limits of their authority.
Work on or near street lighting circuits	For work on or near isolated street lighting circuits.	Class 1 Operators – can issue to all workers Class 2D or 2Dh Operators (who have completed 2D/2Dh CTW training) – can issue on overhead circuits to another member of the same workgroup. Class 5A, 5F, 5H, 5P Operators – within the limits of their authority
Work on or near LV exposed mains and apparatus controlled by a LV switch labelled Warning Do Not Operate (WDNO).		Class 1 Operators – can issue to all workers. Class 2D or 2Dh Operators (who have completed 2D/2Dh CTW training) – can issue on overhead circuits to another member of the same workgroup. Class 5F, 5H, 5P Operators – can issue within the limits of their authority.
To allow work and trip checks to be carried out on in-service protection schemes	Includes protection pilot checks. Used for notification of work only.	Class 5B Operators
Work to be carried out on Telecontrol schemes and SCADA only	Used for notification of work only. Exemption: Not required for data acquisition systems that do not provide alarms to, or are not monitored by, System Control.	Class 5C Operators

Type of Work	Description	Issued By
Work carried out on voltage regulation (VR) systems	Includes VR panels and motor boxes associated with in-service transformers. Used for notification of work only.	Class 5E Operators
Work on revenue and statistical metering systems	Examples include metering panels and instrument transformers with connections to metering equipment. Used for notification purposes only.	Class 5G Operators
Work by external parties near LV distributors - under the WorkCover Code of Practice "Work near overhead powerlines" or the SafeWork Guide "Work near underground assets".	The mains and apparatus may be either isolated from all possible sources of supply, or isolated from network sources of supply and distributed energy resources greater than 10kW per phase, with customer services remaining connected, and LV shorts applied.	Class 1 Operators. Class 5A Operators – can issue within the limits of their authority.

Note: The person responsible for planning or scheduling the work must make arrangements for the issue of the appropriate access authorities.

Exemption: An interim exemption from the need for a clearance to work remains in place for electrically qualified Ausgrid employees when:

- they isolate a section of LV network distributor, or street lighting circuit (at points other than a switch within a substation that controls LV network distributors) for work to be carried out by their workgroup; and
- a 5P operator is not a member of the workgroup at the commencement of work.

In that situation, before de-energised work methods may be used, the LV mains and apparatus must be either:

- Isolated from all possible sources of supply (including customer services) and proved de-energised; or
- Isolated from network sources of supply (with customer services remaining connected), proved de-energised, and short-circuited within the distances from the worksite specified in Clause 9.2.3.

Personal danger tags must be applied to all points of isolation, and the application and removal of LV shorts must be recorded on an LV shorts form, by the authorised person in control of the worksite.

Note: Before carrying out any isolation of LV mains and apparatus, the worker who will be carrying out the isolation must notify the System/Area Operator. For planned work the worker must reference the NAR.

5.6.2 When a Clearance to Work is not Required

A clearance to work is not required in the following situations:

- For work on isolated LV service conductors, or individually isolated street lighting luminaires.
- For ancillary operating work on underground street lighting circuits - i.e. the making and breaking of de-energised LV conductor connections before the issue, or after the cancellation, of an access permit or clearance to work. The work must be carried out by, or under the direct supervision of an appropriately authorised operator, using the controls of Clause 9.5.3.
- For work within a community battery - see Section 11.6.
- For work within a stand-alone power system - see Section 11.7

5.6.3 Completing a Clearance to Work - Operator



Form N°

CLEARANCE TO WORK

Issued in accordance with Disconnection Instruction N° **1** Due for cancellation: Time **2** hrs Date

1. PURPOSE: This Clearance to Work allows work to be carried out on or near the following mains and/or apparatus:

3

to carry out the following work

2. ISSUE: I hereby certify that the requirements of Ausgrid's Electrical Safety Rules have been carried out and the following precautions taken:

a) Isolation Points

4

b) Low Voltage Shorts Low Voltage Shorts have been applied to the mains and/or apparatus at the following locations:

5

c) Additional precautions/warnings

6

This Clearance to Work is issued to **7** Clearance to Work Folder affixed at

Clearance to Work Receptacle/s affixed at

Issued by (Signature) **8** (Print name) Level of Operating Authority

Time hrs. Date

Figure 36 - Clearance to work (purpose and issue section)

Operator

- 1** Write in the disconnection instruction number. If the instruction is given verbally and there is no number given, then write '*verbal*' on the clearance to work form. Write '*N/A*' (not applicable) if used for notification of work.
 - 2** Write in the time and date when the clearance to work is due for cancellation.
 - 3** Write a description of the mains and apparatus to be worked on and a description of the work to be done.
 - 4** Write in the details of isolation points.
If the clearance to work is for notification of work only and there are no isolation points, write '*N/A - for notification only*'.
 - 5** Write in the details of any LV shorts applied.
If no LV shorts were applied write '*nil*'.
- Note:** If the clearance to work is being issued by a restricted operator (where a clearance to work folder is not used) the operator must record the application and removal of the LV shorts (as normally recorded on a folder) in this section of the clearance to work (Section 2b).

- Write '*Warning - service mains not isolated*' where work on LV distributors requires fuses to be removed or bonds/taps broken. The work must be danger-tagged, and all open points checked open and danger-tagged. They must then be listed as isolation points from Ausgrid's network.

6 Write details of any additional precautions and warnings.

7 'This Clearance to Work is Issued to' section:

- Write the classification (e.g. *installation inspector, customer's employee/contractor*) or name of recipient of clearance to work.
- Write the location of the clearance to work folder and any receptacle folders issued for this work. Write 'N/A' if used for notification of work only.

8 Sign the form and print your name and class of operating authority. Write the time and date when you sign the clearance to work.

Note: If the recipient is an electrically qualified Ausgrid employee, the clearance to work may be left at the worksite in a clearance to work folder. If not, the clearance to work must be handed to the recipient by the operator and the isolation explained.

5.6.4 Completing Clearance to Work - Recipient

4) CERTIFICATE OF ACCEPTANCE:

By signing below I make the following statements:

I fully understand the isolations and precautions that have been taken in the section 2 above as well as the limits of my work in relation to these isolations.

I am responsible for making sure that all other people working under my control also understand the isolations and precautions carried out above and the limits of the work in relation to these isolations.

Recipient (Sgd) Print name

Classification Time hrs. Date

Contact Phone Numbers: Working Hour After Hours

Figure 37 - Clearance to work (recipient section)

If you understand and are satisfied with the safety precautions listed on the work, sign the authority and print your name and designation (i.e. company electrician/contractor).

Ausgrid Employee (or Contractor)

Ensure all Ausgrid employees (or contractors to or for Ausgrid) working on the mains and apparatus or a customer's installation are aware of the planned work and of the precautions taken.

Ensure they complete the 'Sign On' column before starting the work (see Figure 40).

5.6.5 Transfer of Clearance to Work Section

This section allows transfer of the clearance to work to another person of the same workgroup.

- 1** If the recipient passes control of the work to another person (before the work is finished), then the transferring recipient signs under the 'Transferred From' section.
- 2** The person accepting the transfer signs as the new recipient under the 'Transferred To' section. The transfer can continue from one person to another of the same workgroup where necessary.
 - a) Where the transfer to the new recipient occurs in person and all people working under the clearance to work are on site, members of the workgroup are not required to sign off the clearance to work during the transfer process.
 - i) If the clearance to work is transferred to a person who had previously signed under 'Sign On', that person must sign off before taking over as the transfer recipient.
 - ii) The new recipient must inform all persons signed under 'Sign On' as soon as possible that the clearance to work has been transferred.
 - b) Where the transfer does not occur in person, or any person signed on the clearance to work is not on site, members of the workgroup must sign off the clearance to work during the transfer process.

- 2 When the work is completed, or when you finish your part of the work, you must sign under the 'Sign Off' column (on the same line) and write in the time and date.

When you sign this section, it means that you understand and agree that:

- a) you have stopped work
- b) you will now treat the installation as live.

Not an Ausgrid Employee (or Contractor)

Ensure every person working on the mains and apparatus or customer's installation is aware of the work to be done and the precautions taken by the operator.

Cross out the section 'Persons Under the Control of the Recipient of this Clearance to Work'.

5.6.7 Cancellation of Clearance to Work

I hereby state that whose signature/s appear/s under "SIGN ON" is unavailable to sign under "SIGN OFF" and has discontinued work on the mains and apparatus referred to in this Clearance to Work.

Signed 1 Print name Time Date
 Witness (sgd) Print name

2 WORKING LV SHORTS STATEMENT

A working LV Short was erected at (Write "NIL" if no working LV Shorts erected or "Refer Below" if multiple LV Shorts erected)

A separate LV Shorts form* has been used to record multiple working LV Shorts – LV Shorts Form No. # * LV Shorts form to be returned with this Clearance to Work

CANCELLATION OF CLEARANCE TO WORK

- I state that I, and all persons under my control, have completed work on the equipment nominated on this Clearance to Work.
- I hereby state that where there were working LV Shorts erected, all working LV Shorts have been removed.
- I and all persons under my control will regard the electrical equipment nominated on this Clearance to Work as being alive.

Recipient (sgd) 3 Print name Time Date
 Recovered by Operator (sgd) 4 Print name Time Date

Figure 41 - Cancellation of clearance to work

Recipient

For a recipient who is an Ausgrid employee (or contractor), check all persons in the workgroup have signed off in the 'Sign Off' section and are clear of the mains and apparatus or customer's installation.

- 1 If someone signed on but is not available to sign off, print the person's name, sign the declaration and notify the person that the clearance to work is cancelled.
- 2 For the working LV short section:
 - a) If no working LV shorts were erected, then write 'Nil' in this section
 - b) If only one set of working LV shorts was erected, then record the set of working LV shorts
 - c) If more than one working LV short is used, complete a LV shorts form and write 'Refer Below' in this section and record the form number.

If you have removed LV permit shorts at the completion of work with the approval of the System/Area Operator (in accordance with Clause 9.2.3), you must write the specific LV permit shorts that have been removed. Directly below the "Recovered by Operator" or "Final Cancellation by Operator" line, you must write "Comments" with the LV permit short number(s) and LV short location(s) that have been removed. (As shown in the example below in Figure 42 – Example of comments recording the removal of LV shorts).

Recipient (sgd)	Print name	Time	Date
Final Cancellation by Operator (sgd)	Print name	Time	Date
Comments – LV Permit Short No. 1 at pole XY12345 removed LV Permit Short No. 2 at pole AZ54321 removed			

Figure 42 – Example of comments recording the removal of LV shorts

- 3 Sign the Cancellation Section and print name, time and date of cancellation. If the mains and apparatus are not ready to return to service, write 'Not ready for service' directly below the "Recovered by Operator" or "Final Cancellation by Operator" line.
- 4 Give the clearance to work to the operator or return it to the specified location for the operator to collect later.

Operator's Section

- 4 Check the permit is complete and is cancelled properly. Sign the section, print your name, the time, and date when you recover the cancelled clearance to work form from the recipient.

Send the document to the Head of Operating, Installations, and Emergency Response.

5.6.8 Low Voltage Shorts Form

A LV shorts form must be used for the following.

Where a Clearance to Work is not used:

- To record LV shorts that are applied to LV mains and apparatus by Ausgrid employees who are working under the Clause 5.6.2 exemption to a clearance to work. The individual directly responsible for attaching the working LV shorts must record them on the LV shorts form as they are attached and sign them off as they are removed.

Where a Clearance to Work is used:

- To record working LV shorts, where more than one set of working LV shorts is required. The individual directly responsible for attaching the working LV shorts must record them on the LV shorts form as they are attached and sign them off as they are removed. The LV shorts form must be returned (along with the clearance to work) to the clearance to work folder once all working LV shorts have been removed and signed off.



LOW VOLTAGE SHORTS FORM

(This form is for recording the application and removal of low voltage short circuits)

Clearance to Work No.:

Disconnection Instruction No.:

Where low voltage shorting is applied, the location of each set of shorts must be recorded in the table below, and each recorded location is to be signed and dated in the "applied by" column by the person responsible for the work site who either applied or instructed and witnessed their application. The form shall be kept at the worksite for the duration of work.

Upon completion of the work the low voltage shorts are to be removed by an authorised person. This person must sign the removed by column for each set of shorts only after each set is removed. The form shall then be returned to the work group's supervisor.

LOCATION OF LOW VOLT SHORT CIRCUIT	APPLIED BY		REMOVED BY	
	PRINT NAME & SIGN	DATE	PRINT NAME & SIGN	DATE

Figure 43 – Low voltage shorts form

5.7 Operating Agreement

This section describes how to complete and use an operating agreement.

5.7.1 How to use an Operating Agreement

An operating agreement is used for work on a high voltage (HV) or low voltage (LV) interconnection between Ausgrid and another organisation. The organisation that issues an operating agreement is required to isolate, and if applicable earth, at the appropriate points. An operating agreement is used by either organisation.

The operating agreement gives an undertaking by the authorised person of Ausgrid, or the other organisation, that the mains and apparatus specified on the operating agreement will remain isolated (and earthed if applicable) until a signed cancellation is received.

The person receiving the operating agreement should check, in the presence of the issuing person, the points of isolation (and earthing if applicable) before accepting the operating agreement.

An operating agreement is not used in place of an access permit.

Original and Duplicate Copies

A duplicate is made of the operating agreement. The issuer retains the duplicate and provides the original to the recipient until the work is complete. These documents are exchanged after the work is complete (see Figure 44).

Exchange of original and duplicate operating agreements

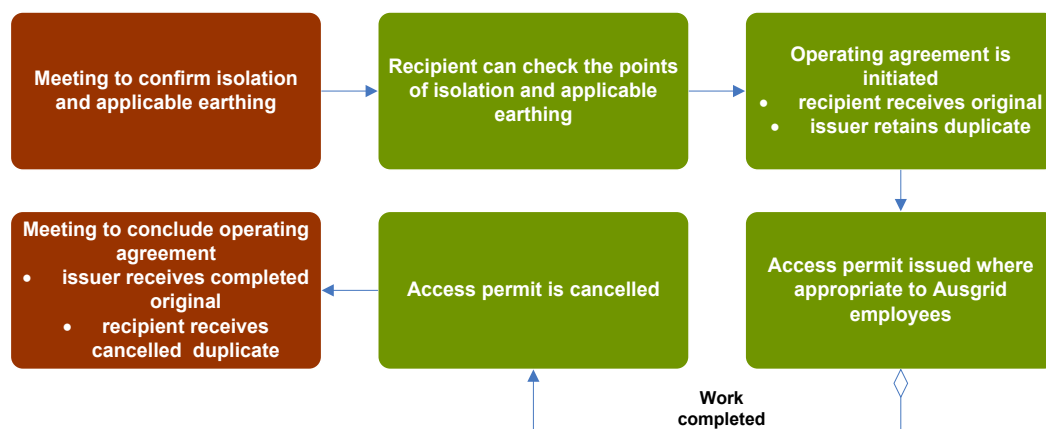


Figure 44 – Summary of the exchange of operating agreement documents (original and duplicate) before work begins and once work is complete.

The principle for issuing copies and retaining cancelled copies is that the organisation writing the operating agreement issues the original to the workgroup and retains the duplicate while the work is in progress. After cancellation of the duplicate, the original is returned to the issuing authority, and the organisation overseeing the workgroup retains the cancelled duplicate.

5.7.2 Isolation by Ausgrid for Another Organisation

When all the necessary operating work is completed by an Ausgrid operator, an operating agreement is filled out, in duplicate, by an authorised Ausgrid employee as follows:



OPERATING AGREEMENT

1. ISSUE

The following high voltage and/or low voltage Mains/Apparatus have been:

- a) Isolated in accordance with (Name of Organisation) Electrical Safety Rules
b) Earthed and short-circuited (strike out if not applicable)

to enable work by (Name of Organisation) workers:

- i. on the interconnection between their network and (Name of Organisation) network; or
ii. on or near (Name of Organisation) network, when required to carry out work on or near their network.

(strike out option i or option ii as applicable)

Mains/Apparatus
.....
.....

Isolation Points - The Mains/Apparatus have been isolated at the following points:.....
.....
.....

Earthing and Short-circuiting equipment has been applied to the Mains/Apparatus at the following locations: (strike out if not applicable)
.....
.....
.....

The above Mains/Apparatus will remain in this condition until this Operating Agreement is cancelled.

ISSUED BY (Print name) Signature
Classification Name of Organisation Time Date

2. ACCEPTANCE BY RECIPIENT

- I hereby acknowledge that I have received advice from the (Name of Organisation) representative that the Mains/Apparatus referred to above have been:
a) Isolated from all possible sources of supply from the (Name of Organisation) network
b) Earthed and short-circuited on the (Name of Organisation) network (strike out if not applicable) and shall remain so until this agreement is cancelled.
- I am aware of the nature and position of the Mains/Apparatus covered by this agreement and will regard all other Mains/Apparatus as alive.
- I understand it is my responsibility to inform those persons working under this agreement of the Mains/Apparatus covered by this agreement.

ACCEPTED BY (Name of Organisation) Representative (Print name)
Signature Classification Time Date

3. CANCELLATION

The above Mains/Apparatus are no longer required to be isolated/earthed. This Operating Agreement is hereby cancelled. I have advised all persons working under this agreement to regard the above Mains/Apparatus as alive.

CANCELLED BY (Name of Organisation) Representative (Print name)
Signature Classification Time Date
Noted by Representative Signature
(Name of Organisation) (Print name)

A71

Figure 45 - Completing an operating agreement

Issue

Sections 1 - 8 are completed by an authorised Ausgrid employee as follows:

- Enter Ausgrid for 'Isolated in accordance with (Name of Organisation)'. Strike out the 'Earthed and short-circuited' phrase if not applicable.
- Enter the name of the organisation requesting this operating agreement. Enter Ausgrid as the "(Name of Organisation) network" for either option i) or ii), as applicable. (Note: Option ii is applicable only to organisations that are specified in Section 14.1). Strike out option i) or ii) as appropriate.

Mains/Apparatus

- 3 Write the mains/apparatus to which the operating agreement applies.

Isolation Points

- 4 List all the points of isolation from Ausgrid's network.

Earthing

- 5 If earthing has been requested on Ausgrid's equipment, list all earthing locations. If no earthing was requested, strike out this section.

Issued by

- 6 Complete your details, writing Ausgrid as the name of the organisation. Include the time and date.

Acceptance Meeting

As the issuer of the agreement, you must meet with the authorised representative of the other organisation to explain the isolation and, if applicable, earthing carried out on Ausgrid's network.

The person accepting the agreement has the right to inspect the isolation and earthing points on Ausgrid's network and you can arrange to allow this inspection to take place.

Once the accepting person is satisfied that all the necessary safety steps have been carried out by Ausgrid, the acceptance section must be completed.

Acceptance by Recipient

- 7 Write 'Ausgrid' after '(Name of Organisation)'.
- 8 Part a) (Isolation from all possible sources of supply). Write 'Ausgrid' prior to the word 'network'. Part b) should be deleted if earthing has not been carried out by Ausgrid.
- 9 The representative accepting the agreement enters the name of their organisation, prints and signs their name, then lists their classification, time and date.

Operator Task

The original copy is then given by the operator to the person accepting the agreement and the duplicate is placed in a permit folder at the point of isolation on Ausgrid's network. Endorse with large letters across the front: 'Operating Agreement on Issue'.

List the location of any earths on the back of the folder.

Cancellation

When the requesting organisation has completed work on their end of the interconnection and the operating agreement is no longer required, another meeting must be arranged between the authorised persons of both organisations.

- 10 The authorised person from the other organisation completes the 'Cancelled by' section on both the duplicate and original documents. The Ausgrid authorised person then completes the 'Noted by' section.

The duplicate copy is given to the authorised person of the other organisation and the original returned to the permit folder.

5.7.3 Isolation by Another Organisation for Ausgrid

In some cases, Ausgrid may require another organisation to isolate and, if applicable, earth the end of an Ausgrid interconnection. In this case, the same procedure is followed except the other organisation serves as the issuing organisation and the Ausgrid Class 1 operator is the recipient of the operating agreement. The form is completed with the other organisation initiating the first steps as described above and Ausgrid receiving the original operating agreement until the work is completed.

In situations where the other organisation does not have their own operating agreement, then Ausgrid's operating agreement may be used by the other organisation. When all the necessary operating work has been completed by the other organisation, the operating agreement is completed in duplicate.

In a similar manner, the original and the duplicate copies of the operating agreement must be cancelled and exchanged. The organisation that issued the agreement retains the cancelled original copy. The duplicate copy retained by Ausgrid is placed in the permit folder.

5.8 Equipping Permit

This section describes the responsibilities for issuing and working under an equipping permit when it must be used. It also provides a description of how to complete the permit.

5.8.1 How to use an Equipping Permit

An equipping permit is issued by the person co-ordinating the works to allow work on mains and apparatus intended to be connected to the network.

Note: An equipping permit may only be issued by a person who is appropriately authorised to submit Network Access Requests (Refer to Clause 3.1.8).

An equipping permit is required for the construction of new mains and apparatus (except where the work is completed within one day). This permit details the mains and apparatus which will be connected to the system, and it must be on site prior to the commencement of any work on the mains and apparatus intended for connection to the network.

You must not commence (or re-commence) work on new mains and apparatus intended for connection to the network until you have checked that an equipping permit covers the work.

Separate equipping permits may be used for different sections of the installation or mains extension.

After the mains and apparatus are connectable, any incomplete or additional work on or near the exposed mains and apparatus must be done under an access permit, or clearance to work, as appropriate.

Note: An equipping permit is not to be used when replacing existing or defective apparatus that are already part of the network and are shown on a system diagram. Use an access permit for such apparatus.

Exception: New or permanently disconnected mains and apparatus do not need to be referred to on an equipping permit until a definite plan for their connection to the network is established. An equipping permit covering the mains and apparatus is issued by the person co-ordinating the complete mains task (e.g. the person in charge) as soon as the commissioning plans are made.

This is done at the same time the system alteration order (SAO) is submitted.

Responsibilities Prior to Cancelling an Equipping Permit

A responsible person from each workgroup (nominated on the equipping permit) must indicate that their work is either 'complete' or 'incomplete' at the time the mains and apparatus are connectable. The person signing the equipping permit for overhead or underground mains work should be the person co-ordinating the complete mains task (e.g. the person in charge).

When an Equipping Permit is not Required

An equipping permit is not required for the construction of new mains and apparatus where the work of construction and energising is carried out totally within one day and:

- the construction work is covered by an access authority/permit (e.g. replacing existing or defective apparatus that are already part of the network and are shown on a system diagram); or
- the person responsible for connecting and energising the new mains and apparatus is the same person responsible for the whole workgroup; or
- when energising using HV Live Work techniques, such as new pole transformer (PT) substations in rural areas.

Restrictions

If you make an external connection (including a tee-joint to a live cable) that results in a capped live low voltage (LV) cable in a distribution centre covered by an equipping permit (see Note), you must ensure the cable is clearly identified or marked as being live (by suitable warnings such as tape and signage). Ensure this is marked on the written risk assessment before starting work.

Note: If the cable is to be terminated onto a LV distributor panel in the distribution centre, the equipping permit must be recovered and replaced by access permits prior to making the connection (see Clause 5.8.5).

5.8.2 Displaying the Equipping Permit

Locations

The equipping permit must be on site prior to the commencement of any work on the mains and apparatus intended to be connected to the network. Complete and place the permit in one of the following locations:

- in a prominent position at a sub-transmission station, zone substation, distribution centre or control point when new or additional mains and apparatus are installed for connection to the network
- at a point of isolation when connecting new or permanently disconnected HV mains where the work is external to an electrical station.

The location of equipping permits must be shown on the SAO submitted to describe the connection of the mains and apparatus.

An equipping permit need not be displayed in a substation when the work only involves pulling new HV or LV cables into the substation.

Where work covered by an equipping permit extends over a number of levels of a substation (or over an extensive area), notices (minimum size A4) must be displayed in prominent locations to indicate the location of the equipping permit.

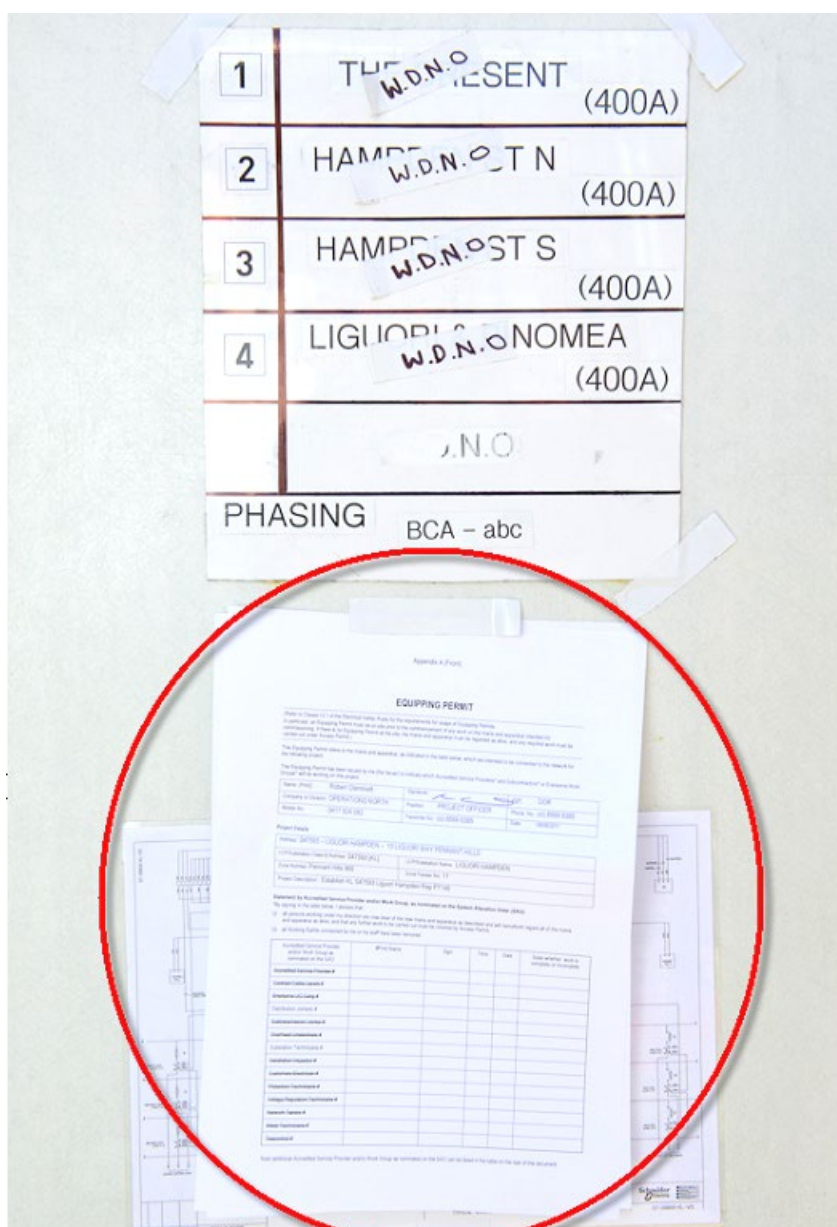


Figure 46 - Equipping permit displayed in new kiosk substation

5.8.3 Completing the Equipping Permit



EQUIPPING PERMIT

(Refer to the Electrical Safety Rules for the requirements for usage of Equipping Permits. In particular, an Equipping Permit must be on site prior to the commencement of any work on the mains and apparatus intended for commissioning. If there is no Equipping Permit at the site, the mains and apparatus must be regarded as alive, and any required work must be carried out under Access Permit.)

This Equipping Permit refers to the mains and apparatus, as indicated in the table below, which are intended to be connected to the network for the following project.

This Equipping Permit has been issued by me (the Issuer) to indicate which Accredited Service Providers* and Subcontractors* or Ausgrid work groups* will be working on this project.

Name: (Print) Signature: **1** ASP:
 Company or Division Position: Phone No:
 Mobile No: Facsimile No: Date:

Project Details

Address: **2**
 LCP/Substation Class & Number: Name:
 Zone Number: Feeder No: Project Description: **3**

Statement by Accredited Service Provider and/or Work Group, as nominated on the System Alteration Order (SAO):

*By signing in the table below, I declare that:

- (i) all persons working under my direction are now clear of the new mains and apparatus as described and will henceforth regard all of the mains and apparatus as alive, and that any further work to be carried out must be covered by Access Permit,
- (ii) all Working Earths connected by me or my staff have been removed.

Accredited Service Provider and/or Work Group as nominated on the SAO	4 #Print Name	Sign	Time	Date	State whether work is complete or incomplete
Accredited Service Provider #					
Contract Cable Layers #					
Distribution Jointers #					
Subtransmission Joints #					
Overhead Lineworkers #		7			
Substation Technicians #					
Installation Inspector #					
Customers Electrician #					
Protection Technicians #					
Voltage Regulation Technicians #					
Network Testers #					
Meter Technicians #					
Telecontrol #					

Note: Additional Accredited Service Provider and/or Work Group as nominated on the SAO can be listed in the table on the rear of this document.

Figure 47 - Equipping permit front page

For Issue – Project Officer/Project Manager

- 1** Write your name, company/group/business unit, position and the contact numbers (including mobile). This section should include a signature and date.

- 2 Complete the project details. Write in the address of the project. Where the project involves a load control point (LCP)/substation, and/or a feeder or a zone, write in relevant details. Examples include:
 - a) For mains work – ‘Corner Graham and Riding Streets’
 - b) For LCP work:
 - ‘PT 2450 Cormorant Sussex’
 - ‘HS 29150 Tocal Homestead’.
- 3 Describe the mains and apparatus covered by the equipping permit. A sample description of the formation of a feeder to a new kiosk would include the following details:
 - a) ‘out of service cable from sealed ends cnr Robey and Wade Streets to sealed ends in pit, in Anzac Pde near Poziers Ave’
 - b) ‘new cable from pit as described above to new kiosk in Lone Pine Pde’.
- 4 List all possible workgroups involved in the project. Any workgroups or accredited service provider (ASP) not required to work on the project (and who will not be nominated on the system alteration order (SAO)), must be crossed out. Examples include:
 - a) ‘Ausgrid Field Services South/Cable Jointers’
 - b) ‘ACME Contracting/Line workers’.

(Refer to the Electrical Safety Rules for the requirements for usage of Equipping Permits. In particular, an Equipping Permit must be on site prior to the commencement of any work on the mains and apparatus intended for commissioning. If there is no Equipping Permit at the site, the mains and apparatus must be regarded as alive, and any required work must be carried out under Access Permit.)

Accredited Service Provider and/or Work Group as nominated on the SAO	#Print Name	Sign	Time	Date	State whether work is complete or incomplete
5					

All Work Groups which do not work on the project must be crossed out. The issuer (who is usually the Project Manager see above details) must be notified of any additional work Groups and he will arrange to amend the on site Equipping Permit.

This Equipping Permit refers to the mains and apparatus, as indicated in the single line diagram below, which are intended to be connected to the network.

Single Line Diagram
(Refer to System Alteration Order for Confirmation of Final Details.)

6

Operator's Section:

All Accredited Service Providers and Work Groups as nominated on the SAO have signed off the front of this form, and this Equipping Permit is now cancelled.

Signed: 8 Time: Date:

On completion return this Equipping Permit to the Operating Superintendent (or equivalent).

Equipment not tested or failed under test to be listed:

Figure 48 - Equipping permit back page

- 5 Include additional accredited service providers or workgroup nominees (if required).
- 6 Draw a line diagram of the mains and apparatus involved.

Work Completed

- 7** When each listed accredited service provider/workgroup has completed their part of the work (or if the equipping permit is due for cancellation), the responsible person for that workgroup must print their name and sign in the appropriate work classification row (see Figure 47). On the same row, write in the time, date and whether that part of the work is '*complete*' or '*incomplete*'.

Note: Signing this section (see Figure 47, item 7) confirms the person signing understands that the mains and apparatus covered by the equipping permit must now be treated as live and no further work must be done on or near the exposed mains and apparatus unless the mains and apparatus are covered by an access permit. The person signing must also advise any other person involved with the work on the mains and apparatus covered by the equipping permit, that the mains and apparatus must now be treated as live.

Operator's Section

- 8** Check the equipping permit has been completed properly by each workgroup, then complete the following:

- sign and print your name
- write the time and date of cancellation
- check the information on the equipping permit matches the information on the SAO.

List any equipment that was not tested or failed under test. Send the cancelled equipping permits (and any other permits and folders) to the Head of Operating, Installations, and Emergency Response.

5.8.4 Cancelling an Equipping Permit

Details on cancelling an equipping permit are provided in Table 15.

Table 15 - Procedures for cancellation of equipping permit

Before Connection to the Network:	Work Incomplete or further Change (or Work) Required
- A SAO must be sent to the Outage Co-ordinator to cancel the equipping permit. - The equipping permit and all associated access authorities/permits on the existing network must be cancelled and recovered before any live connection (or closure of a switch) takes place to energise any part of the mains and apparatus displayed on the equipping permit. - When new or permanently disconnected mains and apparatus are being energised, no access authorities/permits can be issued on any part of the installation until labelling and electrical connectivity is proved by the operator conducting the commissioning checks.	- A network access request (NAR) must be sent with a SAO requesting access permits be issued to allow the work to be completed. - A NAR must be used to arrange cancellation of access permits so that the mains and apparatus can be energised at a later date. If a further change is made to the system, a SAO must be used.

Work on new or permanently disconnected mains and apparatus can proceed for only one day where connections are made under one or more access authorities/permits that cover points of isolation which could energise the mains and apparatus described on the equipping permit.

5.8.5 Replacing an Equipping Permit with an Access Authority/Permit

Work is able to proceed under an equipping permit for the same day that any HV or LV connection will be made that allows the new or permanently disconnected mains and apparatus to become connectable. This condition applies while completing a new installation or installing new equipment in an existing installation.

Except where the mains and apparatus covered by an equipping permit will be made connectable using live work controls, the project manager co-ordinating the connection must arrange to have the equipping permit recovered and an access permit, or clearance to work, issued as appropriate, by an appropriately authorised operator. This process must be completed before mains and apparatus described on the equipping permit can be energised during any work to commission the mains and apparatus.

All remaining work on or near the connectable exposed mains and apparatus must be carried out in accordance with these Rules.

5.9 Folders

This section describes the application of folders and the requirements for completing them.

5.9.1 Access Permit Folder

When issuing an access permit, a Class 1 Operator must prepare an associated access permit folder. The access permit folder must be attached to a switch used as part of the isolation of the mains and apparatus covered by the access permit.

If this switch is a link or bolted connection and it is dangerous (or not practical) to attach the folder to it, then the folder must be attached in the vicinity of the link or bolted connection where it can be easily seen.

Where a high voltage (HV) switch is available for attachment of the access permit folder (except as indicated in the note), the folder must be attached to the HV switch in preference to a low voltage (LV) point of isolation.

Note: If work is planned on a ring main unit (RMU) in a distribution centre with multiple RMUs, the access permit folder must be attached to one of the following:

- a HV point of isolation remote from the distribution centre where the work is done
- the LV point of isolation for the transformer associated with the RMU, if there are three or more RMUs.

The access permit must be left in a receptacle folder (see Multiple Folders below) attached to the isolated RMU, however, the access permit folder must not be attached to a HV point of isolation on an in-service unit in the same substation.

Multiple Folders

If it is necessary to issue an access permit at a location other than the point of isolation where the access permit folder is attached, an additional access permit folder is used.

The words '*Permit Receptacle*' must be clearly printed across each additional access permit folder. The location of the original access permit folder must also be printed on the receptacle folder. Only the original folder is completed in detail by the Class 1 Operator.

5.9.2 Completing the Access Permit Folder

Preparing the Access Permit Folder

The Class 1 (or Class 3) Operator issuing the access permit(s) completes the following details on the access permit folder:



ACCESS PERMIT FOLDER

(For Access Permit/s issued for Work and/or Test)

In accordance with Disconnection Instruction No. _____

Due for reconnection: Time _____ hrs Date _____

To be carried out on:

to carry out the following work:

The following precautions to ensure safety have been taken:

a) Isolation Points

b) Access Permit Earths applied at

c) Additional precautions/warnings

Access Permit Folder affixed at:

Access Permit receptacle/s affixed at:

Access Permit for Work Issued: (Print Names)					Returned and Checked – Cancelled Access Permits for Work		
TO	BY	TIME	DATE	NO.	BY (PRINT NAME)	TIME	DATE

Access Permit for Test Issued: (Print Names)					Returned and Checked – Cancelled Access Permits for Test		
TO	BY	TIME	DATE	NO.	BY (PRINT NAME)	TIME	DATE

EARTHING EQUIPMENT MOVER..... LOCATION OF ACCESS PERMIT EARTHS - RECORD OVER

On completion return this Access Permit Folder with Access Permits and Disconnection Instructions to the Operating Superintendent.

A/1014

Figure 49 - Details required on the front of an access permit folder

- 1 Write in the Disconnection Instruction Number. If you are given the instruction verbally, then write 'verbal' on the permit.
- 2 Write a description of the mains and apparatus to be worked on and the location of the work.
- 3 Enter the following details:
 - a) the points of isolation
 - b) the location of access permit earthing and/or LV permit shorts which have been applied
 - c) any screens and/or yellow tape erected, or any other precautions taken; identify any warnings that need to be given about close-by live mains and apparatus and specify any restrictions to where work can be done or precautions that must be taken by the recipient.
- 4 Write in the location of this folder and any other folders which have been issued for this work and/or test.
- 5 Write in either the 'Access Permit for Test Issued' column or 'Returned and Checked – Cancelled Access Permits for Test' column including:
 - a) the classification and/or name of the access permit recipient
 - b) your name (print)
 - c) the time and date
 - d) the permit number.

MOVEMENT OF DIRECT EARTH EQUIPMENT

6

TAKEN FROM SUB #	USED AT SUB #	RETURNED BY

NUMBER OF EARTHS APPLIED (If none applied write 'nil')

LOCATION OF EARTHS

No.	Location of Earths	Applied by	7 removed by	Unusual conditions for information of operators reconnecting
1				8
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Figure 50 - Details required on the back of an access permit folder form

Record the following information on the back of the access permit folder:

- 6 The movement of any direct earthing and short-circuiting equipment.
- 7 The number of access permit earths and/or LV permit shorts applied, the location of each set of earthing and short-circuiting equipment applied (print your initials against each entry, as each set of earths are applied and removed).
- 8 The details of any unusual operating conditions.

Recovering the Access Permit Folder

Before placing the mains and apparatus into service covered by the related access permit(s), access permit folder and any receptacle folders, check the following:

- all issued access permits are returned
- all persons who have signed under 'Sign On' on the back of the access permit(s) have signed off under the 'Sign Off' section
- each permit recipient (as issued or transferred) has cancelled their access permit
- any special remarks made by the permit recipient.

After checking the cancelled access permit(s), print your name and write in the time and date you recovered the permit(s) on the access permit folder.

Check for details of any unusual operating conditions on the back of the access permit folder. As each set of specified earthing and short-circuiting equipment is removed, print your initials against the entry. If earths have been removed by an access permit recipient in accordance with Clause 9.8.4, the Operator must initial the folder when their removal is confirmed. Record the return of any direct earthing equipment.

Place all the relevant access permits, folders and all operating papers in the access permit folder and return it to the Head of Operating, Installations, and Emergency Response.

5.9.3 Isolation Folder

An isolation folder is used by a Class 1 Operator to record the details of isolated mains and apparatus, so a Restricted Operator can issue a restricted access permit to another member of the Restricted Operator's workgroup.

Folder Location

The isolation folder is normally left at a point of isolation for the work. However, in some circumstances, such as the examples below, the isolation folder may be left at a location that is convenient to both the restricted operator and the Class1 operator.

Examples:

- there is work on a transmission feeder at a worksite remote from its points of isolation
- the work is carried out at multiple worksites remote from their points of isolation and it is not practical to travel excessive distances to record their details in the isolation folder (applies only in the remote areas of the Hunter region).

In these circumstances:

- The proposed location of the isolation folder must be specified on the network access request; and
- The Class 1 Operator must leave another isolation folder marked "receptacle only" at a point of isolation, referencing the serial number and location of the isolation folder.

Class 1 Operator Activities

The Class 1 Operator must:

- complete the isolation and apply earthing and short-circuiting equipment as required.
- record the details of the isolation (and any earthing and short-circuiting equipment applied) on the isolation folder, as detailed in 5.9.4 below.
- advise the System/Area Operator of the serial number and location of the isolation folder.
- where multiple isolation folders are used in remote rural areas of the Hunter region:
 - the isolations must be duplicated on each folder; and
 - all folders must be cross referenced; and
 - the location(s) of the other folder(s) must be noted on each folder.

Restricted Operator Responsibilities

Check the isolation details on the isolation folder on arrival and do the following:

- Check the isolation.
- Contact the System/Area Operator to obtain permission to proceed (if satisfied).
- Clearly and legibly print your name, classification, arrival time and date.
- Record the isolation folder number, isolation points, and any earthing installed, for inclusion on any restricted access permit(s) to be issued.

Proceed to the worksite to ensure the requested isolation is appropriate for the task. If the isolation is appropriate, complete the following:

- prove the mains and apparatus de-energised and apply earthing and short-circuiting equipment
- complete a restricted access permit for work. (The restricted access permit must include the relevant information from the isolation folder, including the isolation folder number, isolation points and any earthing installed by the Class 1 operator).
- complete the 'Sign On' after the restricted access permit for work has been accepted by the recipient and remain at the worksite until the permit has been cancelled by the recipient.

Once the work is finished, the recipient must ensure all members of the workgroup sign off under 'Sign Off' and then cancel the restricted access permit.

The restricted operator must then:

- recover the restricted access permit for work
- remove the earthing and short-circuiting equipment they previously applied
- initial the restricted access permit for work as each earth is removed
- place the cancelled restricted access permit for work in the isolation folder
- complete the isolation folder as detailed in 5.9.4 below.

5.9.4 Completing the Isolation Folder

Class 1 Operator



No.

CLASS 1 OPERATORS' ISOLATION FOLDER

In accordance with Disconnection Instruction/Isolation Folder No. 1

The following precautions to ensure safety have been taken:

a) Isolation Points

.....

b) Access Permit Earths applied by Class 1 unlimited Operator at (if applicable)

.....

2

c) Additional precautions/warnings

.....

3

Isolation by Class 1 Unlimited Operator 4 Print name Signature Time Date

Isolation Folder affixed at:

Restricted Access Permit for Work Issued:						Returned/Cancelled			
BY (Print Name)	GRADE	ARRIVAL TIME	DATE	PERMIT LOCATION	PERMIT No.	WORK COMPLETE	TIME	DATE	CHECKED BY Class 1 Unlimited Operator (Print Name)

EARTHING EQUIPMENT MOVEMENTS & LOCATION OF ACCESS PERMIT EARTHS - RECORD OVER

Figure 51 - Class 1 Operators' isolation folder details

The Class 1 Operator issuing the isolation folder completes the following details:

- 1 Write in the Disconnection Instruction Number. If you are given the instruction verbally, then write '*verbal*' on the permit.
- 2 Detail the following:
 - a) the points of isolation
 - b) the location of earthing which has been applied
 - c) any screens erected or any other precautions taken; identify any warnings about any close-by live mains and apparatus; specify any restrictions to where work can be done; or any precautions that must be taken by the recipient.
- 3 Print your name, sign and write in the time and date.
- 4 Write in the location of the isolation folder at a point of isolation or a mutually agreed location.

EARTHING or LINK SCREEN MOVEMENTS

5

TAKEN FROM SUB.	USED/LEFT AT.	BY Class 1 Operator	RETURNED BY

NUMBER OF EARTHS CONNECTED

LOCATION OF CLASS 1 OPERATOR EARTHING EQUIPMENT

6

	EARTHS CONNECTED		EARTHS DISCONNECTED	
No.	AT	BY	AT	BY
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

UNUSUAL CONDITIONS FOR RECONNECTING CLASS 1 OPERATOR

7

Figure 52 - Details included on the back of the Class 1 Operators' isolation folder.

Record the following information on the back of the isolation folder:

- 5 The movement of any direct earthing equipment.
- 6 The location of each set of earthing and short-circuiting equipment applied and print your initials against each entry.
- 7 Details of any unusual operating conditions.

Restricted Operator



CLASS 1 OPERATORS' ISOLATION FOLDER

No.

In accordance with Disconnection Instruction/Isolation Folder No.

The following precautions to ensure safety have been taken:

a) Isolation Points

b) Access Permit Earths applied by Class 1 Operator at (if applicable)

c) Additional precautions/warnings

Isolation by Class 1 Operator Print name Signature Time Date

Isolation Folder affixed at:

Restricted Access Permit for Work Issued:						Returned/Cancelled			
BY (Print Name)	GRADE	ARRIVAL TIME	DATE	PERMIT LOCATION	PERMIT No.	WORK COMPLETE	TIME	DATE	CHECKED BY Class 1 Operator (Print Name)
1						2			

EARTHING EQUIPMENT MOVEMENTS & LOCATION OF ACCESS PERMIT EARTHS - RECORD OVER

Figure 53 - Class 1 Operators' isolation folder—Restricted Operator

Complete the following details after contacting the System/Area Operator:

- 1 Name and classification, the time, date and the intended location of where the restricted access permit for work will be issued.

When the work is finished:

- 2 Sign off on the isolation folder in the 'Work Complete' column on the same line as your initial entry and write the time and date.

Leave the restricted access permit for work in the isolation folder.

Cancellation by a Class 1 Operator

Returned/Cancelled		
TIME	DATE	CHECKED BY Class 1 Operator (Print Name)

Figure 54 - Cancellation details on the isolation folder

Cancel the isolation folder by entering your name against the corresponding entry on the isolation folder after checking each of the restricted access permit(s) for work (see Figure 54).

When all permits have been checked and the isolation folder recovered, return it (with all associated operating papers) to the Head of Operating, Installations, and Emergency Response.

5.9.5 Clearance to Work Folder

Except as detailed in the exception below, the operator issuing a clearance to work must prepare an associated clearance to work folder. The clearance to work folder must be left at a point of network isolation.

Exception: A clearance to work folder is not required:

- when the clearance to work is issued for notification purposes for work on secondary systems; or
- when the clearance to work is issued by a restricted operator to another member of the same workgroup. (The operator is required to sign onto the clearance to work as a member of the workgroup and remain at the work site).

In this situation, as there will not be a folder, the operator must record the application and removal of the LV shorts in Section 2b) of the clearance to work.

If a clearance to work is issued to another member of the same workgroup by a restricted operator, and that operator is required to leave the work site before the completion of work, the operator must complete a clearance to work folder and leave it at a point of network isolation. The clearance to work issued by the restricted operator must then be cancelled and placed in the folder.

If the restricted operator is unable to complete a folder (for example, due to injury or illness) the following steps must occur, in order -

- all remaining workers must sign-off the clearance to work,
- the recipient must cancel the clearance to work
- the supervisor or manager of the unavailable operator must arrange for another suitably authorised operator to recover the cancelled clearance to work, complete a folder and return the cancelled clearance to work to the folder,
- the supervisor or manager must notify the original operator of the cancellation of the clearance to work as soon as reasonably practicable.

Receptacle

If it is necessary to issue a clearance to work at a location other than the point of isolation where the clearance to work folder is attached, an additional clearance to work folder is to be used as a receptacle.

The words 'CTW *Receptacle*' must be clearly printed across each additional clearance to work folder. The location of the original clearance to work folder must also be printed on the receptacle folder. Only the original clearance to work folder is completed in detail by the Operator.

5.9.6 Completing the Clearance to Work Folder

The operator issuing the clearance to work completes the details on the clearance to work folder as follows.



CLEARANCE TO WORK FOLDER

Issued in accordance with Disconnection Instruction N° **1** Due for cancellation: Time **2** hrs Date

1. PURPOSE: This Clearance to Work allows work to be carried out on or near the following mains and apparatus:

3

2. ISSUE: The following precautions to ensure safety have been taken:

a) Isolation Points

4

b) Low Voltage Shorts applied at:

5

c) Additional precautions/warnings

6

Phase Rotation **7**

Clearance to Work Folder affixed at: **8**

Clearance to Work Issued				Clearance to Work Number	Checked and Cancelled Clearance to Work		
TO	BY	TIME	DATE		BY	TIME	DATE
9							

Figure 55 - Details required for the clearance to work folder

Issuing the Folder

- 1 Write in the Disconnection Instruction Number. If you are given the instruction verbally, then write 'verbal' on the permit.
- 2 Write in the proposed time and date when the clearance to work is due for cancellation.
- 3 Write in a description and location of the mains and apparatus covered by the clearance to work.
- 4 Write in details of any isolation points (write Nil if none exist)
- 5 Write in details of any LV shorts that have been applied (write Nil if none applied)
- 6 Write in any additional precautions taken; any warnings about live mains and apparatus in close proximity; specify any restrictions on where work can be done or precautions that must be taken by the recipient.
- 7 Check the phase rotation and write in the result (if applicable).
- 8 Write in the location of where the folder will be affixed.
- 9 Write in the 'Clearance to Work Issued' column:
 - a) the name of the clearance to work recipient
 - b) your signature
 - c) the time and date.

Record details of any unusual conditions on the back of the clearance to work folder (see Figure 56).

WARNING

EQUIPMENT GOVERNED BY CLEARANCE TO WORK

NUMBER OF LV SHORTS APPLIED (If none applied write 'nil')

LOCATION OF LV SHORTS

No.	Location of LV Shorts	Applied by	Removed by	Unusual conditions for information of operators reconnecting
1				
2				
3				
4				

Figure 56 - Details of LV shorts any unusual conditions

Recovering the Folder

Before placing into service the mains and apparatus covered by the related clearance to work, check the following:

- that all the issued clearance to work forms are returned
- the 'Sign Off' signatures are complete

- the clearance to work recipient has cancelled the related clearance to work.

Sign your name and write in the time and date when you cancelled the clearance(s) to work in the 'Checked and Cancelled Clearance to Work' column (see Figure 57).

Clearance to Work Number	Checked and Cancelled Clearance to Work		
	BY	TIME	DATE

A.201

Figure 57 - Checked and cancelled clearance to work section

Check for details of any unusual operating conditions on the back of the clearance to work folder.

Place all the relevant clearance to work forms and all operating papers in the clearance to work folder and return it to the Head of Operating, Installations, and Emergency Response.

6 Working on the Network

6.1 Working Safely on or near the Ausgrid Network

This section describes the basic safety principles for work on or near the Ausgrid network.



Injury or death may result if you do not take the necessary precautions when working on or near exposed mains and apparatus.

6.1.1 Work Health and Safety

The safety and well-being of all workers depends on following safe systems of work. Refer to the relevant sections in the Work Health and Safety Act 2011.

All employers and workers involved with work on or near the Ausgrid network are required to manage the risks and hazards in accordance with their organisation's applicable safe system of work and in accordance with WHS risk management principles.

In managing risks to health and safety arising from work on or near the Ausgrid network, risks and hazards are required to be eliminated so far as is reasonably practicable. If it is not reasonably practicable to eliminate risks to health and safety, those risks must be minimised so far as is reasonably practicable through the application of the hierarchy of control measures.

6.1.2 Risk Assessment

Before commencing any work covered by these Rules, a written risk assessment must be completed.

The risk assessment must consider the electrical hazards involved in the work and the hazard controls required by these Rules.

All persons involved in the work must be involved in the risk assessment.

If you are in doubt about the safe performance of any work assigned to you, you must stop and request further information from the person in charge of the job.

Ausgrid employees must refer to the risk management requirements in the Ausgrid Health and Safety Management System.

6.1.3 Materials

You must treat all clothing, tools and materials (including liquids, gases and flames) as conductors of electricity unless they are approved for work within minimum safe working distances.

6.1.4 Incident Reporting

If you work on or near electrical mains and apparatus, you must observe these Rules and co-operate in preventing accidents by:

- reporting any dangerous practices to the person responsible for the work
- informing co-workers where they fail to follow any of these Rules and reporting the incident as per Ausgrid incident reporting process.

6.1.5 Fit for Work

Workers must not undertake work on or near the Ausgrid network if suffering physical or mental impairment (e.g. through personal trauma, lack of rest, illness, injury, or use of alcohol or drugs).

6.1.6 Maintaining a Safe Distance from Live Exposed Conductors

You must maintain a safe distance between you and any exposed live conductors, unless you are working to an approved live work procedure.

These Minimum Safe Working Distances are detailed in Chapter 7.

Safe working distances apply to any part of your body or any material you are wearing, carrying or touching which is not designed for safe use on live conductors.

6.1.7 Working Safely on or near Low Voltage

You must be authorised to work on or near exposed LV mains and apparatus.

You must treat all exposed LV mains and apparatus as live until they are:

- Isolated from all sources of supply and proved de-energised; or
- LV network distributors are isolated from network sources of supply, proved de-energised and shorted in accordance with Clause 9.2.3.

Refer to Clause 9.1.1 for the requirements for work on or near exposed LV mains and apparatus.

6.1.8 Working Safely on or near High Voltage

You must be authorised to work on or near exposed HV mains and apparatus.

You must treat all exposed HV mains and apparatus as live until they are isolated, proved de-energised, earthed and short-circuited (by approved means), and you have signed onto an access permit covering those mains and apparatus.

Refer to Clause 9.1.3 for the requirements for work on or near exposed HV mains and apparatus.

6.1.9 Electric and Magnetic Fields

Electric and magnetic fields (EMF) are present near energised electrical mains and apparatus.

Refer to Clause 8.4.7 for information on areas where electric and magnetic fields exceed recommended occupational levels.

Refer to the Ausgrid Network Standard NS174C – Environmental Handbook, for information on EMF and specific advice for workers who are pregnant or those who have medical implants.

Ausgrid employees who have medical implants must also refer to the Ausgrid Health and Safety Management System.

6.1.10 Hazardous Materials

Persons working on or near the Ausgrid network may encounter various hazardous materials and emissions.

Refer to the Ausgrid Network Standard NS174C – Environmental Handbook, for information on these materials and the controls required for working with them.

6.2 PPE, Tools and Equipment

This section describes the use of personal protective equipment (PPE). It also details the tools for testing and other work-related activities.

6.2.1 Checking Safety and Operating Equipment

You must check all safety and operating equipment before you use it to make sure that it is:

- correct for its intended application; and
- in good working order; and
- free from defects.

Periodically inspect and test the equipment as specified in the Industry Safety Steering Committee - Guide to electrical workers' safety equipment (ISSC 14). If a specific inspection/test is not stated in ISSC 14, the person responsible for the workgroup must examine the equipment at least once every six months.

If you find any equipment that is not in good condition, you must label it and withdraw it from service immediately. Replace withdrawn equipment with equipment in good condition before work begins.

Some items of safety and operating equipment that are electrically inspected, tested, or calibrated periodically have a sticker or label which indicates when the item must be retested or rechecked. Do not use any equipment where the sticker or label is missing, or the item is overdue for re-testing.

6.2.2 Personal Protective Equipment (PPE)

You must wear protective clothing and other PPE which provides appropriate protection to the head, eyes, body, arms, hands, legs, and feet when you work on or near exposed conductors. (See the "National

guideline to the selection, use and maintenance of personal protective equipment for electrical arc hazards” ENA NENS 09-2014.

Note: Exposed metal jewellery and other adornments (such as bracelets, rings, neck chains, watches, clothing with metal threads or metal components, or other conductive items) must not be worn when working on or near live exposed mains and apparatus.

6.2.3 Protective Clothing

Base Garments

Full length arc rated clothing (i.e. base garments providing coverage from neck, to wrist, to ankle - e.g. shirt & trousers or coveralls) with a minimum Arc Thermal Performance Value (ATPV) of 4 cal/cm² is required for the following situations:

- All work on, near, or in the vicinity of the Ausgrid Network (i.e. all work within the Minimum Safe Work Distance of an Ordinary Person from mains and apparatus);
- Entry to substations;
- Entry to areas where there are live exposed conductors;
- Entry to underground cable pits.

The requirement for arc rated clothing for entry to substations and areas where there are live exposed conductors applies to both workers and visitors.

Note: The labelling on some protective clothing and other items of PPE may provide the PPE category, formerly known as hazard risk category (HRC), rather than the ATPV. The minimum ATPV relating to the categories is as follows:

Category 1 = 4cal/cm² Category 2 = 8cal/cm² Category 3 = 25cal/cm² Category 4 = 40cal/cm²

Undergarments

Undergarments, if worn, must contain no more than 10% flammable synthetic materials.

Outer Garments

Outer thermal garments must, as a minimum, be either made of wool, or be Flame Resistant to ISO 14116 (or equivalent).

Rainwear

Rainwear must, as a minimum, be Flame Resistant to ISO 14116 (or equivalent).

High Visibility Vests

High visibility vests must, as a minimum, be Flame Resistance to ISO 14116 (or equivalent).



Figure 58 - Typical Ausgrid clothing and PPE

6.2.4 Eye Protection

Eye protection, complying with Australian Standard AS 1337 must be worn when working on or near live low voltage (LV) mains and apparatus.

If glasses with metal frames are worn, they should be covered by protective over-glasses.

6.2.5 Footwear

General

For visitors entering substations or areas with live exposed conductors, covered, flat-soled footwear is required as a minimum. Safety footwear may be required, depending on the risk assessment.

Electrically non-conductive safety footwear complying with AS/NZS 2210.1 is required for all work on or near the Ausgrid network. Uppers must not consist of woven nylons or other synthetics.

Gumboots

Where gumboots are required by these Rules, they must be:

- safety gumboots;
- made of rubber or PVC;
- in good condition; and
- compliant with either:
 - Australian Standard AS/NZS 2210 “Electrically non-conductive” (Marked with the symbol “I”); or
 - ASTM F2413 “Electrical Hazard Resistant” (marked with the symbol EH).

6.2.6 Safety Helmets

Where required by these Rules, safety helmets (hard hats) must comply with Australian Standard AS/NZS 1801 “Occupational protective helmets”.

Apart from the specific situations required by these Rules, safety helmets must also be worn when working in any situation where the risk assessment, signage, regulations, or the person in charge identifies that safety helmets should be worn.

When in doubt, consult the safe work method statement (SWMS) and your supervisor.

6.2.7 Gloves

Low Voltage Insulating Gloves

Where required by these Rules, Low Voltage insulating gloves must comply with one of the following standards.

- AS 2225 (*superseded*) - ‘650 Volts Working’ voltage rating.
- AS 60903 – Class 00 or Class 0
- IEC 60903 – Class 00 or Class 0
- EN 60903 – Class 00 or Class 0
- ASTM D120 – Class 00 or Class 0

Other types of gloves (e.g. leather or cotton) are not insulating and must not be relied on for insulating purposes.

Where these Rules require a worker to wear insulating gloves, the worker must wear an insulating glove on each hand.

Except for rescue situations, protective outer gloves are required to be worn over insulating gloves at all times.

Inspect and air-test insulating gloves before each use (see Clause 6.2.1). Store insulating gloves as specified in the relevant standard to which they comply.

Rescue Kit Insulating Gloves

Rescue kit insulating gloves must comply with one of the standards listed above and must be rated at 1000V or Class 0. (Insulating gloves rated at 650V or Class 00 must not be used in rescue kits).

Rescue kit insulating gloves must only be used for rescue purposes.

Protective outers are not mandatory for use with rescue kit insulating gloves used in a rescue situation.

If rescue kit insulating gloves are used, they must be either electrically re-tested prior to reinstatement or discarded.

Protective Outer Gloves

When wearing insulating gloves, you must wear leather protective outer gloves over the insulating gloves. Protective outer gloves are manufactured from leather and provide mechanical and arc protection for the insulating glove. They do not provide protection against electric shock.

Exemptions:

- Protective outer gloves are not mandatory for use with rescue kit insulating gloves used in a rescue situation.
- Oil resistant PVC gloves may be used as protective outer gloves over insulating gloves for work on tail-ended transformer link boxes where transferred earth potentials may be present. (The PVC gloves must be suitable for use with mineral oil, double dipped, and no greater than 300mm in length).

Cotton Inner Gloves

Cotton inner gloves may be worn under insulating gloves to absorb perspiration. Inner gloves also provide an additional thermal barrier in the event of exposure to an arc.

6.2.8 Hats and headwear

Any hat or headwear that is worn by workers:

- During any work on, near, or in the vicinity of exposed mains and apparatus;
- Within a substation or other area where there are exposed conductors; or
- Within a cable pit.

Must not:

- Comprise more than 10% flammable synthetic materials; and
- Contain any exposed metal eyelets or other fully exposed conductive components.

6.2.9 First-Aid Kits

Provide portable first-aid kits to treat minor injuries. Carry a first-aid kit on all vehicles and tool trailers and make sure that there is a kit on every worksite. Replace any used or expired items as soon as possible. Inspect all first aid kits every six months to ensure the following:

- the contents match the contents list (to confirm the kit is complete)
- the items have not passed their expiry date
- the container and first-aid markings are not damaged.

Store kits held at a depot in a dry place away from sources of heat, dirt, oil, fumes or corrosives.

Stow kits in vehicles where they are readily accessible but restrained to prevent them getting loose.

Kits must be designed to comply with the NSW Work Health and Safety Regulation 2011 and are described in detail in ISSC 14.

6.2.10 Emergency Rescue Kits

Emergency rescue kits are designed to assist in the rescue of workers from poles, towers, EWPs, confined spaces, and other situations that involve mains and apparatus (see Table 16 for where kits are located).

Rescue Kits must meet the requirements of ISSC 14).

Table 16 – Location of emergency rescue kits

Activity Requiring an Emergency Kit	Location
When working at heights in a harness	Pole top - Ensure it is easily accessible, (i.e. at the foot of every pole from which a person is working aloft. A pole top emergency kit is also used for awning work.
	Tower - Ensure it is easily accessible at each tower on which a person is working.
	EWP - Controlled Descent Device(s) located on the basket
	Transformer - Locate behind the base of the ladder.
Confined spaces	As required by the WHS Regulations, Australian Standard AS2865, and the SafeWork Australia Code of Practice. Ausgrid employees must refer to the Ausgrid Health and Safety Management System.
Live exposed LV	Required when a person is working on or near live exposed LV mains and apparatus, while being observed by a safety observer The kit must be: - easily accessible to the safety observer; and - located outside the MSWD from live exposed conductors.



Figure 59 - Pole top rescue kit showing box and contents



Figure 60 - Low voltage rescue kit showing contents

6.2.11 High Voltage Detectors

Use HV detectors (e.g. Modieworks and phasing indicators) to prove that HV conductors are de-energised or for phasing HV conductors. Fit the detectors onto operating sticks or rods (where required) and only use within the limits of the voltage ratings marked on them by the manufacturer.

Test detectors immediately before and after use.

Note: HV detectors designed to detect alternating current will not detect direct current or static charges.

6.2.12 Low Voltage Detectors

Rating

All contact type instruments used on live LV exposed mains and apparatus must be rated at Category IV 600V or Category III 1000V.

Confirming voltage

Only the following LV detectors may be used for confirming phase-to-phase or phase-to-neutral/earth voltages:

- test lamps; or
- dual probe, contact type volt meters/testers/indicators

Proving de-energised

Only the following LV detectors may be used to prove exposed LV conductors (which are normally live or intended to become live) are de-energised:

- test lamps;
- dual probe, contact type volt meters/testers/indicators; or
- in situations where the contact type detectors listed above are not reasonably practicable, authorised operators may use Modiewark non-contact voltage detectors to prove LV mains and apparatus are de-energised.

Other LV detectors, such as non-contact voltage detectors (proximity testers) or single probe contact type voltage detectors (e.g. the LV-5 detector), may be used to indicate the presence of AC voltage on exposed metalwork in accordance with Section 10.1 - Safe-to-touch Testing of Network Assets, but they must not be used to prove exposed LV conductors (which are normally live or intended to become live) are de-energised.

Ausgrid employees must refer to Technical Guide T0032 – Safety Equipment – Care, Use and Inspection – Low Voltage Instruments, for information on approved LV detectors.

6.2.13 Low Voltage Screens

An LV screen is a barrier of approved non-conductive material which is fitted over live exposed LV mains and apparatus to prevent inadvertent contact.

If an LV screen is installed that meets the following requirements, then the LV mains and apparatus are no longer considered as “exposed”.

The LV screen must:

- Be constructed of approved rigid* non-conductive material (polycarbonate or acrylic); and
- Achieve the requirements of Australian Standard AS 60529 ingress protection rating IP2X (not have any holes or gaps with a diameter of 12mm or greater); and
- Not be in contact with exposed LV mains and apparatus (unless approved); and
- Be fixed in position by means that prevent it being inadvertently dislodged.

*A barrier of flexible insulating material complying with the requirements of Australian Standard AS4202 Class II, or IEC 61112, may be used as a screen for exposed 110V ac conductors on substation panels.

Only authorised persons can erect and remove LV screens and they must follow approved procedures.

LV screens intended for permanent installation must be approved by Ausgrid – Asset Management – Engineering.

LV screens intended for temporary installation must have a substation screening identification tag attached, as required by Clause 8.4.9.

Before starting work, you must inspect the screens to ensure that they are not dislodged or damaged. In particular, establish that the work will not make any screen ineffective (e.g. by removing a phase barrier, screen panel or making a hole in a screen—see Figure 61). If you doubt the effectiveness of a screen, refer the matter to the person in charge of the work.

Ensure there is no interference with erected screens and that materials or goods are not stacked against them. Wires, rods, conduits or similar objects must not penetrate between the screens or into a screened zone.

During erection of the screens in a substation, consider worker pathways between where the work is carried out and other parts of the substation.



Figure 61 - A screen over exposed LV apparatus in a substation.

6.2.14 Low Voltage Temporary Insulation and Insulating Mats

Temporary Insulation

LV temporary insulating covers (temporary insulation) are used for work on or near live LV exposed mains and apparatus. See Section 9.5 for information regarding the use of temporary insulation for work on or near live exposed LV conductors.

Where LV temporary insulation is required by these Rules, the insulating covers must comply with one of the following standards (unless otherwise approved by Ausgrid):

- Australian Standard AS 4202 – Insulating Covers for Electrical Purposes;
- IEC 61112 – Live Working – Electrical Insulating Blankets;
- IEC 61229 – Rigid Protective Covers for Live Working on a.c. Installations;
- IEC 61479 – Live Working – Flexible Conductor Covers (Line Hoses) of Insulating Material.

Insulating Mats

Insulating mats are used to insulate workers at ground level from earth potential, for work on or near live exposed LV mains and apparatus. (See Clause 9.5.4 for information regarding the use of insulating mats for work on or near live exposed LV conductors).

Where insulating mats are required by these Rules, they must comply with either Australian Standard AS/NZS 2978 – Insulating Mats for Electrical Purposes (superseded), or Australian Standard AS/NZS 61111 – Live Working - Electrical Insulating Mats (Class 0).



Figure 62 - LV temporary insulation and an insulating mat at a kiosk substation

6.2.15 Earthed Screens

An earthed screen is barrier of earthed conductive material, which is designed to prevent access to live exposed HV conductors.

Earthed screens must be specifically designed for the apparatus and must only be installed by Class 1 Operators, to an approved procedure.



Figure 63 – An earthed screen for Hazemeyer switchgear



Figure 64 – An earthed screen in place covering live feeder spouts (note the busbar is earthed)

6.2.16 Low Voltage Tools

Insulated Tools

An insulated tool is a tool which is:

- Appropriately rated for the voltage of the exposed mains and apparatus on which it is to be used; and
- Allows the user to maintain the relevant Minimum Safe Work Distance during use.

Insulated tools must be periodically retested in accordance with ISSC14.

Insulated tools may only be used on live exposed LV mains and apparatus by authorised persons who have been trained in their use and are working to an approved procedure.

Covered Tools

Tools covered with insulating material which do not achieve the requirements for insulated tools (above) must be regarded as covered tools. Live work controls must be in place for their use on live mains and apparatus.

Covered tools are used for live LV work as one of the controls to manage the risk of creating an arc between conductors.



Figure 65 – Examples of covered tools.

Low Voltage Portable Electrical Tools and Equipment

Regularly test LV portable electrical tools and equipment. Ensure the tools and equipment are maintained and the leads are in good order. Refer to Australian/New Zealand Standard AS/NZS 3760:2010 – In-service Safety Inspection and Testing of Electrical Equipment, and AS/NZS 3012:2010 – Electrical Installations - Construction and Demolition Sites, for full details of the requirements for inspection and testing. Ensure the tools and equipment are tested and tagged. The tag must show the test date.



Figure 66 – Tested tag on LV portable electrical tool protected by an RCD

Tool Containers

Tool containers for use on live low voltage mains and apparatus should provide a secure, non-conductive method to store and carry tools.

6.2.17 Protecting Handheld and Portable Equipment with Residual Current Devices

When using handheld and portable electrical tools and equipment, comply with the WorkCover NSW Code of Practice - Electrical Practices for Construction Work except for specific work as documented in an Ausgrid controlled procedure (e.g. process control plan).

Use an RCD with a rated tripping current not exceeding 30mA to protect all handheld and portable equipment. This RCD protection can be provided by either:

- RCDs installed as part of the fixed wiring of an installation (protecting socket outlets)
- approved portable power boards fitted with RCDs.

If you do not know that RCDs are installed as part of the fixed wiring of an installation, you must use approved portable power boards fitted with RCDs.

The use of RCDs does not eliminate the need for other required safety procedures relating to the use, maintenance and storage of handheld and portable equipment.

6.2.18 Earthing and Short-Circuiting Equipment

High Voltage

Isolated HV mains and apparatus must be earthed and short-circuited to protect workers from induced voltages or unintentional re-energisation of the mains and apparatus.

Earthing and short-circuiting equipment is designed to carry short-circuit current between phases and to earth, limiting the rise in voltage and causing protection equipment to operate.

Earthing and short-circuiting of isolated HV mains and apparatus may be achieved by either the closing of earth switches on apparatus, or the application of portable earthing and short-circuiting equipment (HV earths).

Portable HV earths must be marked with the rated current and time (as shown below in Table 17) and must only be used on apparatus within these limits.

Portable HV earths must be marked with the next inspection and test due dates (see Table 17) and must only be used within these dates.

Low Voltage

LV short circuiting equipment (**LV shorts**) are designed to protect workers against the risk of shock from inadvertent back-feed from distributed energy resources of up to 10kW per phase, by limiting the rise in voltage.

LV shorts must comply with Network Standard NS223 – Low Voltage Short-Circuiting for De-energised Work.

LV shorts must be marked with the next inspection and test due dates (see Table 17) and must only be used within these dates.

Note: LV shorts are not designed to protect against a network distributor being energised from a network source of supply. LV shorts must not be used as HV earths.

Inspection and Test Labels

The following labels must be applied to portable HV earths and LV shorts.

Table 17 – Rating, inspection, and test labels

Label	Example
Rating Provides details of the portable earthing and shorting equipment rating.	Location: Rated Current (kA): Rated Time (Seconds):  PA10 90
Due for inspection The due for inspection date must be six months from the date of the last inspection	
Due for re-test The due for re-test date must be three years from date of the last test.	

6.2.19 HV Insulated Tools - Operating and Height Measuring Sticks

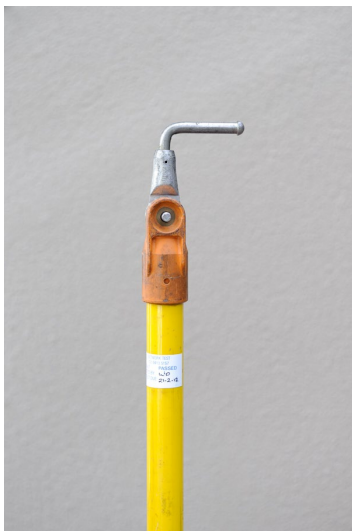


Figure 67 - Operating stick with link attachment

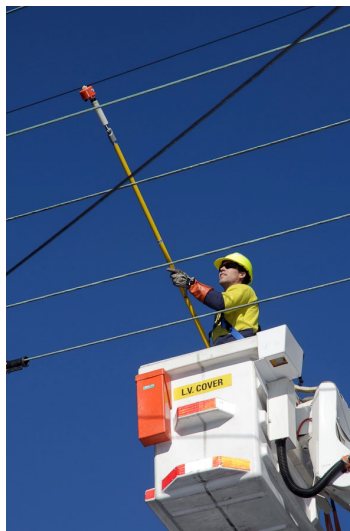


Figure 68 - Using an operating stick with an approved voltage detector to prove HV overhead lines are de-energised.

Operating Sticks

Operating sticks are HV insulated tools.

They are used for carrying out operating work on exposed mains and apparatus (e.g. operating links and fuses, proving mains are de-energised with a voltage detector, attaching earthing and short-circuiting equipment).

Operating sticks and height measuring sticks may only be used on live exposed HV mains and apparatus by authorised persons who have been trained in their use.

Telescopic operating sticks must have a foam filled top section. Only this foam filled section is rated for HV. The remaining hollow fibreglass sections are rated only for LV. Authorised persons using telescopic operating sticks must not allow sections that are rated for LV only, to come within the MSWD of live exposed HV conductors.

Height Measuring Sticks

Height measuring sticks are HV insulated tools.

They are used to measure the height of overhead conductors.

Height measuring sticks may only be used on live exposed HV mains and apparatus by authorised persons who have been trained in their use.

Telescopic height measuring sticks must have a foam filled top section. Only this foam filled section is rated for HV. The remaining hollow fibreglass sections are rated only for LV. Authorised persons using telescopic height measuring sticks must not allow sections that are rated for LV only, to come within the MSWD of live exposed HV conductors.

General

Operating sticks, and height measuring sticks must only be used on or near live exposed HV mains and apparatus at a voltage equal to or less than the voltage rating of the stick.

They must be electrically tested at least every 12 months.

They must be marked with the following:

- Rated voltage
- Date tested – or next test due date
- Name of the approved testing authority (if not tested by Ausgrid).

(Refer to Distribution Guideline DG230 – Interim Labelling Guideline for Live Line, Operating and Measuring Sticks)

Authorised persons using insulated operating sticks and height measuring sticks must inspect the sticks prior to each use to confirm they are free from defects and are within test date. They must not be used if the test date is missing, cannot be read, or the retest date has passed.



Figure 69 – An example of a test sticker for HV insulated tools

6.2.20 HV Insulated Tools - Vegetation Control

HV insulated tools used for vegetation control must be designed to withstand contact with HV mains and apparatus. (Examples of these insulated tools include hydraulic cutting saws, pruning tools and their attachments). These tools must only be used near in-service mains and apparatus which are energised at a voltage equal to or less than the voltage rating marked.

Clean and examine HV insulated tools before use and as required during use. Test at least every six months (refer to ISSC14). Label accordingly, including the date of test and name of the approved testing authority.



Figure 70 – A vegetation control worker a HV insulated hydraulic cutting saw

6.2.21 Cable Identification Equipment

Prior to remotely cutting an underground cable, authorised workers must positively identify the underground cables to be worked on at the worksite.

See the following sections for cable identification methods

Cable Voltage	Clause	Table
Low Voltage	Clause 9.3.1	Table 31
High Voltage	Clause 9.9.3	Table 33
Sub-transmission	Clause 9.9.5	Table 34

Where cables are to be identified by electrical or signal generation and detection methods, workers must use only approved equipment compliant with the Ausgrid Technical Guide T0003 – Cable Identification and Phasing.



Figure 71 - Live LV cable identification equipment



Figure 72 - Cable identification generator and receiver

6.2.22 Remote Cable Cutting Equipment

Remote cable cutting equipment must be used to prove insulated underground cables are de-energised at the location of the proposed work.

Workers must not use handheld cable cutters or stabbers to prove cables are de-energised.



Figure 73 – Remote cable cutting equipment

Remote cable cutting equipment must comply with the Ausgrid Technical Guide T0031 – Remote Cable Cutting Equipment.

6.2.23 Fall Protection

Where work on or near Ausgrid mains and apparatus presents a risk of falls from heights, the risks must be managed in accordance with the Industry Safety Steering Committee - Guide for height safety within the NSW electricity industry (ISSC 34).

Ausgrid employees must refer to the fall protection requirements in the Ausgrid Health and Safety Management System.



Figure 74 - Approved fall-arrest harness

6.2.24 Using Appropriate Ladders

The following table provides guidance for use of ladders.

Table 18 - Ladder usage

Ladder Type	Use or Comment
Non-conductive portable ladder (e.g. fibreglass or timber)	Work on or near live electrical mains and apparatus.
Non-conductive portable ladder (e.g. fibreglass or timber)—may have metallic components such as brackets, rungs or platforms	Metallic components (and any carried metallic components) must not be closer than the MSWD to exposed live mains and apparatus.
Conductive portable ladders (including ladders made with wire-reinforced stiles)	Must not be used in substations. Must not be used closer than the MSWD to exposed live mains and apparatus. Must not be used to ascend poles. Exception: May be used to access steel towers and sub-transmission mains with an approved SWMS - e.g. hook ladders).

6.2.25 Portable Pole Platforms

Portable pole platforms provide a work platform for overhead line work and must comply with ISSC 14. Use only approved pole platforms appropriate for that particular type of pole (e.g. wood, concrete, steel or composite fibre poles) and the type of work.

Do not use pole platforms on steel or concrete street lighting columns as they are not designed to be climbed.

6.2.26 Gas Detection and Monitoring Equipment

Check and monitor the atmosphere before entering or occupying a confined space using gas detection and monitoring equipment. The procedure must comply with the Work Health and Safety Regulation 2011 and Australian Standard - Confined spaces (AS 2865-2009).

Test the atmosphere for oxygen deficiency or excess, and for hazardous gases. Portable gas detectors are available for this purpose.

6.2.27 Temporary Supply Points for Tools and Equipment

Workers must use only approved temporary connection devices to provide LV supply for powered tools and equipment.

Any connection of approved devices must be made by electrically qualified persons using an approved procedure.

7 Minimum Safe Working Distances

7.1 Minimum Safe Working Distances for Workers

This section describes the Minimum Safe Working Distance(s) (**MSWD**) for work involving live exposed conductors.

7.1.1 Scope

These **MSWD** apply for all work carried out under the NSW Electricity Supply (Safety and Network Management) Regulation, relating to the construction, maintenance, and operation of the Ausgrid network.

These **MSWD** do not apply to work carried out by external parties, in the vicinity of the Ausgrid network, for other purposes (see Clause 7.1.6 below for further information).

7.1.2 Overview of Minimum Safe Working Distances

A **MSWD** is the closest distance that you (or any part of your body, tools or other moveable equipment you are touching) can approach live exposed conductors, unless you are:

- working under the conditions for reduced **MSWD** (see Section 7.2); or
- authorised to work on or near live exposed conductors and working to an approved live work procedure (see the HVLW Manual for HV or Section 9.5 for LV).

The **MSWD** are dependent on the nominal voltage and whether you are an ordinary person, instructed person or authorised person (see Clause 7.1.3 for worker classifications).

The **MSWD** are shown in Table 19.

Notes:

- Chapter 9 describes the requirements if there is a reasonably probability your body, tools or other moveable equipment you are touching will come closer to live exposed conductors than the **MSWD**.
- When necessary, erect a suitable screen or barrier to maintain **MSWD** from live exposed conductors. Where appropriate, obtain an access permit and ensure **MSWD** are observed when erecting or removing the screen or barrier.

7.1.3 Worker Classifications

MSWD depend on the personnel classification. These include:

- ordinary person
- instructed person
- authorised person.

Ordinary Person

Refer to Chapter 16 - Glossary – Personnel for the definition of an ordinary person.

Instructed Person

Refer to Chapter 16 - Glossary – Personnel for the definition of an instructed person.

As required by Clause 3.1.1, an instructed person must be directly supervised by an authorised person.

Authorised Person

Refer to Chapter 16 - Glossary – Personnel for the definition of an authorised person.

Refer to Clause 3.1.1, for the requirements to be an authorised person for work, on, near, or in the vicinity, of mains and apparatus.

7.1.4 Categories of Distances

The following categories of **MSWD** are included in this section:

- Safe working distances for persons
 - **MSWD** (Table 19)

- Situations where there are reduced MSWD (refer to Section 7.2)
- Absolute limit of approach (Table 20)
- Clearances for mobile plant and loads (Table 22)
- Clearances to scaffolding (Table 25 and Table 26)
- Clearances for street lighting (Table 27)
- Also included in this section are minimum fixed clearances. These are the minimum clearances that must be achieved by points of isolation (other than commercially manufactured switchgear which complies with national or international standards).

7.1.5 Minimum Safe Working Distance to Live Exposed Conductors

Table 19 provides the MSWD for ordinary, instructed, and authorised persons. The remaining tables in this section describe various circumstances where these distances will vary. For example, the distances when using cranes, plant and attached loads to live electrical apparatus (refer to Table 22).

Tools or objects that are specifically designed for testing, operating, or working on live exposed conductors may be brought within the MSWD, provided the tools or objects meet any relevant test specifications.

Table 19 - Summary of MSWD for ordinary persons, instructed persons, and authorised persons.

Nominal Voltage (V)		Ordinary Persons (m)	Instructed Persons (m)	Authorised Persons (m)
More than	Up to and including			
Direct current (dc) – nominal voltage (V)				
0	60	No mandatory controls required to manage the risk of electric shock		
60	120	No contact allowed	Insulated* contact only	Insulated* contact only
120	1500	3.0	0.5	0.5
Alternating current (ac) – nominal voltage (V)				
0	25	No mandatory controls required to manage the risk of electric shock		
25	50	No contact allowed	Insulated* contact only	Insulated* contact only
50	1000	3.0	0.5	0.5
Alternating current (ac) - nominal Voltage (kV)				
1	11	3.0	0.7	0.7
11	22	3.0	0.7	0.7
22	33	3.0	1.0	1.0
33	66	3.0	1.0	1.0
66	132	3.0	1.5	1.5
132	220	6.0	2.5	2.5
220	330	6.0	3.0	3.0
330	-	8.0	4.0	4.0
*Tools covered with insulating material that is visually assessed as being in good condition are sufficient to meet the requirement for insulated contact with extra low voltage (ELV) conductors.				

Increased MSWD

Some categories of work will require clearances greater than those in this table. Examples include vegetation management (Refer to Section 10.5) and the use of cranes and mobile plant near overhead mains (Refer to Section 7.5)

Reduced MSWD

Some categories of work permit authorised persons to work to reduced MSWD. Refer to Section 7.2 for details.

Precautions when working near LV

If you are working on or near an earthed neutral conductor and it is known that there is also a live exposed LV conductor less than 0.5m away, you must treat the earthed neutral conductor as live. (Refer to Section 9.5 for live low voltage controls).

Precautions for Work in Outdoor Substations (Switchyard)

- Portable metal or wooden ladders with wire reinforcements must not be used in substations.
- When carrying long objects use two people and always carry below shoulder level. Ladders and step ladders with non-conductive stiles and approved special purpose ladders may be used.
- Umbrellas must not be taken into a switchyard.
- If you are taller than 1.9m you must pay extra attention to clearance distances (design clearances assume a height of 1.9m).

The following precautions apply for authorised persons transiting an outdoor switchyard:

- When transiting a switchyard by walking across or through the switchyard, you must carry only small handheld objects (e.g. clipboard, folder, camera, etc.). These items must be carried below shoulder height.
- The written risk assessment check must consider the prevailing conditions prior to transiting an outdoor switchyard. When developing the risk assessment, the route used for the carriage of materials must be carefully chosen to ensure the MSWD are maintained.
- You may also carry out a visual inspection within the switchyard, provided you remain in contact with the ground and do not use any tools (e.g. tape measures) other than writing implements, a laser height measuring device, or a camera. No object may extend above the top of your head.
- For non-electrical work in substations, refer also to the Ausgrid Network Standard NS 165 - Safety Requirements for Non-Electrical Work in and around Live Substations.

Note: When transiting outdoor 33kV switchyards, the MSWD may be reduced to 0.9m.



Figure 75 – Safe method for carrying long objects in a switchyard.

7.1.6 Work by External Parties in the Vicinity of Ausgrid's Network

External parties carrying out work that is not covered by the NSW Electricity Supply (Safety and Network management) Regulation, in the vicinity of overhead lines, must comply with the WorkCover Code of Practice "Work near overhead power lines" and advice provided by Ausgrid based on the ISSC 32 guide. (Examples of this work include building construction, maintenance & demolition).

External parties carrying out work that is not covered by the NSW Electricity Supply (Safety and Network Management) Regulation, in the vicinity of underground assets, must comply with the WorkCover Guide “Work near underground assets” and the Ausgrid Network Standard NS 156.

7.2 Reduced Minimum Safe Working Distances

This section describes written instructions and operating procedures for reduced MSWD.

7.2.1 Reduced Minimum Safe Working Distances

Operating Procedures

If you are an authorised person, live exposed HV conductors must not be approached closer than the MSWD (see Clause 7.1.5) except as follows:

- You are performing operating work within the scope of your operating authority.
- The work can be done safely, and you have received written instructions (including supplementary explanations) on what to do and any special precautions required (see Clause 7.2.3). Work of this type is restricted to very specific tasks where live mains and apparatus could become exposed during the work (e.g. adjusting spout shutters on indoor switchgear). Refer to Clause 7.3.1 for absolute limits of approach.

Absolute Limit of Approach

Refer to Clause 7.3.1 (Table 20) when inspecting, testing, operating or when fixing isolation screens.

7.2.2 Requirements for Observers

When using reduced MSWD, a safety observer must witness your work practices (except for operating work).

The safety observer must be an electrically qualified authorised person who knows the hazards and appropriate safety controls associated with the work.

The Safety Observer must have Satisfactorily Completed Initial or Annual Refresher Training and Assessment in the Following National Units of Competence:

- provide first aid in an ESI environment (UETDTRRF10).
- release and rescue of a person from live apparatus as appropriate to the work being undertaken e.g. rescuing a person from a pole (UETDTRRF02), Elevating Work Platform (**EWP**) (UETDTRRF03), steel tower (UETDTRRF04), or low voltage panel (UETDTRRF06).
- provide cardiopulmonary resuscitation (HLTAID001)

The safety observer must stay in the vicinity of the worksite to maintain sight of the person carrying out the task.

7.2.3 Written Instruction Work

Written instructions relating to reduced MSWD must be issued with the authority of the Ausgrid Group or Business Unit Manager and must include the network voltage and the minimum clearance.

These instructions may be either standard procedures (e.g. for operating or testing) or specific instructions for an individual job.

7.3 Absolute Limit of Approach

This section describes absolute limit of approach distances.

7.3.1 Applying the Absolute Limit of Approach

An absolute limit of approach distance is the closest an authorised person can come to inspect, test, operate, or to affix insulation or screens, when working according to an approved safe system of work.

Table 20 – Absolute limit of approach distances

Nominal Voltages (kV)		Absolute Limit of Approach (m)
More than	Up to and including	
1	33	0.4
33	66	0.6
66	132	1.2
132	220	1.9
220	330	2.0
330	-	3.2

Exceptions:

- Absolute limits do not apply when carrying out high voltage live work on exposed high voltage conductors in accordance with the Ausgrid HVLW Manual.
- When completing operating work on specially designed equipment (using an insulating operating stick or approved earthing equipment), the absolute limit of approach can be reduced from 0.4m to 0.3m for live exposed conductors up to and including 22kV.

7.4 Fixed Clearances

This section describes minimum fixed clearances for high voltage (HV) work.

7.4.1 Minimum Fixed Clearances for High Voltage Work

Isolated HV mains and apparatus must be separated from live exposed conductors by the minimum fixed clearances detailed in Table 21 – Minimum fixed clearances for high voltage work.

Exception: Minimum fixed clearances do not apply to commercially manufactured switchgear which complies with national or international standards.

Table 21 – Minimum fixed clearances for high voltage work

Nominal Voltages (kV)		Minimum Fixed Clearance (m)
More than	Up to and including	
1	11	0.16*
11	33	0.32
33	66	0.63
66	132	1.1

*For voltages up to and including 11kV, increase the clearance (0.32m is recommended) if there is a risk of birds or rodents bridging the gap.

Note: Minimum fixed clearances are not for construction design purposes. Refer to the relevant Network Standards for construction design clearances.

7.5 Mobile Plant

This section describes the minimum approach distances for mobile plant from live exposed mains and apparatus, and the controls required.

7.5.1 Scope

The approach distances and controls in this section apply for all work relating to the construction, maintenance, and operation of the Ausgrid network.

Notes:

- Mobile plant includes cranes, hoists, borer/erectors, EWPs and associated loads.
- The distances in this section do not apply to external parties who are working under the WorkCover Code of Practice “Work near overhead power lines”, or the SafeWork Guide “Work near underground assets”.

7.5.2 Training and Authorisation

General

Persons operating mobile plant must hold any relevant high-risk work licences required for the mobile plant involved.

Ordinary Persons

If either the mobile plant operator or the observer:

- do not hold the national unit of competence UETDREL005, UETDREL006, or equivalent; or
- have not completed the former 3166 exemption, 5099 exemption, or ISSC26 mobile plant training; or
- have not completed the Ausgrid training course - Crane and Plant Electrical Safety.

The approach distances for ordinary persons in Table 22 column B apply.

Instructed Persons

If the mobile plant operator and/or the observer:

- currently hold the national unit of competence UETDREL005, UETDREL006, or equivalent; or
- have completed the former 3166 exemption, 5099 exemption, or ISSC26 mobile plant training; or
- have completed the Ausgrid training course - Crane and Plant Electrical Safety; and
- have not completed training in these Rules

The approach distances for instructed persons in Table 22 column C apply.

Authorised Persons

If both the mobile plant operator and the observer:

- currently hold the national unit of competence UETDREL005, UETDREL006, or equivalent; or
- have completed the former 3166 exemption, 5099 exemption, or ISSC26 mobile plant training; or
- have completed the Ausgrid training course - Crane and Plant Electrical Safety; and
- have completed training and annual assessment in these Rules

The approach distances for authorised persons in Table 22 column D apply.

7.5.3 Minimum Approach Distances

The approach distances in Table 22 apply to mobile plant that is used in conjunction with the controls set out in this section.

Note: Grab cranes, or floating cranes, or their loads, must not approach closer than the distances shown in column B of Table 22

Table 22 - Minimum approach distances of mobile plant and loads to live exposed* conductors

Nominal Voltage (kV)		Minimum Approach Distance (m)			
		Without an Observer	With an Observer		
More than	Up to and including	All Persons (A)	Ordinary Persons (B)	Instructed Persons (C)	Authorised Persons (D)
LV (*exposed or insulated)		3.0	3.0	1.0	0.5 (see notes below)
1	22	3.0	3.0	1.2	0.7
22	66	3.0	3.0	1.4	1.0
66	132	3.0	3.0	1.8	1.5
132	220	6.0	6.0	2.4	2.4
220	330	6.0	6.0	3.7	3.0
Above 330		8.0	8.0	4.6	4.5
Up to 1500V dc		3.0	3.0		1.0

Notes:

- Insulated portions of mobile plant complying with Clause 7.5.11 - Insulation Requirements for Elevating Work Platforms, may come within 0.5m from live exposed LV conductors, but must not be brought into contact with them.
- See Clause 10.2.3 for the requirements for the operation of mobile plant within 500mm of insulated LV overhead conductors.

7.5.4 Safety Observer

Any time mobile plant is operating, and there is a reasonable probability the mobile plant or load will move within the approach distances provided in Column A of Table 22, the mobile plant must be observed by a safety observer.

The safety observer is required to observe the approach of the crane, plant or load to electrical apparatus and to warn the mobile plant operator in sufficient time to ensure the relevant approach distances are maintained.

The safety observer must:

- be trained in accordance with Clause 7.5.2; and
- be able to clearly observe the approach distances; and
- be able to communicate with the mobile plant operator at all times while the mobile plant is operating; and
- be positioned to minimise the risk of exposure to hazards.

The safety observer must not:

- carry out any other duty during the period of observance; or
- observe more than one item of mobile plant at any period of observance; or
- be located on the work basket of an EWP during the period of observance.

Exceptions:

- A safety observer is not mandatory for an item of stationary plant which:
 - is supporting a static load comprising a pole with inadequate strength or footing; and
 - is located outside the distances in Table 22 Column D from live exposed conductors (except where the exposed conductors are low voltage conductors that have been covered by temporary insulating covers that comply with Clause 6.2.14).
- A safety observer is not mandatory where an effective limiting device has been set to prevent any component part of the mobile plant or load approaching closer than the relevant minimum approach distances in Table 22, provided that:
 - the limiting device is effective under stress conditions; and
 - the limiting device is inspected and tested at regular intervals.

7.5.5 Persons in Contact with the Plant or Loads

While the mobile plant is operating within the distances of Column A of Table 22, only persons implementing the controls listed below may be in contact with any part of the mobile plant or load, and the ground or earthed situation.

The Mobile Plant Operator

The mobile plant operator may operate the controls of cranes or plant while standing on the ground, or while in contact with an earthed situation, only if one or more of the following controls are implemented:

- The mobile plant or the controls are effectively insulated in accordance with Clause 7.5.11; or
- The mobile plant operator wears LV insulating gloves or gumboots, and the voltage of any overhead electrical apparatus does not exceed 1000 volts; or
- The mobile plant operator stands on an equipotential metallic mat which is electrically connected to all metalwork associated with the controls.

Authorised Persons

Workers at the worksite, other than the mobile plant operator, may contact the mobile plant or load while standing on the ground, or while in contact with an earthed situation, only under the following conditions:

- The contact is with mobile plant that is insulated in accordance with Clause 7.5.11; or
- The contact is with a load consisting of a timber or composite fibreglass pole; or
- They are holding a non-conductive tag line which is attached to the load to control the movement of the load; or
- The contact is with a load which is suspended by a non-conductive lifting rope, or a conductive lifting rope with a non-conductive section or sling, which is located between the load and the overhead mains; or
- The workers are wearing LV insulating gloves or gumboots.

Ordinary Persons

Where there is a risk of persons, other than those implementing the controls listed above, making contact with the mobile plant and the ground at the same time, an exclusion zone must be established around the plant and/or load.

7.5.6 Stability of the Plant or Load

Appropriate controls must be implemented to prevent conditions such as terrain, weather, or the functional behaviour of the plant, causing the plant or load to come within the approach distances in Table 22. Examples of these controls include, but are not limited to:

- Preparation of the surface on which the mobile plant is required to operate;
- Mechanical limiting devices on the mobile plant; and
- Non-conductive tag lines attached to loads.

7.5.7 Earthing Requirements

Mobile plant (that is not insulated in accordance with Australian Standard AS1418.10) must be earthed as follows:

- **Within electrical stations**

When any mobile plant is operating (not stowed in transit) and there is a reasonable probability the mobile plant or load will come within twice the distances in Table 22 Column A, the plant must be connected to an appropriate point of the substation earth grid by a trailing earth cable which is capable of carrying the prospective earth fault current.

When mobile plant is positioned outside of a substation and operating within a substation, a site-specific earthing study is required.

- **Whenever it is operating within the approach distances of Table 22 Column A**

The mobile plant must be connected to earth by a cable which is capable of carrying the prospective earth fault current. The method of connection to earth is to follow the order of preference below:

1. A permanently installed system earth (excluding energised SWER substation earths);
2. An alternate earth connection such as a pole nail or ground anchor;
3. A temporary driven earth stake;
4. An earthing chain (minimum 16mm steel chain with at least 300mm in contact with the ground surface)

Note: To be used only where there is no permanent earth, and a temporary earth stake cannot be driven due to hard pavement or sealed road surfaces.

Exception: Where a site-specific earthing study mandates alternate controls instead of earthing.

- **For work in the vicinity of overhead sub-transmission mains**

For work on sub-transmission mains and distribution mains that run parallel to sub-transmission mains – the mobile plant must be earthed and/or equipotentially bonded as required by Section 9.11.

- **For work on or near exposed HV conductors**

The mobile plant must be earthed as required by the HVLW Manual.

7.5.8 Inadvertent Contact with Live Exposed Conductors

Step and Touch Potential Risk

If uninsulated mobile plant contacts live overhead conductors -

- A competent person at the site must immediately:
 - Contact the Ausgrid Control Room or Ausgrid Emergency number; and
 - Remain at least 8m from the mobile plant and in a position to keep other persons at least 8m clear of the plant.
- The mobile plant operator should:
 - Remain inside the cabin or on the vehicle (where safe to do so); and
 - Warn all other persons to keep away from the plant and not touch any part of the crane, rope, or load; and
 - Without anyone approaching the mobile plant, operate the plant in such a manner to break contact, where possible;
 - When unable to move the plant clear of the overhead conductors, remain inside the cabin, or on the vehicle, and take no further action until advised that the mains have been isolated, proved de-energised, and earthed/short-circuited as required by these Rules.
 - Only when it is essential to leave the cabin or vehicle because of fire, or some other hazard, jump clear of the vehicle (as far from the vehicle as safely possible) – do not make contact with the vehicle and the ground at the same time. When moving away from the plant, jump, hop, or shuffle, to manage the risk of step potential (see Clause 9.11.4).

If the plant operator is immobilised, the mains must be isolated, proved de-energised, and earthed/short-circuited as required by these Rules, before assistance is given.

Tyre Pyrolysis

If uninsulated plant makes contact with exposed high voltage conductors, the risk of tyre pyrolysis (an explosion of the tyre caused by the combination of hydrocarbons, heating, and pressure increase, resulting from the electrical current through the tyre) must be managed by establishing a suitable exclusion zone.

For work by or for Ausgrid, refer to the Plant and Equipment requirements within the Ausgrid Health and Safety Management System.

7.5.9 Mobile Plant near Live Exposed LV

Mobile plant and loads may come within the distance of Table 22 Column D from live exposed LV conductors only if the mobile plant is used as part of a LV live work procedure in accordance with Clause 9.5.5.

7.5.10 Mobile Plant near Live Exposed HV

Mobile plant and loads may come within the distances of Table 22 Column D from live exposed HV conductors only if the mobile plant is used as part of a HV live work procedure in accordance with the Ausgrid HVLW Manual.

7.5.11 Insulation Requirements for Elevating Work Platforms

If workers are working on or near live exposed mains and apparatus from an EWP, the EWP must be effectively insulated to the relevant system voltage to perform work near live exposed mains and apparatus.

An EWP must be regarded as being insulated only if the work basket is fully insulated to prevent inadvertent exposure to persons on the work basket to a difference of potential between the structural components of the work basket, and the insulation of the elevating work platform complies to Australian Standard 1418.10 – Cranes, Hoists, and Winches: Part 10 – Mobile elevating work platforms.

Testing of the EWP insulation must be carried out in accordance with the requirements of Australian Standard AS1418.10 – Cranes, hoists, and winches. Part 10: Mobile Elevating Work Platforms

A current test certificate indicating that the EWP has passed the necessary routine insulation tests must be readily available at the worksite.

The following information must be recorded:

1. testing organisation name
2. test date
3. EWP 'passed' or 'failed'
4. test equipment number and calibration date.

Note: The test certificate must include items 1 to 4 inclusive. Item 4 may be excluded where the accredited service provider (ASP) demonstrates (to the satisfaction of Ausgrid's authorised representative) that these details are readily available from the ASP's quality system.

7.6 Vehicles

This section provides the minimum approach distances for vehicles (and mobile plant that is stowed for transit) which are driven by persons in the vicinity of overhead mains and apparatus.

7.6.1 Minimum Approach Distances – Overhead Mains and Apparatus

No part of a vehicle in transit may approach live overhead mains and apparatus closer than the distances in Table 23. This includes the load, exhaust pipe, or attachments such as rotating/flashing lights or radio aerials. Refer to Figure 76 below.



Figure 76 – An illustration of the maximum overall height of a vehicle (Image courtesy of SafeWork NSW)

Table 23 - Minimum approach distances for vehicles from live overhead mains and apparatus

Nominal Voltage (kV)		Minimum Approach Distances for Vehicles in Transit – from Live Overhead Mains and Apparatus
More than	Up to and including	
LV		0.6
1	33	0.9
33	66	1.5
66	132	2.1
132	220	2.9
220	330	3.4
330	500	4.4
up to 1500Vdc		0.9

7.6.2 Equipotential Bonding Requirements - Vehicles

Stationary vehicles within substations, which have equipment in contact with isolated mains and/or apparatus (e.g. via electrical test leads or oil hoses), must be bonded to the substation earth grid via a conductor with a minimum cross-sectional area of 6mm².

7.7 Drones

The operation of any drone within the vicinity of exposed mains and apparatus, by an Ausgrid employee, contractor to Ausgrid, or ASP, must comply with the Ausgrid Drone Operations Manual.

7.8 Scaffolding

This section describes using fixed and mobile scaffolding in substations, using lightweight scaffolding for maintenance work in electrical stations, and using fixed and mobile scaffolding near overhead lines.

7.8.1 Using Fixed and Mobile Scaffolding in Electrical Stations

To erect, dismantle or move scaffolding within a live electrical station, you must have a WorkCover/SafeWork licence to perform high risk work and you must meet the following conditions:

- you are an authorised person
- you are trained
- you hold at least a basic scaffolding competency certificate.

If you are an authorised person erecting, dismantling or moving scaffolding, you must be accompanied by an observer. The observer must also be an authorised person and must ensure the required clearances to live conductors are maintained and provide warning if there is a risk that the required clearances may be breached.

Except as permitted in Clause 7.8.2, the clearance between live exposed mains and apparatus and scaffolding with metallic components must be at least 4m. If using non-metallic scaffolding, clearance must be at least 1.5m. Guidance is also provided in WorkCover Guide - Safe Working at Heights.

Minimum safe working distances must also be maintained.

If the required clearances cannot be maintained, the following table applies:

Table 24 – Precautions where required scaffolding clearances cannot be maintained

Voltage	Conditions
LV exposed mains	Must be isolated and proved de-energised.
HV exposed mains	• must be isolated, proved de-energised, earthed and short-circuited • an access permit must be issued.

When carrying out high voltage testing on isolated mains and apparatus, no part of the scaffolding (or portable structure) may be closer than the minimum fixed clearance for the applicable test voltage (as specified in Table 21).

To reduce the incidence of induced voltages on metal components, lengths of metal scaffolding must be effectively earthed.

7.8.2 Using Lightweight Scaffolding for Maintenance Work in Electrical Stations

To erect, dismantle or move lightweight scaffolding for maintenance work on mains and apparatus in electrical stations, you must have a WorkCover/SafeWork licence to perform high risk work. You must also be an authorised person, trained and hold at least a basic scaffolding competency certificate when working to an approved procedure for the use of lightweight aluminium or fibreglass scaffolding for maintenance work on mains and apparatus in electrical stations.

The following applies:

- You must obtain an access permit for the equipment to be worked on before erecting, working on, dismantling or moving scaffolding.
- You must maintain a minimum clearance of 3.5m from metallic scaffolding (or scaffolding components) to adjacent live exposed high voltage conductors up to and including 132kV.
- You must maintain a minimum clearance of 1.5m from non-metallic scaffolding (or scaffolding components) to adjacent live exposed high voltage conductors up to and including 132kV.
- You must develop and document a safe method of work to ensure the required clearances to live equipment and minimum safe working distances are maintained for all expected maintenance procedures (including the use of cranes, hoists or winches for raising or lowering of components to or from the ground or scaffolding).
- An observer (who is also an authorised person) must oversee the lowering or raising of components if there is any risk the required clearances may be breached.



Figure 77 - Using lightweight fibreglass scaffolding

7.8.3 Using Fixed and Mobile Scaffolding near Overhead Lines

The distances in this clause apply to authorised or instructed persons working under these Rules and not to work by external parties under the WorkCover NSW Code of Practice “Work Near Overhead Powerlines”.

Where metallic scaffolding (or associated components) is likely to come within 4m of existing overhead conductors, under worst conditions of conductor sag and wind movement (blowout), refer to the following tables:

- Table 25 applies during erection and dismantling of the scaffolding.
- Table 26 applies while the scaffolding is erected.

Table 25 - Clearances to scaffolding - during erection and dismantling

Voltage	Conductor	Clearance (m) (maximum sag or blowout must be added)		Controls
		More than	Up to and including	
Low voltage (including aerial services)	Exposed	-	4.0	Access authority/permit required.
	Insulated (PVC or XLPE)	-	0.5	Access authority/permit required.
		0.5	4.0	Install temporary insulating covers.
High voltage (up to and including 132kV)		-	4.0	Access permit required

Table 26 - Clearances to scaffolding—when erected

Voltage	Conductor	Clearance (m) (maximum sag or blowout must be added)		Controls
		More than	Up to and including	
Low voltage (including aerial services)	Exposed	-	0.5	Access authority/permit required
		0.5	4.0	Install visual markers and hoarding with internal signage (see note).
	Insulated (PVC or XLPE)	-	Less than 0.1m	Access authority/permit required.
		0.1	0.5	Install visual markers and hoarding with internal signage (see note).
High voltage (up to and including 132kV)	Exposed or covered	-	Less than 1.5	Access permit required
		1.5	4.0	Install hoarding with internal signage

Hoarding

For details of the type of acceptable materials and the distances above and below the conductor/cable that must be mechanically shielded, refer to the Industry Safety Steering Committee - Guide for Network Operators to Provide Information to the Construction Industry for Working Near Overhead Power Lines (ISSC 32).

Where hoarding is required, attach warning signs to the worker side of the hoarding. The warning sign must warn of the presence of the electrical hazard (on the other side of the hoarding) and warn that the hoarding must not be removed.

7.8.4 Enclosure of Conductors

The enclosure of conductors typically occurs where there is a need to maintain supply to a worksite. The conductors must be isolated until safely enclosed.

Generally only LV will be considered suitable for enclosing. HV may be enclosed as specified by a risk assessment and the inclusion of suitable control measures.

Before conductors are re-energised, the internal clearances and safety conditions as outlined in Table 26 should be met.

An enclosed LV conductor will only be re-energised when the clearance between the conductor(s) and the enclosure is:

- 0.5 metres or more for bare conductors
- 0.1 metres or more for aerial bundled cable (ABC) conductors, for worst case conditions (sag and blowout)

Warning signs must be attached to the worker side of the enclosure, warning of the presence of the electrical hazard on the other side of the hoarding and that the hoarding should not be removed.

For requirements for acceptable materials for enclosing conductors refer to the Industry Safety Steering Committee - Guide for Network Operators to Provide Information to the Construction Industry for Working Near Overhead Power Lines (ISSC 32).

7.9 Street Lighting

This section describes clearances for street lighting equipment from live exposed conductors.

7.9.1 Clearances for Street Lighting Equipment

New Installations

New streetlighting installations must achieve the clearances from overhead mains and apparatus specified by Network Standard NS220 – Overhead Design Manual.

During Installation

During the installation, replacement, or repositioning of street lighting brackets and equipment, the relevant MSWD must be maintained between any part of the bracket or equipment and live exposed conductors.

Previously Installed Equipment

Workers may carry out work on existing streetlighting equipment where the street lighting bracket is fixed in position and where parts of the bracket are:

- within the clearances required by Network Standard NS220; or
- within the relevant MSWD from live exposed conductors,

provided:

- the workers, and any moveable conductive material they are holding, maintain the relevant MSWD from live exposed conductors; and
- the worker is working from an insulated EWP (LV or HV), or a timber/fibreglass, pole, ladder, or platform; and
- the bracket is fixed in position; and
- the work will not involve any movement of the bracket; and
- the minimum clearance between the street lighting bracket that is fixed in position and live exposed conductors is greater than the distances shown in Table 27 below.

If the above conditions cannot be achieved, the mains and apparatus must be isolated in accordance with these Rules or carried out using the relevant live work controls (HVLW Manual for HV or Section 9.5 of these Rules for LV).

Table 27 - Clearance between installed street lighting brackets and exposed conductors

Voltages (kV)		Clearance between any fixed part of street lighting brackets and equipment and exposed conductors (m)	
More than	Up to and including	Bracket and exposed conductors attached to the same pole	Bracket and exposed conductors not attached to the same pole
ELV	1	0.16	0.5
1	22	0.32	1.5
22	66	0.9	2.1
66	132	1.5	3.1

8 Designated Work Areas

8.1 Safe Work Areas

This section provides a uniform set of requirements for installing tape barriers and signage to define safe work areas for work under access permit conditions.

8.1.1 Defining a Safe Work Area

A safe work area (i.e. the mains and apparatus that are isolated and earthed as required by these Rules) must be defined by a tape barrier, in conjunction with an access authority/permit, for work on or near:

- HV mains and apparatus located within an electrical station; and
- On Sydney City enclosed-type LV switchboards in distribution substations.

A safe work area consists of planning, establishing, maintaining, and recovering a work area where the conditions are safe for workers to conduct work. The safe work area is created by erecting yellow tape, applied using the barrier-in or barrier-out method as appropriate. Barrier-in means surrounding (except for an entranceway) apparatus that is safe to work on (see Section 8.2 for details). Barrier-out means having unrestricted access to apparatus that is safe to work on and prohibiting access to live apparatus using a tape barrier (see Section 8.3 for details).

Where multiple safe work areas are to be defined in the one switchyard, the same tape barrier method should be used for each area.

The Operator is responsible for erecting the safe work area which allows workers to maintain minimum safe working distances. A safe work area must be established prior to issuing an access authority/permit and must not be removed until the access authority/permit has been cancelled.

The access authority/permit recipient is responsible for maintaining the safe work area. All workers involved in the job or task (from planning to execution) are responsible for observing a safe work area.



Figure 78 – An example of a safe work area defined by a yellow tape barrier.

Other parts of this section provide further guidance in the establishment of a safe work area.

8.1.2 Taping Principles

A person working on an access permit must not go over, through, under, or move the tape when carrying out work associated with mains and apparatus (refer to Clause 8.1.3 for exceptions).

Only Operators who are appropriately authorised may use yellow tape in association with an access authority/permit (Refer to Section 3.2). The tape is used as follows:

- In outdoor HV switchyards to indicate where it is safe to work and to show the proper entrance to the area. All other mains and apparatus must be regarded as live.

- On HV metal clad switchgear, insulation enclosed switchgear, transformers and exposed equipment in cages or enclosures, to identify mains and apparatus that are live and in the vicinity of the mains and apparatus under access permit.
- On low voltage (LV) Sydney City enclosed type switchboards to identify live panels that are adjacent to any panel(s) under access authority/permit.

Only the operator can erect, remove, or reposition yellow tape barriers. The operator must remove the yellow tape as soon as possible after recovering all cancelled access authorities/permits.

Yellow tape must be arranged in such a way, so it is possible for people to work on the mains and apparatus without interfering with or going beyond the tape.

The network access request (NAR) should indicate any specific requirements needed for erecting the yellow tape.

Signing onto an access permit

Workers must sign on to an access permit before entering a barrier-in yellow-taped safe work area.

Workers must sign onto an access permit when entering part of a switchyard that is included in the safe work area defined by a barrier-out yellow-tape barrier if:

- The workers will be carrying out work on or near exposed mains and apparatus within the safe work area; or
- The work that the workers intend to carry out is included in the purpose of the work described on the access permit.

8.1.3 Taping Exceptions

- Yellow tape may be lowered for a short time by the recipient of an access authority/permit, or someone else if instructed by the recipient of the access authority/permit. This is only to allow equipment that cannot be brought through the entrance way to be brought in or out of the worksite. The tape must be put back exactly in the original position as soon as possible.
- When equipment adjacent to an area under an access authority/permit has been totally taped off, and it is essential to gain access to the adjacent equipment, a person may move the tape to enter the equipment area (if the tape is blocking the only available entrance to that area). The person who moves the tape must not be either of the following:
 - the recipient of an access authority/permit
 - a member of the workgroup on the access authority/permit on the worksite.

For each exception, the workgroup must be advised about the action being taken. The person moving the tape must have an appropriate reason to move the tape and must replace the tape in its original position immediately after gaining entry or exit.

8.1.4 Erecting a Safe Work Area (Barrier-in Method)

A barrier-in method is erected around the equipment under access permit conditions. The inside of the taped areas become the safe work area. This method is generally used in open switchyards as the most practical method of identifying the equipment under access and establishing a safe work area.

The barrier-in method typically includes:

- a single entrance corridor (with nominal width of 1 to 1.5 metres and length of 1 to 2 metres)
- entrance clearly marked with four red 'Saferoads D-top' bollards
- bollards labelled 'Entry/Exit'
- taped entry corridors which join the main taped work area at right angles with the taped entry located in the centre of a taped boundary side where practicable.

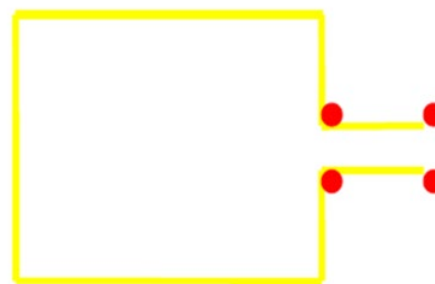


Figure 79 – A photograph and diagram illustrating correct entry to a safe work area with the entrance corridor tape formed at right angles to the safe work area.

In a small number of situations, the layout of the equipment inside the station may not allow the corridor to be in the centre or achieve a right-angle return. In this case, the entry may be readjusted, but it still must be clearly defined by the use of four or more high visibility bollards.

All workers and visitors must be briefed and made aware of any hazards during the risk assessment process prior to commencing work.

8.1.5 Erecting a Safe Work Area (Barrier-out Method)

In some situations (due to the equipment type or layout within the station, or the type of work to be performed), the barrier-out method may be used. With the barrier-out method, a tape barrier is erected between the equipment described in the access authority/permit and all adjacent live equipment in the station.

Since access is prevented to all other live equipment, high visibility bollards are not required at the entrance.

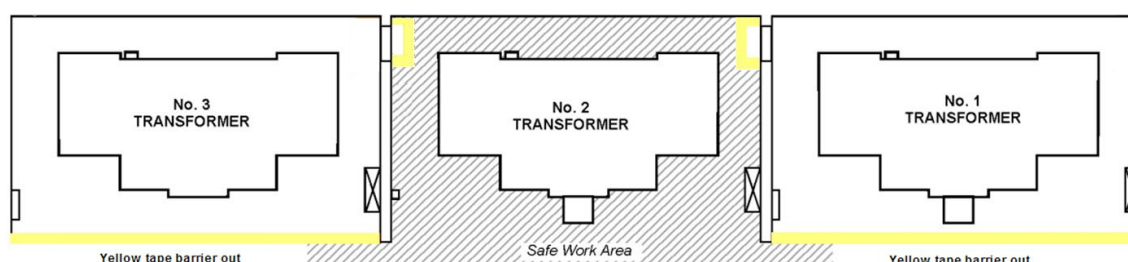


Figure 80 - A diagram illustrating barrier-out method

8.1.6 Situations not Requiring Yellow Tape

Yellow tape is not required for the following:

- switchgear at remote points of isolation unless work is going to be done at the remote location
- LV mains and apparatus (except Sydney City enclosed type switchboards where the barrier-out yellow tape method is used)
- control boards
- relays (except where it cannot be avoided, such as metal clad switchgear – see Table 33)
- HV cables (except on associated end boxes)
- cross-bonding and earthing link boxes
- gas and oil charging equipment
- shutters or covers secured by operator locks and operator danger tags.

8.1.7 Outdoor switchyards

If yellow tape stands are required to support yellow tape, they must be no greater than 4m apart. They must also be weighted down to prevent them being blown over or inadvertently knocked down.

Location of Access Permit

The access permit must be left in a receptacle folder at the entrance to the safe working area or in the permit folder at the point of isolation if indoor switchgear is involved.

Tape Restrictions

Do not attach yellow tape to (or pass through) a structure which supports a switch (forming a point of isolation for the work) or supports other live mains and apparatus.



Danger Signs

Where exposed live mains and apparatus are close to (or pass over) a pathway or a work area marked with yellow tape, the operator who issues the access permit must display a 'Danger High Voltage Overhead' sign to clearly identify the location of the adjacent exposed live mains and apparatus.

Additional 'Danger High Voltage Overhead' signs can also be erected by the recipient of an access permit if the pre-worksite risk assessment indicates this additional safety requirement.

Multiple Safe Working Areas

If the equipment to be worked on cannot be contained within one defined safe working area, a second safe working area can be created. The access permit must identify the number of safe working areas and list all entranceways. Entranceways must be identified by a number on a receptacle folder at the entranceway to the safe working area.

The receptacle folder must also refer to the following:

- identifying number of the access permit
- location of the permit folder
- the number and location of any other receptacle folder.

8.1.8 Safe Work Area Standard Equipment

There are a number of aids used in creating a safe work area. Table 28 provides details on the standard aids used by Ausgrid.

Table 28 - Aids used by Ausgrid to create a safe work environment.

Aids	Illustration	Comments
Yellow tape		Ausgrid follows the industry standard in the use of yellow tape in creating a safe work area.
Ausgrid standard tape supporting stands		Stands must be powder-coated or painted yellow.
Saferoads D Top bollard weight or equivalent		To increase the weight factor for tape supporting stands, a Saferoads D top bollard weight or equivalent should be used.

Aids	Illustration	Comments
Red Saferoads D Top bollards (or equivalent) with weights		Specific tape stands are used to identify the entry point. These are marked with high visibility entry / exit sleeves which fit over the vertical stanchion.
'Danger HV Overhead' signs		Additional signs can be placed around the yard as part of the walk-around at the discretion of the recipient.
Tags		Operator danger tag used to prevent inadvertent operation of a point of isolation or prevent access to dangerous conditions.

8.2 Applying a Safe Work Area Using Barrier-in Method

This section describes how an operator applies barrier-in requirements for outdoor switchyards.

8.2.1 Erecting the tape barrier

The following is the required procedure to erect a barrier-in yellow tape:

1. Form only one entrance corridor to the safe working area using four red bollards. Place two of the red bollards 1 to 1.5 metres apart approximately 1 to 2 metres outside the enclosure entrance. The entrance can be either at a gate (which is tied or held open) or where a panel of chain wire or mesh barrier has been temporarily removed. Where practical, the entrance corridor should join the main working area at right angles near the centre of one side to provide an additional indicator of the defined entrance corridor.
2. Attach the yellow tape to the first red bollard and take the tape from this bollard through the entrance corridor (around the second bollard) and then around the mains and apparatus on which the work will be done.
3. Take the tape back through the entrance (past the third bollard) corridor and attach it to the fourth bollard.



Figure 81 – A typical application of barrier-in method

If a section of the barrier which surrounds the enclosure becomes part of the boundary of the safe working area, then this barrier may be used instead of the yellow tape to identify the safe working area.

The area must be taped off at any other gates in the barrier that form part of the boundary of the safe working area to ensure the designated entrance is the only means of entering or leaving the safe working area.

Since everyone must enter the safe work area through the taped entrance, it is not necessary to tape closed any other entrance gates (that do not form part of the boundary of the safe working area) or entrance gates to any other high voltage enclosure in the switchyard.

The recipient of the access permit is responsible for ensuring that everyone enters and leaves the defined safe working area through the taped entrance corridor.

Note: Where an access permit is issued for work in a switchyard with separate enclosures containing exposed live high voltage mains and apparatus, each enclosure must be considered as an individual open switchyard and taped appropriately.

8.3 Applying a Safe Work Area using Barrier-out Method

This section describes how an operator applies a safe work area using barrier-out.

8.3.1 Erecting the tape barrier

In some situations, due to the type of equipment, the layout of the equipment within the substation, or the type of work to be performed, a barrier-out method may be the most suitable method.

Table 29 below describes the equipment, situations, and locations where the barrier out method should be used, and the taping requirements for each of these situations and locations.

Table 29 - Taping requirements for barrier-out situations and equipment

Situation / equipment	Requirements
Adjacent cages	Examples: Equipment (such as frequency injection units, capacitors or other exposed types of equipment) that is enclosed in multiple adjacent cages. Procedure: Tie yellow tape across the entrance gates of the adjacent cages.
	Note: For non-adjacent cages (e.g. some outdoor switchyards with stand-alone cages), use barrier-in procedures (see Clause 8.2.1).
HV metal clad switchgear	Use yellow tape to identify live HV mains and apparatus adjacent to HV mains and apparatus to be worked on under an access permit.
HV Air insulated and compound filled, metal clad switchgear	Use yellow tape to identify live HV mains and apparatus adjacent to HV mains and apparatus to be worked on under an access permit. Tie yellow tape up the front, over the top and down the back of the panels (where normally accessible to persons) on each side of the panel where the work will be done (or the panel which is used as a point of isolation at a worksite). For an end panel, tie up the front, over the top and down the back (where normally accessible to persons) of the panel adjacent to it. For air insulated and compound filled switchgear (configured as multi-panel or single panel), tie yellow tape across externally accessible cover plates at every point where a person could get access to live mains and apparatus. Since it is not possible to tape over internal bolted cover plates or the top of switchgear labelled 'No Step', it is the responsibility

Situation / equipment	Requirements
	of the access permit recipient to prevent access to live components.  Treat bolted cover plates as a means of access to live conductors. Exceptions to taping bolted cover plates include: • Switchgear labelled 'No Step' (due to its internal arc venting design), such as Tamco VHID and Reyrolle LMVP switchgear, does not require the top cover plates taped. Only adjacent live panels require taping. Refer to a suitable safe work method statement (SWMS) for protection from other live areas (such as an adjacent group bar). • Internal cover plates (behind other bolted external cover plates) do not require taping to define live areas since warning labels should already be in place. Note: You may need to tape additional panels of multi-panel switchgear where a single panel would otherwise remain untaped and it is: • adjacent to yellow tape applied for the issue of an access permit (e.g. there are three panels, or for work on the third panel from one end) • between existing yellow tape and new yellow tape applied for the issue of another access permit.
Switchgear - Single circuit breaker installations	At installations where only one HV switch is installed, yellow tape must be tied across or around any cover plate where access can be gained to live conductors.
Gas insulated metal clad switchgear	Tie yellow tape around the metal cladding of the gas compartments which adjoin the gas compartment(s) where the work is being done. You must also tape around the perimeter of all other equipment not covered by the access permit. Exception: Tape the external panels or doors of live gas insulated chambers covered by metal clad panels or doors instead of taping over the bolted cover plates concealed behind (e.g. GM6 33kV gas insulated switchgear).
Insulation enclosed switchgear (e.g. Hazemeyer Magnefix MD4, Krone Type KES10 Switchgear)	Yellow tape must be used on insulation enclosed switchgear to identify live HV mains and apparatus adjacent to the HV mains and apparatus to be covered by an access permit. Tape the front of each switch and fuse cap except for the switch or fuse caps removed for isolation.
Individual switchgear units—excluding Hazemeyer Magnefix MD4 and Krone Type KES10 Switchgear—refer to details for insulation enclosed switchgear above.	Tie yellow tape on fuse-switch units, ring main circuit breakers, ring main isolator fuse-switch units, and isolating and earthing switches to identify live HV mains and apparatus in the same work area as the HV mains and apparatus to be covered by an access permit. Tape as follows: • across every point where a person could get access to live mains and apparatus on the unit where the work will be done • around all other units.

Situation / equipment	Requirements
	 Treat bolted cover plates as a means of access to live conductors.
Work or test on city 11kV network	Use yellow tape to identify live high voltage mains and apparatus where work will be carried out and which is in the same area as the HV mains and apparatus to be worked on. In a city substation, use yellow tape to identify live HV switches where any switch is used to earth the feeder under the access permit, before the access permit is issued (refer to details for individual switchgear units above).
LV Sydney City enclosed type switchboards (older type) with asbestos or fibreglass trunking	Tie yellow tape across the doors of all the panels (including the network protectors or air circuit breakers) except the panel(s) which will be worked on under access authority/permit. No other type of low voltage boards installed in Sydney CBD substations requires taping.
Sub-transmission or zone transformers housed within individual cubicles or bays, where a bollard defined entry is not practical,	Tape across the entrance to cubicles or bays of all transformers in the substation, except for the entrance to the cubicle or bay where the work will be done. Tape-out live transformers in the same cubicle or bay as another transformer covered by an access permit. For the purposes of taping, a reactor is considered a transformer.  Where an access pathway is through a cubicle or bay that contains a live transformer, a path through the cubicle or bay must be marked out with yellow tape.
Distribution transformers in multiple transformer substations	Tie yellow tape across the accessible sides of all transformers except the transformer to be worked on.
Open switchyards where the layout of the equipment within the substation or the type of work to be performed makes tape-in impractical	The tape should be erected to create a dividing line between the apparatus to be worked on and all live equipment



Figure 82 - A multi-panel taping set up for barrier-out method

8.4 Labels, Warning Tags and Signs

This section describes labelling mains and apparatus, warning do not operate (WDNO) labels, operator danger tags, personal danger tags, warning tags, and high voltage (HV) cage danger signs.

8.4.1 Labelling Mains and Apparatus

For all mains and apparatus, clearly label every switch, transformer, cable, end box, or termination if the identity is not obvious.

Change the labels if the connections to mains and apparatus are altered causing an alteration to the network.

The authorised person in charge of the work must make sure that the mains and apparatus are clearly and permanently labelled to comply with the following:

- National Electricity Network Safety Code (ENA DOC 001-2008) and the Ausgrid Network Management Plan
- Ausgrid - Network Standard—Labelling of Mains and Apparatus (NS 158)



Figure 83 - Clear and permanent labelling on typical mains and apparatus

8.4.2 Warning do not Operate (WDNO) Labels

Use WDNO labels to warn people that mains and apparatus must not be energised. Fit WDNO labels to the following:

- switches that are live (or can be made live) but do not have any mains and apparatus connected to them
- switches that control unserviceable mains and apparatus that must not be energised
- switches that control the mains and apparatus taken out of service either permanently or temporarily, for example:
 - permanently disconnected mains and apparatus not intended to be returned to service after maintenance or repair and will not be energised
 - temporarily disconnected augmentation or zone development work, and low voltage (LV) Sydney CBD mains which will be re-energised following live LV work (see Guidance for WDNO labels).



Figure 84 – Switchgear panel labelled WDNO

When not to use WDNO Labels

For work covered by a network access request (NAR) when the mains and apparatus are intended for reconnection at the end of work on the same day.

Guidance for WDNO Labels

- If WDNO labels are attached to the switches controlling the mains and apparatus, provide details to System Control on a system alteration order (SAO).
- Obtain an access permit for work carried out on mains and apparatus labelled WDNO.
- Do not remove earthing equipment from mains and apparatus labelled WDNO while the mains and apparatus are under an access permit, unless it is necessary for the work (see Clause 9.8.4 for exceptions which allow temporarily removing earthing and short-circuiting equipment).

8.4.3 Operator Danger Tags

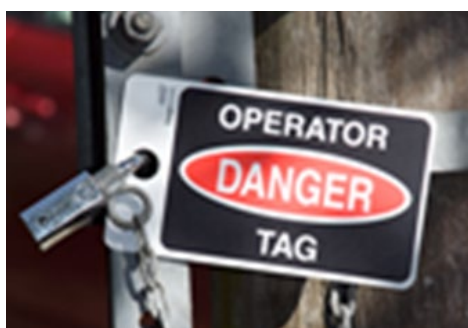


Figure 85 - Both sides of an Operators Danger Tag

Operator danger tags are rectangular boards, plates, or tags with the words '*Operator Danger Tag*' on one side and '*Danger – This apparatus must not be operated*' on the other side (as shown in Figure 85). They are used only by operators as a warning in the following situations:

- to guard against unauthorised or accidental operation of switches used as points of isolation when an access permit or a clearance to work is issued
- on substation doors and switchgear shutters to alert people not to enter or approach live equipment or conductors.
- To prevent the unauthorised or accidental operation of earth switches used for access permit earthing.

Note: Earth switches which are intended for operation by the permit recipient must not have an operator danger attached.

Operator danger tags are fixed to the controls of switches or other controlling devices. If this is not possible, they are attached in a position where they can be clearly seen and will alert any person about to operate the switch or controlling device.

When operating from the ground, the operator danger tag must be placed in a position where it cannot be easily removed.

Removal

Do not interfere with operator danger tags. Operator danger tags which have been installed by an operator must only be removed by:

- an operator with an appropriate operating authority; or
- a person under instruction and the direct supervision of an operator with an appropriate operating authority.



Operator danger tags must only be used by an operator. They must be securely attached and clearly visible.

8.4.4 Personal Danger Tags

Attach oval personal danger tags to all points of isolation, when you are working on isolated LV mains and apparatus which do not require an access authority/permit. This includes bonds or links which are temporarily disconnected for work on or near the LV overhead network.

Personal danger tags warn everyone that the isolations/connections must not be restored. The personal danger tag can only be removed by the person (or persons) who signed and attached it, or by a member of the workgroup with the permission of all those who originally signed the tag. Where this is not possible (and all attempts to contact the person or persons have failed), the immediate supervisor of the signatories may remove the tag after a thorough investigation of the status of the equipment and the worksite to ensure the safety of all personnel.

The person in charge must give permission for someone who is not a member of the workgroup to remove the tag.

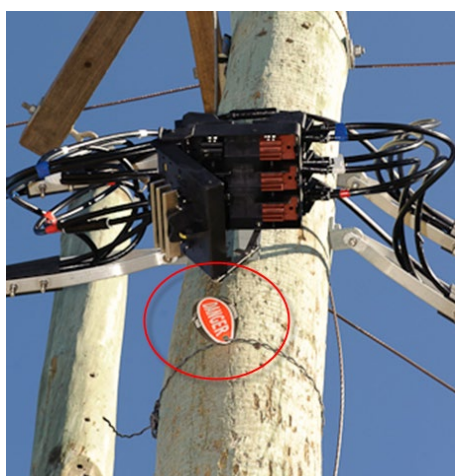


Figure 86 - A personal danger tag in use



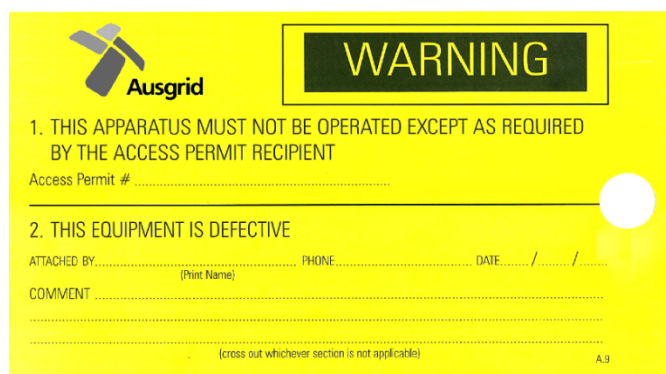
Figure 87 – Both sides of a personal danger

8.4.5 Warning Tags

Yellow warning tags are attached to equipment as follows:

Table 30 - Use of yellow warning tags

For	How it is applied	By whom
Equipment which may be operated under access permit	Attach yellow warning tags to LV controlling devices (when an access permit is issued) to indicate that these controlling devices may be operated by the access permit recipient, or a member of the recipient's workgroup. List the equipment on the access permit (e.g. 'Transformer tap changer, fans and oil pump 415V supply switched off and warning tagged').	Applied and removed by an operator
Defective equipment	Attach yellow warning tags to defective equipment. Notify the control room if the defective equipment could affect operations on the network. Where appropriate, indicate the nature of the defect. If there are no details on the tag, the control room should be contacted for information.	Applied by the worker discovering the defect, and removed by the worker remedying the defect
Identifying working earths in switchyards	Attach yellow warning tags to working earths applied in an outdoor switchyard where there are also hand-applied access permit earths. This is to clearly identify the working earths.	The access permit recipient is responsible for attaching and removing these warning tags.



The image shows the reverse side of a yellow warning tag. It features the Ausgrid logo at the top left. The main heading is 'WARNING' in a black box. Below this, there are two sections for text entry. Section 1 is for equipment that must not be operated except as required by the access permit recipient, with a line for 'Access Permit #'. Section 2 is for defective equipment, with lines for 'ATTACHED BY' (with a note to print name), 'PHONE', 'DATE' (month/day/year), and 'COMMENT'. At the bottom, there is a note to cross out whichever section is not applicable, and a small 'A.9' in the bottom right corner.

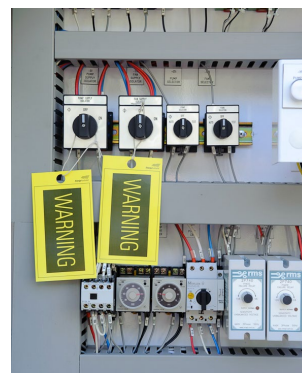


Figure 88 – The reverse side of a yellow warning tag and warning tags in use

8.4.6 High Voltage Cage Danger Sign

A cage is a fully fenced or walled area (of minimum height 1.5m), room, or compartment, which contains exposed HV mains and apparatus, where the minimum safe working distances cannot be maintained.

Special signs warning about the hazards are fixed to the outside of the cage.

A HV cage danger sign, as shown below in Figure 89, must be attached to each entrance of the cage.



Figure 89 – A HV cage danger sign.

Operators may carry out operating work in a cage only if absolute limits of approach can be maintained.

Persons carrying out work, other than operating work, must sign onto a relevant access permit prior to entering a cage.

The cage entrance must be locked at all times except when an access permit is issued or during operating work.

If a cage also has a strong magnetic fields sign, as detailed below in Clause 8.4.7, workers must not enter the cage while the mains and apparatus are energised*.

*Entering the cage to prove the mains and apparatus are de-energised is permissible.

8.4.7 Strong Magnetic Fields

The sign shown below in Figure 90 – A strong magnetic fields sign. is used where magnetic fields created by electrical apparatus exceed recommended occupational levels.

Workers must not enter delineated areas with this sign attached while the apparatus is energised*.

*Entering the delineated area to prove the mains and apparatus are de-energised is permissible.

Note: It is not necessary to prove insulated cables are de-energised at the worksite.

Refer to Network Standard NS174C – Environmental Handbook, for further information on electric and magnetic fields (EMF).



Figure 90 – A strong magnetic fields sign.

8.4.8 Temporary 'Powerlines Overhead' Warning Sign

Where work must be completed in the vicinity of overhead powerlines, temporary warning signs may be erected to make workers aware of the danger of overhead powerlines.



Figure 91 - Temporary 'Powerlines Overhead' warning sign

8.4.9 Substation Screening Identification Tag

The substation screening identification tag identifies installed LV substation screening that is not intended for permanent installation. The tag comes as a single sheet comprising two sections—substation copy and depot copy.

As required by Clause 6.2.13, the substation copy section must be completed and attached to the screening in a prominent location. The remainder of the tag (depot copy) must be completed and returned to the depot.

Substation Screening Identification Tag Substation Copy	Substation Screening Identification Tag Depot Copy
Screened by: _____	Screened by: _____
Contact Number: _____	Substation No: _____
Date: _____	Substation Name: _____
Reason: _____	Installed Date: _____ Removal Date: _____
_____	Requested By: _____
_____	Reason: _____
(See Reverse for Details) A213	

Figure 92 – Both sections of the substation screening identification tag—substation copy and depot copy

8.4.10 Switching Information Tag

Switching information tags are pre-printed cards used by operators to record preliminary isolations and earthing when a permit is not issued. The tag may also be used to record details that need to be passed on to another operator such as earthing equipment movements and phasing issues. When completing a switching information tag, operators must also add their name, date, and signature.

SWITCHING INFORMATION TAG In association with Network Access Request No.	SWITCHING INFORMATION TAG (See over for details)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
SEE OVER	OPERATOR NAME: _____
S/L NO1553 S/C 156652 A396	SIGNATURE: _____ DATE: _____
	S/L NO1553 S/C 156652 A396

Figure 93 – Both Sides of a Switching Information Tag

9 Access the Network

9.1 Work On or Near Mains and Apparatus

This section describes the requirements for working on or near exposed LV and HV mains and apparatus.

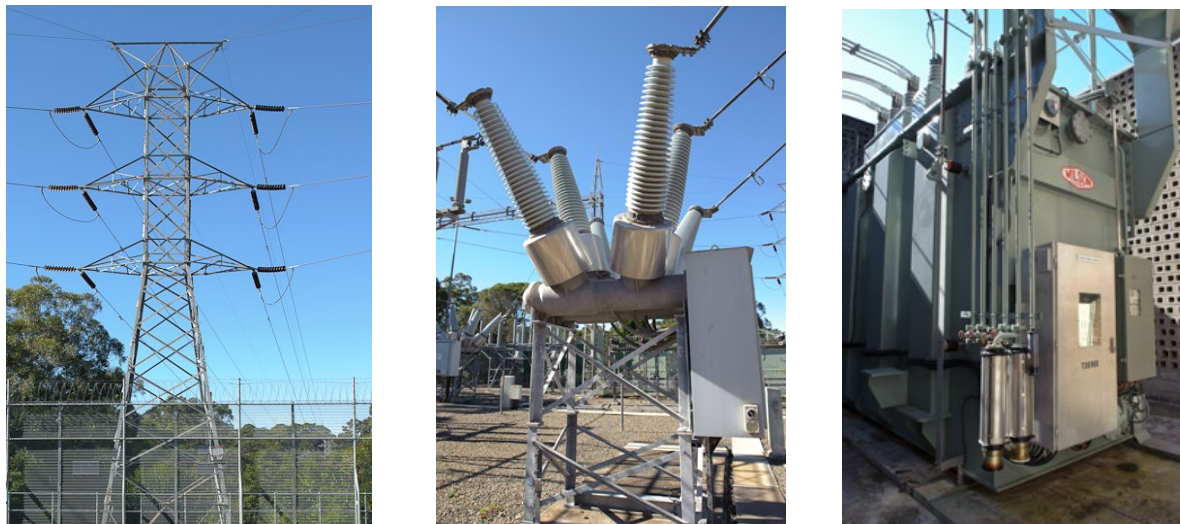


Figure 94 - Various parts of the network used by Ausgrid to supply electricity — overhead lines, a circuit breaker, and a transformer.

9.1.1 Working on or Near Exposed LV Mains and Apparatus

You must treat all exposed LV mains and apparatus as live until isolated and proven de-energised by an authorised person. The authorised person must complete all of the following steps for either option 1 or 2 below.

Option 1 - Isolated from all Sources of Supply

1. Isolate the mains and apparatus from all possible sources of electricity supply.
2. Prove the exposed conductors are de-energised using approved testing equipment.
3. Issue an access authority/permit as required by Section 5 .



Figure 95 – Illustration of the steps required under Option 1

Option 2 (LV network distributors only) - Isolated from network sources of supply and shorted

1. Isolate the LV network distributor from network sources of supply and distributed energy resources with a capacity greater than 10kW per phase. (Other customer services may remain connected).
2. Prove the exposed conductors are de-energised using approved testing equipment.
3. Immediately apply LV shorts as per the requirements of Clause 9.2.3.
4. Issue an access authority/permit as required by Section 5.



Figure 96 – Illustration of the steps required under Option 2

Notes:

- **Possible Sources of Supply**

Possible sources of electrical supply may include distributed energy resources at customer installations (such as stand-by generators, parallel generation plants, solar panels, inverter/ uninterruptible power systems (UPS), multiple control supplies, auxiliary control systems, transformation up from extra LV systems).

- **Induced Voltages**

If there is the possibility of hazardous induced voltages occurring, then earth and short-circuit LV mains and apparatus using approved methods. Otherwise, use live LV work procedures.

9.1.2 Insulation Effectiveness on Low Voltage Mains and Apparatus

Low voltage mains and apparatus covered by tape, rubber, plastic, PVC, fabric or other similar materials must be treated as exposed unless these materials have been designed to a relevant Standard, specifically for the purpose, and are in good condition.

Insulated LV Overhead Mains

The insulation of overhead conductors covered with PVC or XLPE insulation (e.g. services and LV ABC) can be subject to breakdown due to ultraviolet exposure. Refer to Clause 10.2.3 for the controls required to manage this risk for work on or near live LV insulated overhead conductors.

Underground LV Cables

Underground LV cables may also be subject to a breakdown of insulation. Refer to Clauses 9.3.3 and 9.3.4 for the controls required for work on or near live LV underground cables.

9.1.3 Working on or Near Exposed HV Mains and Apparatus

Treat all exposed HV mains and apparatus as live until isolated, proven de-energised, earthed and short-circuited, and an access permit issued by an authorised person. The authorised person must complete the following steps:

1. Isolate the mains and apparatus from all possible sources of electrical supply.
2. Prove the exposed conductors are de-energised using approved testing equipment.
3. Earth and short-circuit the conductors.
4. Where required by Section 8, define the safe work area using tape barriers.
5. Issue an access permit.

If any HV work cannot be done in accordance with the above procedures, then you must use other precautions authorised by the Head of Asset Risk and Performance.



Figure 97 - Illustration of the steps required to allow work on or near high voltage mains and apparatus

9.1.4 Insulation Effectiveness on High Voltage Mains and Apparatus

You must treat HV mains and apparatus that are covered with insulation but do not have an earthed metal sheath or screen as exposed, unless they are specifically listed below, and the insulation is in good condition:

- Hazemeyer Magnefix MD4 switchgear, and Krone Type KES 10 switchgear, and associated cable terminations covered with approved screens
- spouts covered by non-metallic bus shutters on commercially manufactured switchgear conforming with Australian or International standards
- commercially manufactured switchgear, consisting of insulated busbars and components, conforming to Australian or International standards.

9.1.5 Work on or Near Live HV Overhead Mains and Apparatus

Work on or near live HV overhead mains and apparatus must be carried out in accordance with the Ausgrid HV Live Work Manual. Refer to the Manual for all details of work on or near live exposed HV mains and apparatus.

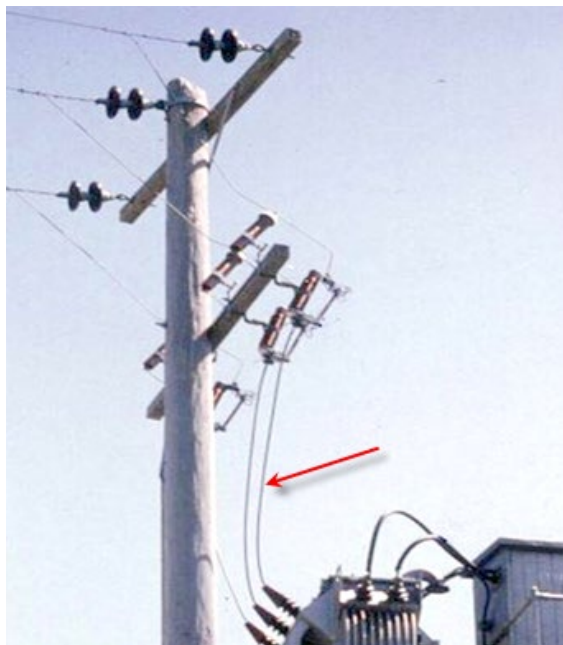


Figure 98 – 11kV unscreened cable

9.1.6 Electrically Dangerous Areas not Covered by an Access Permit

You must arrange suitable barriers when you are working beyond the minimum safe working distance (MSWD) where an access permit is not required, but where there is a risk of breaching the MSWD to exposed live HV mains and apparatus.

The barriers must prevent workers from coming within the MSWD to the exposed live HV mains and apparatus. Barriers can be plastic mesh, rails, chains, ropes, or similar material and must have the appropriate warning signs.

If there is any doubt that the barrier will be effective, a stand-by person must warn people not to go into the electrically dangerous area.

Only authorised persons can go beyond, remove, or interfere with barriers or warning signs.



Figure 99 - Barrier to prevent workers encroaching minimum safe working distances

9.2 Low Voltage Work - Isolated

This section describes the isolation, proving de-energised, and shorting of low voltage (LV) mains and apparatus,

9.2.1 Isolating LV Mains and Apparatus

Isolation means mains and apparatus are disconnected from all possible sources of electrical energy. Use one or more of the following methods:

- open switches
- withdraw circuit breakers
- remove fuses, links, or connections
- tie back bonds.

For the purpose of isolating LV mains and apparatus, only LV phase conductors are to be isolated. LV neutral conductors are to remain connected.

Note: Neutral conductors associated with the isolated mains and apparatus may need to be disconnected as part of the work, or for testing.

Points of isolation must be secured with a danger tag (and, where the apparatus accommodates, a lock) to prevent unauthorised or unintentional re-energisation.

9.2.2 Proving Low Voltage Mains and Apparatus are De-energised

Following isolation of LV mains and apparatus, the authorised person responsible for the isolation must prove that the mains and apparatus are de-energised. Proving the mains and apparatus are de-energised must, as a minimum, be carried out at one of the points of isolation.

The relevant authorised person must demonstrate a de-energised status to a non-electrically qualified worker and clearly identify energised and de-energised mains and apparatus.

In addition, as required by Clause 5.1.4, the recipient of an access authority/permit covering LV mains and apparatus must prove the mains and apparatus are de-energised at each worksite prior to work.

Approved LV detectors, compliant with Clause 6.2.12, must be used to prove that LV mains and apparatus are de-energised.

The approved LV detector must be tested (using a known source of supply or an approved proving unit for the detector) both immediately before and immediately after proving mains and apparatus are de-energised, to confirm it is operating correctly.

For work on the cores of underground LV cables, the mains and apparatus must be proved de-energised at the worksite by remote cutting, using approved equipment. (Refer to Section 9.3)

Ensure testing equipment is appropriate for the specific voltage.

When proving LV mains and apparatus are de-energised using an approved contact type detector, the conductors must be clean and clear of contamination or oxide at the point of detector contact with the conductor.

Ausgrid employees must refer to Technical Guide T0032 – Safety Equipment – Care, Use and Inspection – Low Voltage Instruments, for information on approved LV detectors.

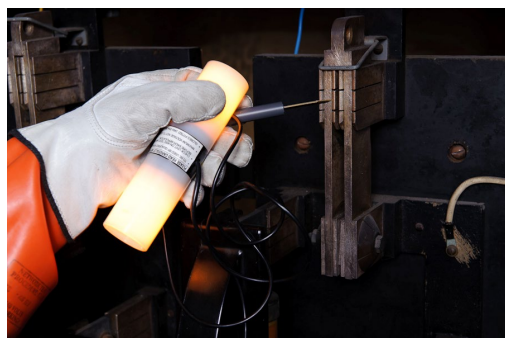


Figure 100 - Test lamps in use

9.2.3 Shorting LV Network Distributors

LV shorting is applied to network distributors to protect against potential sources of supply from connected customer services.

LV network distributors are to be shorted between the neutral and all phase conductors when all of the following apply:

- isolation from network sources of supply has occurred; and
- distributed energy resources with a capacity greater than 10kW per phase are isolated; and
- customer services, with a distributed energy resource capacity of up to 10kW per phase remain connected; and
- live work procedures are not used.

LV Short Circuiting Equipment

LV short circuiting equipment (LV shorts) must comply with the requirements of Network Standard NS223 – Low Voltage Short Circuiting for De-energised Work.

Application of LV Shorts

LV shorts must only be applied by trained and competent persons.

Workers applying and removing LV shorts must wear the PPE required for work on or near live exposed LV.

The conductors must be clean and clear of contamination or oxide at the point at which the shorts are attached.

Permit Shorts

For the issue of an access authority/permit, LV shorts must be applied as close as practicable to the worksite, and generally within the conductor route distances from the work site outlined below. These shorts are referred to as “permit shorts”.

- LV overhead bare open wire - 100m
- LV ABC - 300m
- LV underground mains - 200m

Conductor route distances from the worksite to the LV shorts may vary from the distances specified above provided the distances comply with Technical Guide T0029 – Short Circuits for LV Distribution Networks.

(Refer to Network Standard NS223 – Low Voltage Short Circuiting for De-energised Work, for further information).

LV permit shorts may only be applied under the direction of an appropriately authorised operator.

The application and removal of permit shorts are to be recorded by the operator on the access authority/permit folder if used, or the access authority/permit if a folder is not used.

Working Shorts

If the work will break conductor connections, such that the mains will not be short circuited within the distances from the work site specified above, trained and competent workers must apply additional LV shorts which are known as “working shorts”, under the direction of the access authority/permit recipient.

If an additional set of working shorts is applied, the access authority/permit recipient must record them on the access authority/permit. If more than one set of working shorts are applied, the recipient must record their application and removal on a LV shorts form.

Temporary Removal of LV Permit Shorts

LV permit shorts may be temporarily removed for the purpose of carrying out testing with non-hazardous low voltages only with the approval of the access authority/permit recipient.

The LV permit shorts must be reinstated immediately upon the completion of testing.

All workers other than those conducting the testing must stand clear while the shorts are removed and those workers conducting the testing must wear LV insulating gloves and safety eyewear when approaching within the MSWD of exposed LV mains and apparatus.

Removal Or Relocation of LV Permit Shorts

If a LV short that is recorded on an access authority/permit needs to be removed (other than the temporary removal above) or relocated, then the access authority/permit must be signed off by those signed on and cancelled by the recipient, prior to the removal of the shorts.

Removal of LV Shorts - at the Completion of Work

LV permit shorts may be removed when the work is complete by utilising one of the following methods:

- LV permit shorts may be removed by trained and competent staff under the direction of an appropriately authorised operator. The operator must then sign the LV shorts off the access authority/permit or access authority/permit folder once they are removed; or
- LV permit shorts may be removed by the access authority/permit recipient if approval is given by the System/Area Operator. In this case, the recipient must only remove those LV shorts that were applied for the issue of their access authority/permit. The following process must be followed:
 - The recipient must contact the System/Area Operator to gain approval to remove the LV shorts and confirm they are not required for another access authority/permit which is on issue on the mains and apparatus.
 - All members of the workgroup must then sign off the access authority/permit. (The recipient must not commence removing the LV shorts until all members of the workgroup have signed off the access authority/permit).
 - After all members have signed off, but prior to cancelling the access authority/permit, the recipient removes the LV shorts.
 - The recipient must then write on the access authority/permit the specific LV shorts that have been removed. (See Clause 5.6.8)
 - After the completion of the above steps, the recipient must then cancel the access authority/permit and advise the System/Area Operator.

9.3 Low Voltage Work - Cables

This section describes the requirements for identifying and remotely cutting LV cables before starting work.

9.3.1 Identifying Low Voltage Cables

You must not work on any cable (including LV, pilot or communication cable), unless the cable is identified, by a worker who is authorised to identify cables, at the worksite using at least one of the methods in Table 31, then remotely cut as required by Clause 9.3.2.

Regardless of the identification method used, the cable identification must be verified by a second authorised person.

You must uncover and check all other cables in the immediate vicinity before working on underground cables.

Table 31 - LV cable identification methods

ID	Method	Description
a	Visual identification	Visually trace the cable along its entire length from the point where it has been isolated to the worksite and ensure independent verification by another worker.
b	Signal generation and detection	Use an approved signal generator and associated signal detector, in accordance with Technical Guide T0003 – Cable Identification and Phasing.
c	Fault location tests	Apply HV to the faulty core or sheath and identify the generation of smoke, flame or sparks, or other clear evidence of a breakdown at a fault at the worksite.
d	Conduit “rodding”	Where a cable in a conduit cannot be identified using methods b) or c), the cable may be traced by “rodding” (inserting non-conductive rod(s) into the conduit).

ID	Method	Description
e	Live cables	Use equipment such as an approved square-wave signal generators and detectors to identify live cables.
f	Other methods	Cable ends which are de-energised may be identified by other approved methods. For example, the use of an approved insulation resistance tester (IRT) and phasing resistors.

Note: If it is not reasonably practicable to identify the cable(s) using one of the methods in Table 31, the remote cutting of the cable(s), as required by Clause 9.3.2, may proceed only if a proposal detailing:

- the reasons why the cable identification methods in Table 31 are not reasonably practicable to implement;
- the available cable information; and
- the alternate controls that have been, or will be, implemented to confirm the correct cable is to be remotely cut;

is endorsed by System Control and approved by the Level 3 Ausgrid manager (or their delegate) of the workgroup carrying out the work or submitting the NAR.

9.3.2 Remote Cutting Low Voltage Cables

LV Cables (including pilot cables) must be remotely cut as required by Table 32 below.

Table 32 - When remote cable cutting is, or is not, required

Remote Cutting	Description
Remote cutting is required	• to prove the de-energised status of an identified cable with the use of approved equipment • when the work requires the identified cable to be cut, or the conductor will be exposed during the course of the work • when the cables cannot be identified.
Remote cutting is not required	If the cable can be identified by visual tracing from a point of isolation (or some other approved method) and the following conditions apply: • it is a live LV cable • it is a communications cable • for sheath or serving repairs • it is an insulation repair where the cable is not to be cut.

When required by Table 32, immediately after the identification, remotely cut the cable:

- using approved equipment (see Clause 6.2.22),
- in the presence of the person who is going to do the work, and
- at the point where the work will be done,

in accordance with the requirements of the Ausgrid Technical Guide T0031 – Remote Cable Cutting Equipment.

9.3.3 Insulation Defects

Workers must not make uninsulated contact with a live LV underground cable if the insulation appears defective. (This includes cables with visible calcium adipate and PVC sheathed cables with visible swelling - as per Network Standard NS199).

Cables identified with these defects must be reported for corrective action in accordance with Network Standard NS199.

In addition to the above requirements, workers must wear LV insulating gloves when moving any live LV insulated underground distribution cable with their hands, due to the risks associated with a breakdown of insulation that may not be visible or identifiable.

Specific Cable Types

There are additional controls required for work on or near the following specific cable types:

- high-density polyethylene (**HDPE**) insulated cables (refer to Network Standard NS199 for the controls required for work on or near these cables);
- LV cables with an exposed conductive sheath or armour (refer to Clause 9.3.4 for the controls for work on or near these cables).

9.3.4 Low Voltage Cables with Exposed Conductive Sheath or Armour

Under certain fault conditions, hazardous a.c. voltages can be present on the exposed conductive sheath or armour of low voltage underground cables.

Testing

Exposed conductive sheath or armour of low voltage cables must be tested to confirm it is not live, prior to working on or near the cable.

The person conducting the testing must wear the following PPE:

- LV insulating gloves (as specified in Clause 6.2.7); and
- Gumboots (compliant Clause 6.2.5).

Where the work will be carried out in a cable pit with multiple conductive sheathed or armoured cables, the testing of the cables must be verified by a second competent person.

Ausgrid employees must carry out the testing in accordance with Technical Guide T0052 – “Confirming the absence of AC voltages on the exposed conductive sheath or armour of low voltage network cables”.

Controls

No work is to occur on or near a cable that has a voltage of 5Vac or greater present on the conductive cable sheath or armour. Workers must immediately report the result and prevent access to the cable or pit until the hazard is investigated, identified, and rectified.

If the testing confirms the conductive cable sheath or armour is not subject to a voltage of 5Vac or greater, work within 500mm of the cable may proceed, provided workers wear LV insulating gloves and gumboots (as detailed above), and make no uninsulated contact with the cable.

9.3.5 Cutting Cables, Conduits or Cover Strips

To prevent damage to any adjacent buried cables, you must excavate removable soil or backfill to a minimum radius of 200mm around any cable, conduit, or cover strip, before cutting it. Additional precautions such as physical barriers may also be required to prevent damage to adjacent cables.

Note: Refer to Network Standard NS156 – Working Near or Around Underground Cables for the requirements for excavation near Ausgrid underground cables.

9.3.6 Excavation of Faulted Underground Cables

All workers involved in the excavation of faulted underground cables, within the following distances from the cable:

1. below a depth of 150mm above the cable cover strip (identified by hand excavated “pot holes”); or
2. within 300mm of the cable;

must sign onto the relevant access authority/permit issued for the testing and/or repair of that cable, before commencing work.

9.3.7 Pilot and Communications Cables

Before carrying out work on Ausgrid pilot cables or communication cables, workers must sign onto a relevant access authority/permit covering those cables, as required below.

Copper Pilot Cables

An access permit or clearance to work is required for work on the cores of copper pilot cables that are in-service.

This is to secure the electrical isolation of those cables and ensure the work will not adversely impact the primary network.

An access permit or clearance to work is not required for work on copper pilot cables that are permanently disconnected.

Fibre-optic Communication Cables

A clearance to work is required for any work on a fibre-optic communications cable which will interrupt a protection or SCADA system.

This is to ensure the work does not adversely impact the primary network.

9.4 Low Voltage Work - Connection and Disconnection

This section describes the requirements for **connecting and disconnecting** low voltage mains, apparatus, services, and installations.

9.4.1 Connecting and Disconnecting Low Voltage Mains and Apparatus

Before closing the connections to any LV mains and apparatus, you must carry out appropriate tests to check for:

- phasing
- phase-to-phase faults
- phase-to-earth/neutral faults.

Make sure everyone is clear of the conductors and that any plant, tools, materials, and earthing equipment (if any) are removed before you connect LV mains and apparatus to a live LV source of supply.

When you are **disconnecting** LV mains and apparatus:

1. Disconnect the connections at the source of supply.
2. If a neutral conductor is involved, disconnect the neutral conductor last.

When **connecting** LV mains and apparatus to a live LV source of supply:

1. Connect the neutral conductor first—if a neutral conductor is involved.
2. Connect the live (active) conductors to the source of supply last.

To ensure that a voltage difference does not exist at the connection, check the phasing from all possible sources of supply. If there is any possibility of interconnection to another power source, you must phase all new or disconnected connections before connections are made.

To check the phasing, you must use approved equipment such as:

- test lamps
- voltmeters
- indicating devices.

9.4.2 Connection and Disconnection of Installations to the LV Network

Hazard



An installation which is incorrectly or unsafely connected to the network could create a situation where a person receives an electric shock which could be fatal.

Testing requirements

Workers must comply with Network Standard NS282 – Service Testing, when connecting or reconnecting* any installation to the LV network.

* This is required when any conductor connections to an installation are disconnected (broken) and are to be reconnected (made). It is not required if an installation is isolated and re-energised only through the operation of a Service Protective Device (SPD).

Measured values of the tests required by Network Standard NS282 must be recorded in a relevant form, system, or register, for each installation.

Polarity

Both the service mains neutral and the customer's neutral must be positively identified. This must be done by an electrical method such as a lamp test or a test with another approved device.

Neutral Conductor

Workers must not energise an installation, or allow an installation to remain energised, beyond the service protective device (or main switch(es) for installations with barge board mounted service fuses) without the installation having a NS282 compliant connection to neutral.

Disconnection

When overhead services are to be left disconnected, the disconnection must be at the customer's terminals or at the street mains, not at the customer's switchboard.

Ausgrid Employees

Ausgrid employees must comply with the Ausgrid Work Instruction- Service Testing and Connection.

9.4.3 Connection of Loads Across Circuits

Workers must not connect any load between different LV circuits. (For example, workers must not connect a street lighting luminaire between a LV distributor phase conductor and a street lighting circuit neutral conductor).

9.5 Low Voltage Work - Live Low Voltage

This section describes the requirements for work on or near exposed live low voltage (LV) mains and apparatus.

Background

The Electricity Supply (Safety and Network Management) Regulation 2014 (NSW) requires an electricity supply network operator to "take all reasonable steps" to make the electricity network safe. This includes, but is not limited to:

- the safety of members of the public;
- the safety of persons working on the electricity supply network; and
- the management of safety risks arising from the loss of electricity supply.

The isolation of low voltage mains and apparatus generally requires an interruption of supply to customers. The interruption of electricity supply to our communities can have significant consequences, such as:

- The safety of those who rely on electricity supply for life support equipment is affected by supply interruptions.
- Electricity supply interruptions to traffic signals and public transport systems can impact public safety.
- The interruption of electricity supply to vulnerable customers such as hospitals and nursing homes can impact public safety.
- The interruption of electricity supply to essential services such as water and sewerage systems can impact public safety, hygiene and the environment.
- The interruption of electricity supply to medical facilities, security systems, communication and data services, fire protection systems, and commercial building services can result in risk, disruption and financial impacts to the community.
- Mortality rates increase during extreme weather conditions. The safety of those who rely on heating, cooling or telecommunications can be affected by supply interruptions during extreme weather conditions.

The live work controls are designed allow workers to safely carry out work on or near mains and apparatus without requiring the interruption of electricity supply to the community.

9.5.1 Assessment of Whether the Work Should be carried out Live

The assessment process described below applies to all work on or near exposed low voltage mains and apparatus (excluding the work described in Clause 9.5.3 that is carried out in accordance with approved procedures).

Actions

The following assessment process must be followed when planning work on or near exposed low voltage mains and apparatus (LV work). Figure 101 below illustrates this process in a flowchart.

Assessment by Persons Planning Low Voltage Work

Persons who plan LV work are responsible for the following assessments.

- **Question 1: Is the task allowed on the live LV work task list?**

The person planning the live LV work must confirm that the task is allowed under the Live LV Work Task List (see Appendix A of this document).

Assessment

If the answer to Question 1 is yes (i.e. the task is allowed on the Live LV Work Task List), the person planning the work should proceed to Question 2.

If the answer to Question 1 is no (i.e. the task is not allowed on the Live LV Work Task List) the mains and apparatus must be isolated in accordance with these Rules. (Refer to Section 4.1 for the planning process for isolated work).

- **Question 2: Can the live work controls be achieved for the specific task and site?**

The person planning live LV work must assess if the live work controls of Clause 9.5.4 of this document can be effectively achieved for the specific tasks and arrangements and conditions of the site. (Persons planning live work may need to consult with live authorised workers, or other subject matter experts, in this assessment).

Note: For work carried out by or for Ausgrid, refer to Technical Guide T0124 – Low Voltage Assessment Framework.

Exemption: This pre-work task and site-specific assessment is not required for:

- Regulated disconnection/reconnection and metering tasks on behalf of Ausgrid

Assessment

If the answer to Question 2 is yes (i.e. the person planning the work assesses that the applicable live work controls can be achieved for the task), the work may be planned to be undertaken live (noting a further on-site assessment must be undertaken by the live LV workers).

If the answer to Question 2 is no (i.e. the person planning the work assesses that the applicable live work controls cannot be achieved for the task), the mains and apparatus must be isolated in accordance with these Rules. (Refer to Section 4.1 for the planning process for isolated work).

Assessment by Authorised Live LV Workers

Following the above assessments, the authorised live LV workers who are intending to carry out the planned live LV work must make the following assessment prior to undertaking live work.

- **Question 3: Can the live LV work be carried out safely?**

The authorised live LV workers intending to carry out the live work must assess if the live controls can be effectively achieved and the live work carried out safely, having regard to the site conditions and arrangement at the time of the work being undertaken.

Assessment

If the answer to Question 3 is yes (i.e. the workers assess that the live controls can be effectively achieved, and the work carried out safely), the work on or near live exposed LV mains and apparatus may proceed.

If the answer to Question 3 is no (i.e. the workers assess that the live controls cannot be effectively achieved), the mains and apparatus must be isolated in accordance with these Rules. (Refer to Section 4.1 for the planning process for isolated work).

Proceeding with Live LV Work

Live LV work may only proceed if the answers to Questions 1 to 3 are yes.

Note:

If, at any time before or during the performance of a task live, the appropriate live work controls are not able to be fully and safely implemented or if there are concerns from the work crew about performing the work live, work must be safely paused, and further assessments undertaken.

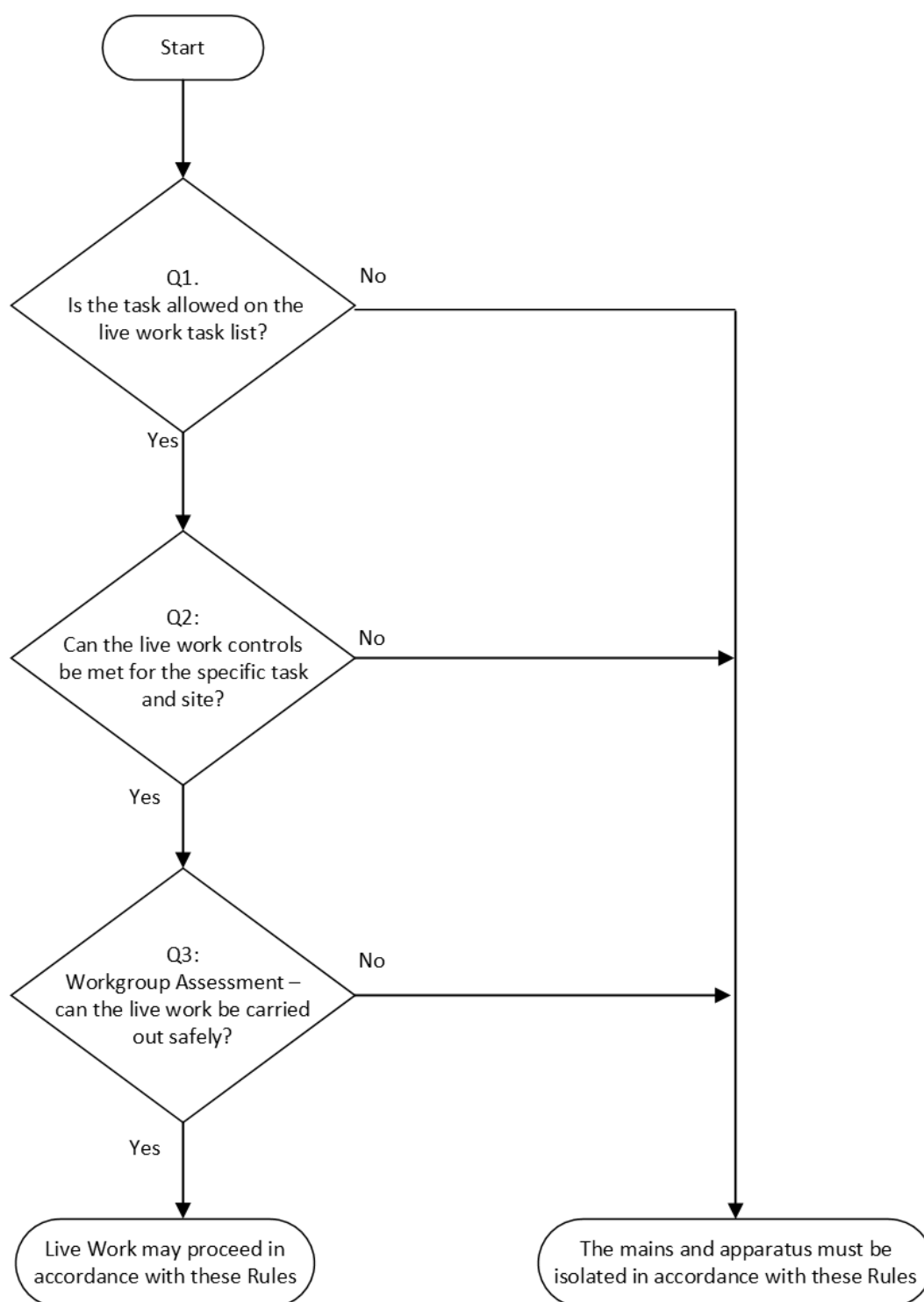


Figure 101 – Flowchart illustrating the LV work planning process

9.5.2 Authorisation for Live LV Work

Authorised Persons

Work on or near live exposed low voltage mains and apparatus may only be carried out by persons who are:

- authorised to work on, near, or in the vicinity of mains and apparatus; and
- electrically qualified; and

- trained, assessed as competent, and authorised by their employer to carry out the task on live LV exposed mains and apparatus.

Apprentices

(Persons employed under an electrical apprenticeship)

Before working on or near exposed live low voltage mains and apparatus, apprentices must:

1. receive practical training in carrying out the task using live work controls, on de-energised or protected equipment in a training environment, and
2. be assessed* as competent to carry out the work on or near live exposed low voltage mains and apparatus under the direct supervision of an authorised person.

*The assessment must be carried out by a person who has both:

- formal qualification in workplace assessment, and
- a thorough knowledge of the task and the required controls.

Once trained and assessed as competent (as detailed above) apprentices may only work on or near live exposed low voltage mains and apparatus under the direct supervision of an authorised person who is:

1. competent to carry out the live work safely, and
2. able to ensure approved live low voltage work procedures are followed.

9.5.3 Operating, Testing/Measurement, and Visual Inspection

If you are carrying out the following activities on or near live exposed LV mains and apparatus:

1. operating work (other than the making and breaking of conductor connections, or installation/removal of bolt-in fuses, via live work methods); or
2. the following testing/measurement - proving de-energised, verifying isolation, identifying neutral, proving polarity, measuring or recording of voltage or current or impedance, verifying correct phasing, cable identification or fault location; or
3. visual inspection,

you must, as a minimum:

- Wear a low voltage insulating glove with leather protective outer glove on each hand; and
- Use approved operating or testing equipment; and
- Wear protective eyewear; and
- Wear a safety helmet; and
- Where you pass between live exposed live low voltage overhead conductors, you must:
 - apply approved temporary insulation to all conductors within reach; and
 - be observed by a safety observer; and
- Follow other approved precautions* to control the risk of inadvertent contact with other live conductors, neutral conductors, or conductive material at earth potential.

*The approval of precautions for these tasks must be by a suitably authorised officer of the employer, following a risk assessment after consultation with persons who have a clear understanding of the work being performed and the risks associated with that work.

9.5.4 Controls for Work on or near Exposed Live LV

If you are carrying out work (other than operating, testing, or visual inspection) on or near live exposed LV mains and apparatus, you must implement all the following control measures:

1. Insulate earth potential

You must insulate yourself from earth potential and insulate any conductive material at earth potential¹ that is within your reach².

¹ Conductive material at earth potential includes, but is not limited to, steel and concrete poles, earth wires and downleads, earthed metal brackets and fittings, metal sheathed or armoured cables, communication cable catenary wires.

² Your reach includes your extended reach with any conductive tools and/or equipment that you may be using.

Insulation from earth potential must be achieved by:

- Working from a timber or fibreglass ladder, pole, or platform, or
- Working from an insulated EWP, or
- Working from an insulating mat³ that complies with Clause 6.2.14, and,
- Applying temporary insulation compliant with Clause 6.2.14 to any conductive materials at earth potential that are within your reach.

2. Insulate all other conductors

You must apply temporary insulation to all other live exposed conductors⁴ that are within your reach², other than the conductor you are working on.

Temporary insulating covers must comply with Clause 6.2.14.

You must visually inspect them prior to use to ensure they are in good condition.

You must adequately secure any temporary insulating cover you apply to exposed conductors, to prevent it being inadvertently dislodged.

Should you, or any mobile plant operating at your worksite, make inadvertent contact with a temporary insulating cover, you must immediately check that the insulating cover has not been dislodged and that no electrical contact has been made or is possible due to the exposure of an uninsulated section of live low voltage mains or apparatus.

Temporary insulation may need to be applied to exposed conductors beyond your reach, depending on the nature of the work being undertaken.

Exception: If you are working on overhead mains from a position below the lowest live overhead conductor (such that the only parts of your body capable of reaching the live exposed conductors are your insulating glove covered hands or forearms) the application of temporary insulation to the low voltage overhead conductors is not mandatory.

For Ausgrid employees, refer to Technical Guide T0089 Electrical Temporary Insulating Covers and Screens, for further information.

3. Insulating gloves

You must wear a low voltage insulating glove with protective leather outer glove on each hand, and you may only make contact with the live exposed conductor with your insulating glove covered hands.

4. One potential at a time

You may only work on one potential at a time.

5. Body separation

You must keep uninsulated parts of your body separated from all conductors – both the exposed conductor being worked on, and the adjacent conductors covered with temporary insulation. (Temporary insulation compliant with Australian Standard AS 4202 is designed to protect against inadvertent contact only).

6. Safety Observer

If you are working on or near live exposed low voltage mains and apparatus, a safety observer must witness your work practices.

The safety observer must be an electrically qualified authorised person who knows the hazards and appropriate safety controls associated with the work.

The safety observer must have satisfactorily completed initial or annual refresher training and assessment in the following national units of competence:

- a) provide first aid in an ESI environment (UETDTRRF10).
- b) release and rescue of a person from live apparatus as appropriate to the work being undertaken e.g. rescuing a person from a pole (UETDTRRF02), EWP (UETDTRRF03), steel tower (UETDTRRF04), or low voltage panel (UETDTRRF06).

³ If an insulating mat is not suitable due to the work environment (e.g. wet conditions where water or mud would short circuit the mat) workers may insulate themselves from earth by wearing rubber gumboots that comply with Clause 6.2.5 – provided they remain standing or squatting during the live work

⁴ "Other conductors" include, but are not limited to, neutral conductors, conductors of unlike phases of the same distributor, all conductors of a different distributor, street lighting conductors, any conductive material at a different electrical potential to the conductor being worked on. If you are working on or near a neutral conductor, and there is a live exposed low voltage conductor at a different potential within 0.5m you must treat the neutral conductor as live.

- c) provide cardiopulmonary resuscitation (HLTAID001)

Role of the Safety Observer

A safety observer for live low voltage work must:

- a) Ensure the appropriate safety controls are implemented and monitored for compliance as far as reasonably practicable and alert the live workers to any unsafe actions that may inadvertently occur.
- b) Be in a position where they can adequately visually monitor the work. If the observer is unable to maintain clear vision of the live work, a secondary safety observer must be appointed to assist.
- c) Maintain effective and immediate communication with the live worker(s) while the live work is in progress. Communication aids such as two-way radios may be required in some environments.
- d) Be able to stop the work if necessary. The safety observer has the authority to temporarily stop the work at any time, to allow the work team to review their actions and controls.
- e) Be prepared to perform or assist in a rescue. If observing workers carrying out live work from an EWP with remote base controls, the safety observer must have the EWP remote base controls readily accessible and within 2m of them, while live work is in progress.
- f) Ensure, so far as reasonably practicable, that unauthorised persons remain clear of the immediate worksite.

A single safety observer may monitor more than one live worker, provided the workers are at the same location (e.g. the same pole or EWP), working on the same task and electrical potential, and site conditions allow.

A safety observer for live low voltage work **must not**:

- a) Be inattentive or distracted.
- b) Carry out any other activity while observing.
- c) Be located within the Minimum Safe Working Distance from live low voltage mains and apparatus.
- d) Be located in the work basket of an EWP. (A secondary observer may be located within an EWP basket to assist the observer, if the observer is unable to clearly view the work being undertaken).

Requirements for the Work Group

The workgroup must:

- a) Know who is fulfilling the role of the safety observer at any given point during the live work.
- b) The workers carrying out the live work must:
 - i) Maintain effective and immediate communication with the safety observer at all times. (Communication aids such as two-way radios may be required in some environments).
 - ii) Where intended critical steps in the live work process may not be reasonably foreseen by the safety observer, workers must inform the observer of such intended steps prior to carrying them out.
 - iii) Listen to any advice, warning, or direction given by the safety observer and take appropriate action.

Exemption: (To the requirement for, or electrical qualification of, a safety observer)

You may work within 0.5m from live exposed low voltage mains and apparatus without a safety observer, or with a safety observer who is not electrically qualified, only if the following conditions are met:

- a) A documented risk assessment details the appropriate risk controls measures so the work can be carried out safely without an observer, or with an observer who is not electrically qualified, and
- b) Safe methods of working and documented procedures are approved⁵ for the work without a safety observer, or with an observer who is not electrically qualified, for example:
 - i) Approved operating work.
 - ii) Carrying out the following testing (proving de-energised, verifying isolation, identifying neutral, proving polarity, measuring voltage or current, verifying correct phasing).

⁵ The approval of Safe Work Methods must be by a suitably authorised officer of the employer, after consultation with persons who have a clear understanding of the work being performed and the risks associated with that work.

- iii) Emergency disconnection of overhead service cables (when working aloft below the lowest exposed low voltage conductor).
- iv) Visual inspection of mains and/or apparatus.

7. Rescue kit

A rescue kit appropriate for the type of work being undertaken must be readily available and accessible to the safety observer at each location where live work is being carried out.

8. Personal Protective Equipment (PPE)

In addition to wearing low voltage insulating gloves as required in section c) of this clause, you must wear the following PPE when carrying out work on or near live exposed low voltage mains and apparatus:

- a) Full length arc rated clothing - compliant with Clause 6.2.3;
- b) Protective eyewear – compliant with Clause 6.2.4;
- c) Safety helmet (hard hat) - compliant with Clause 6.2.6;
- d) Safety footwear – compliant with Clause 6.2.5.

9. Covered tools

Portable hand tools used for work on or near live exposed low voltage mains and apparatus should be covered with appropriately rated insulation that is in good condition, wherever reasonably practical.

You must securely store tools and other conductive objects which could fall onto live exposed conductors. (Objects falling from pockets are particularly hazardous).

10. Working together

When working together on or near live exposed low voltage mains and apparatus with another worker you must both work on the same electrical potential wherever reasonably practicable. If this is not reasonably practicable, you must maintain a minimum of 500mm separation between workers, and not pass conductive material from one to another.

9.5.5 Mobile Plant near Live Exposed LV

This section provides the controls required, in addition to the controls required by Section 7.5, for the operation of uninsulated mobile plant near live exposed LV mains and apparatus (i.e. within the approach distances of Table 22 Column D).

Refer to Clause 10.2.3 for the requirements for the operation of mobile plant within 500mm of insulated overhead mains.

Training

The mobile plant operator and observer must have completed the training required for an authorised person, as set out in Clause 7.5.2.

Controls

In addition to the controls of Section 7.5 the following controls must be applied.

a) Temporary insulation

All exposed conductors, at an electrical potential other than earth potential, must be covered with temporary insulating covers compliant with Clause 6.2.14.

The temporary insulating covers must be applied to all exposed conductors within an area at least 0.5m greater than the reasonably foreseeable planned operating envelope of the mobile plant and load.

b) Contact with the exposed conductors

Persons controlling the mobile plant must not allow any part of the mobile plant or load (other than a timber or composite fibreglass pole) to make contact with the temporarily insulated exposed conductors.

Should any contact occur between any mobile plant or load and a temporary insulating cover, the electrically qualified worker supervising the work must immediately check that the insulating cover has not been dislodged and that no electrical contact has been made or is possible with a section of exposed live low voltage mains or apparatus.

Note: If a timber or composite fibreglass pole is to remain, once erected, in contact with an exposed conductor covered with temporary insulation - the temporary insulating covers must be

adequately secured at the point of contact to prevent possible movement of the temporary insulating covers allowing exposed conductors to come into contact with the pole.

c) Contact with the mobile plant and loads

Mobile plant operator

The controls of Clause 7.5.5 apply for the mobile plant operator contacting the mobile plant and the ground or earthed situation at the same time.

Authorised persons

The controls of Clause 7.5.5 apply for authorised persons in contact with plant & loads that are within the approach distances of Table 22 Column D from live exposed LV conductors covered with temporary insulation but not in contact with them.

If a timber or composite fibreglass pole comes into contact with live exposed LV conductors that are covered with temporary insulation, workers on the ground or in an earthed situation may only make contact with the pole if they are wearing LV insulating gloves or gumboots.

d) Supervision

All work utilising mobile plant near live exposed LV mains and apparatus must be carried out under the direct supervision of an electrically qualified worker who is authorised to carry out work on or near the live exposed LV mains or apparatus.

Note: The supervising electrically qualified person may fulfil the role of the safety observer for the mobile plant.

9.5.6 Ausgrid Low Voltage Live Work Manual

In addition to these Rules, Ausgrid employees must also refer to and comply with the Ausgrid low voltage live work manual, for work on or near live exposed low voltage mains and apparatus.



Figure 102 – Applying temporary insulation to low voltage overhead mains

9.6 High Voltage Work - Isolation

This section describes isolation of high voltage (HV) mains and apparatus, isolation by making a break in the circuit and using locking devices to secure isolation.

9.6.1 Isolating High Voltage Mains and Apparatus

Isolate HV mains and apparatus from a source of supply by making a break in the electrical circuit, for example:

- at a switch or isolator
- by withdrawing fuses or opening links
- by removing or separating connections.



Figure 103 - Open 132kV isolator with closed earthing switch

Ensure the method of isolation is approved and appropriate to the voltage involved.

Separation distances between the contacts or connections must be no less than the minimum fixed clearances (described in Clause 7.4.1).

9.6.2 Isolation by Operating a Switch

If a switch cannot be withdrawn or mechanically locked open (e.g. at HV links which are manually operated by link sticks), apply an operator danger tag that must be:

- clearly visible for anyone attempting to operate the switch
- in a secure position to avoid removal or damage.

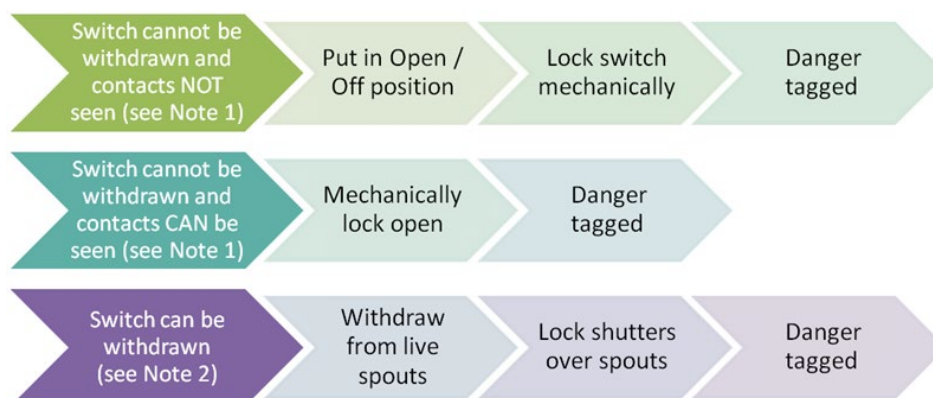


Figure 104 - Precautions taken when operating a switch to isolate high voltage mains and apparatus.

Note 1: If the switch operating shaft cannot be locked, lock any covers preventing access to the switch operating shaft and apply an operator danger tag.

Note 2: For solid insulated switchgear (or insulation enclosed switchgear where removable switch-caps are withdrawn), prevent access to live contacts by securing dust caps in an approved manner.

Note 3: Make remote switch control circuits inoperable using one of the following:

- open, lock, and danger-tag an isolation control switch at the site where the point of network isolation is located
- remove fuses or opening links and apply operator danger tags.

Note 4: Where switches used as points of isolation are spring, hydraulically or pneumatically operated, discharge the stored energy (unless specifically requested), so the switches cannot be accidentally closed.

When using an access permit to work on a switch, leave the stored energy charged only when:

- the recipient of the access permit requests that the switch's stored energy is left charged
- the stored energy is left charged relative to an approved operating procedure.

Note 5: Isolation by making the break in the circuit in a medium other than air—such as oil, sulphur-hexafluoride, vacuum, or solid insulation (unless approved)—is not suitable for the application of HV for test purposes.

Insulating mediums other than air are not suitable for work or other tests which involve the removal of earthing and short-circuiting equipment at the point of isolation. Without special approved precautions, do not remove earths from solid insulation enclosed switchgear (e.g. Hazemeyer, Krone) which is considered to have the break in a medium other than air.

Note 6: When isolating by opening HV drop-out fuses, refer to the approved procedure (e.g. operating instructions).

9.6.3 HV Lines with Limited Isolation Points

On some overhead HV lines in the Hunter area, there are limited points of HV isolation. Isolation of all distribution substations between HV isolation points, or from a HV isolation point to the end of the HV line, would take an unreasonable time and cause unacceptable customer interruption duration.

In those situations (where it is not reasonably practicable to isolate from all possible sources of supply from LV customers supplied by substations on the HV line) the isolation, earthing and short-circuiting requirements for provision of an access permit on 11kV/12.7kV SWER/22kV mains and apparatus (and associated LV distributors) are as follows:

- The HV mains and apparatus must be isolated from the HV network;
- Access permit earths must be erected either side of the worksite; .
- Between the access permit earths, all distribution substations must be isolated from possible sources of LV supply, or the LV distributors from these substations must be isolated and shorted as required by Clause 9.2.3.

Outside the access permit earths (between the access permit earths and points of isolation from the HV network and between the downstream access permit earths and the termination of the overhead line), the following substations must be isolated:

- all distributions substations with interconnections to substations outside the isolation area;
- all substations supplying customers with known distributed energy resource capacity greater than 10kW per phase;
- all distribution substations with a capacity greater than 200kVA;
- for 12.7kV SWER lines – any SWER distribution substation within 150m of an access permit earth.

Other distribution substations outside the access permit earths need not be isolated.

9.6.4 Using Locking Devices to Secure Isolation

A locking device applied by a Class 1 Operator must only be unlocked and removed by a Class 1 Operator.

A locking device applied by a restricted operator must only be unlocked and removed by:

- the restricted operator who applied the locking device
- an authorised person with the approval of both the restricted operator who applied the locking device and the System Operator.

Take precautions (such as locking and danger tagging) to prevent the following unauthorised or unintentional activities:

- closure of switches (including isolators)
- closure of circuit breakers
- insertion of fuses
- reconnection of links or other connections.

Do not force or override interlocks which form part of the locking process and ensure that the correct operating sequence is carried out and inappropriate access to equipment is prevented.

Locking can be done with a keyed locking device or by a suitable interlock incorporated into the switch operating mechanism.



Figure 105 - Applied locking devices

9.7 High Voltage Work - Proving De-energised

This section describes proving high voltage (HV) conductors are de-energised.

9.7.1 Proving High Voltage Conductors are De-energised

Prove that HV conductors are de-energised by using approved methods and detecting equipment with appropriately rated and tested operating rods and sticks. Only use the detecting equipment within the limits of its marked voltage rating.

Check the detecting equipment to prove it is in proper working order immediately before and immediately after proving that the HV conductors are de-energised.



Figure 106 - Checking HV detector

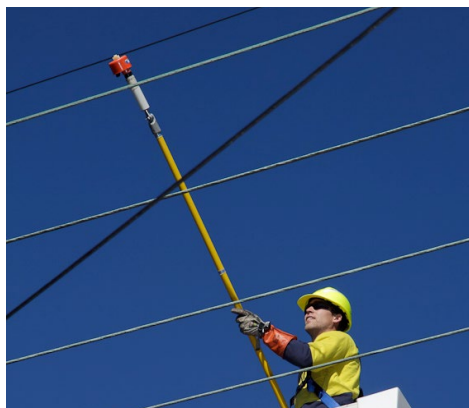


Figure 107 - Proving HV conductors are de-energised

9.8 High Voltage Work - Earthing and Short Circuiting

This section describes earthing and short-circuiting of mains and apparatus.

9.8.1 Earthing and Short-Circuiting - General

HV conductors are considered earthed where:

1. there is a continuous electrical connection to the general mass of earth; and
2. the electrical path does not pass through a fuse; or

3. the electrical path does not pass through a transformer (except a current transformer), a reactor, a powerline carrier wave trap, or any apparatus that provides a relatively high impedance.

Earthing and short-circuiting equipment must be rated to carry the prospective peak fault current for a length of time equal to the clearing-time of back-up protection.



Figure 108 – Portable earthing and short-circuiting equipment

Access Permit Earths

Rule: Earthing and short-circuiting equipment must be applied between all points of HV isolation and the worksite. These earths are known as access permit earths and must be listed on the access permit.

Exception: See Clause 9.8.2 for the requirements for earthing busbars in a substation.

Where a point of isolation of HV mains and apparatus is made on the LV network (such as distribution substation LV fuses), it is not necessary to apply earthing and short-circuiting equipment between the LV point of isolation and the worksite. Apply earthing and short-circuiting equipment between all HV points of isolation and the worksite.

At least one set of access permit earths must be as close as practicable to the worksite.

Training

Workers must be trained, and assessed as competent, to erect earthing and short-circuiting equipment.

The application of access permit earths must be carried out by a suitably authorised operator, or by a trained and competent person under the direct supervision of an appropriately authorised Operator.

Working earths may be applied by the access permit recipient, or by trained and competent workers under the direct supervision of the access permit recipient.

Proving De-energised

Rule: HV conductors must be proved de-energised immediately before applying the earthing and short-circuiting equipment.

Exceptions: There are three exceptions to the need to prove mains and apparatus are de-energised immediately prior to the application of earthing and short-circuiting equipment, as detailed below:

1. Where the conductors are fully enclosed and cannot be proved de-energised - and an integral earthing and short-circuiting switch is used.

Note: The fault making capacity of the switch must be fully rated for the prospective peak fault levels. Earthing switches associated with non-withdrawable circuit breakers need not be fully rated for the prospective peak fault levels if they are interlocked with the feeder and busbar disconnectors on each side of the circuit breaker. These earthing switches can be closed only after the circuit breaker and disconnectors are opened. The interlocks must be fully operational.

2. The recipient of an access permit may apply working earths to overhead mains without proving the mains are de-energised, only if:
 - a) There are existing earths (access permit earths or working earths) on the same line within sight; or
 - b) The recipient visually traces the overhead mains from existing earths to the site of the proposed working earths, and the visual trace is verified by a second person.If this cannot be done, the line must be retested before the application of working earths.
3. Where the conductors cannot be proven de-energised and alternate controls are approved by the Head of Asset Risk and Performance.

9.8.2 Earthing and Short-Circuiting - Mains and Apparatus other than Overhead Lines

Prior to issuing an access permit, the following apparatus must be earthed and short-circuited as set out below:

- Pole transformers (**PT**) directly connected to underground cables (e.g. 'Q type' PTs)—where an access permit is issued for this type of PT, or a test will be carried out on the HV cable, apply additional earthing and short-circuiting equipment to the HV conductors between the cable sealing ends and the drop-out fuses at the PT.
- For access permits issued at a distribution centre for work on:
 - Insulation enclosed switchgear or solid insulation switchgear—apply earthing and short-circuiting equipment to the feeder connections at the worksite to show that the mains and apparatus are de-energised. The transformer connections can be directly earthed through the transformer fuse terminals.
 - Metal clad ring main units—the feeder earthing switches, and the transformer earthing switches are to be left in the 'Earth On' position but not locked.
- Busbars—apply only one set of earthing and short-circuiting equipment directly to the busbars. It is not necessary to apply earthing equipment between the busbar and each source of HV supply. When the busbar is divided into sections, short-circuit and earth each section before dividing.

A circuit breaker may form part of an electrical path used to earth and short-circuit mains and apparatus, provided the circuit breaker is;

1. Closed, made inoperable, locked, and danger-tagged (if not intended for operation by the recipient); or
2. Closed, made inoperable, and warning tagged (if intended for operation by the recipient).

A switch (other than a circuit breaker or fuse) may form part of an electrical path used to earth and short-circuit mains and apparatus, provided the switch is;

1. Closed, locked (if possible), and danger-tagged (if not intended for operation by the recipient); or
2. Closed and warning tagged (if intended for operation by the recipient).

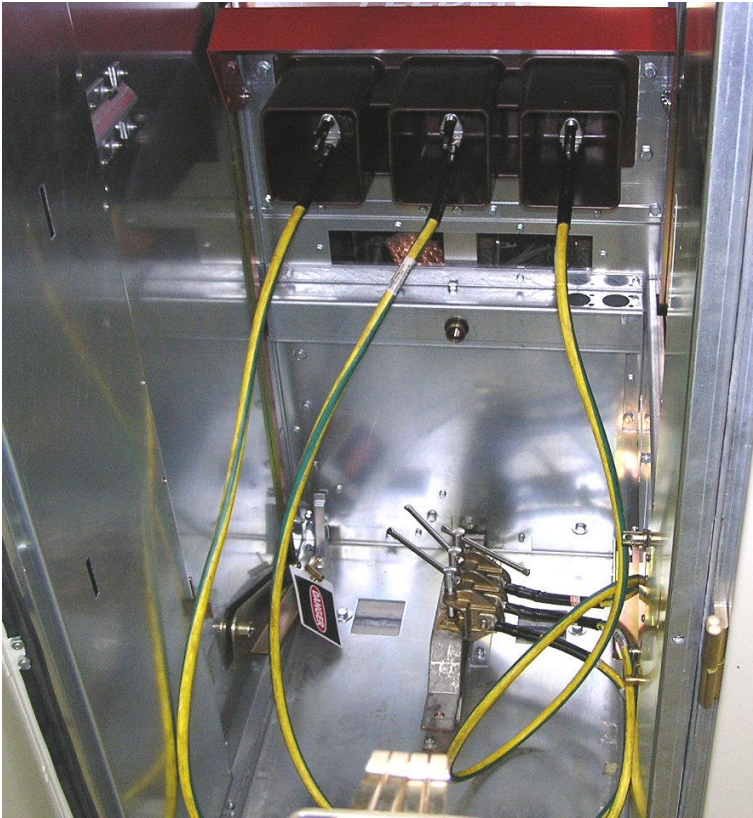


Figure 109 – Earthing applied to 11kV horizontal racking switchgear

Working Earths

In an outdoor switchyard, where both access permit earths and working earths are applied by hand, identify the working earths with a warning tag (see Clause 8.4.5).

9.8.3 Earthing and Short Circuiting – Overhead Lines and Apparatus

Rule: At least one set of earths must be visible to everyone working on or near the overhead line.

Exception: HV ABC and covered conductor thick (CCT) cables which are earthed at the exposed connections or earthing points provided (see Figure 110).

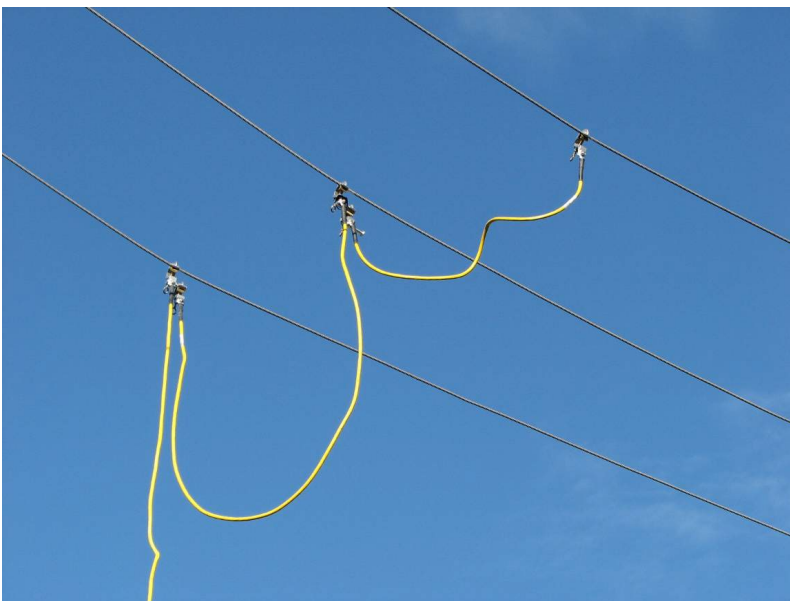


Figure 110 - Three phases earthed and short-circuited on HV overhead line

Applying Earthing and Short-Circuiting Equipment

When applying earthing and short-circuiting equipment, you must work 'from the ground up', that is:

1. Connect the phase-to-earth lead to earth before connecting it to a conductor (always apply the phase-to-earth lead first and remove it last).
2. Connect one end of a phase-to-phase (short-circuiting) lead to a conductor which has already been earthed, before connecting the other end to the next conductor.
3. Always maintain clearances from exposed conductors (as indicated in Chapter 7) until the earth is connected to the conductor.
4. Always use an insulated tool to apply earthing and short-circuiting equipment.

Working Earths

Where the worksite moves from the initial location, the access permit recipient is responsible for the installation of working earths to ensure at least one set of earths are visible to everyone working on the line.

Prior to installing working earths, the recipient must:

- visibly identify an existing set of earths on the same line from the worksite; or
- positively trace the line from the existing set of earths to the worksite and have the trace verified by a second person; or
- if the recipient is a Class 2A, 2At, 2D, 2Dh, or Class 1 operator, the recipient may confirm that the new location is the correct line and within the isolated area – then retest the line to prove that it is de-energised.

Single Wire Earth Return (SWER) Lines

SWER is a single-wire line for supplying single-phase electrical power from an electrical grid to remote areas. In a SWER system, the earth is used as the return path for the current to avoid the need for a second wire (or neutral wire) to act as a return path.

Isolate SWER lines in accordance with the approved work instruction.

When earthing a SWER line, at least one earth connection must be to a permanent earthing facility, or a temporary earth that is proven to have a resistance to earth of less than 25 Ohms (to be proven by standard earth resistance test methods, immediately prior to connection).

If the SWER line is to be divided, any section of line between the worksite and HV point(s) of isolation must have at least one connection to an earth with a proven resistance to earth of less than 25 Ohms. .

SWER lines cannot be protected by sensitive earth fault or earth fault protection, so make a visual inspection of insulators before working on or around SWER poles. Before working on the poles, visually inspect SWER transformer earthing arrangements to confirm it is not visibly damaged.



Figure 111 – A SWER substation

HV Aerial Bundled Cable (ABC)

HV ABC (consisting of insulated conductors which are screened at earth potential) need not be earthed and short-circuited at the worksite, provided you earth and short-circuit conductors between all points of isolation and the worksite using a permanent earthing installation. The necessary steps are illustrated in Figure 112.

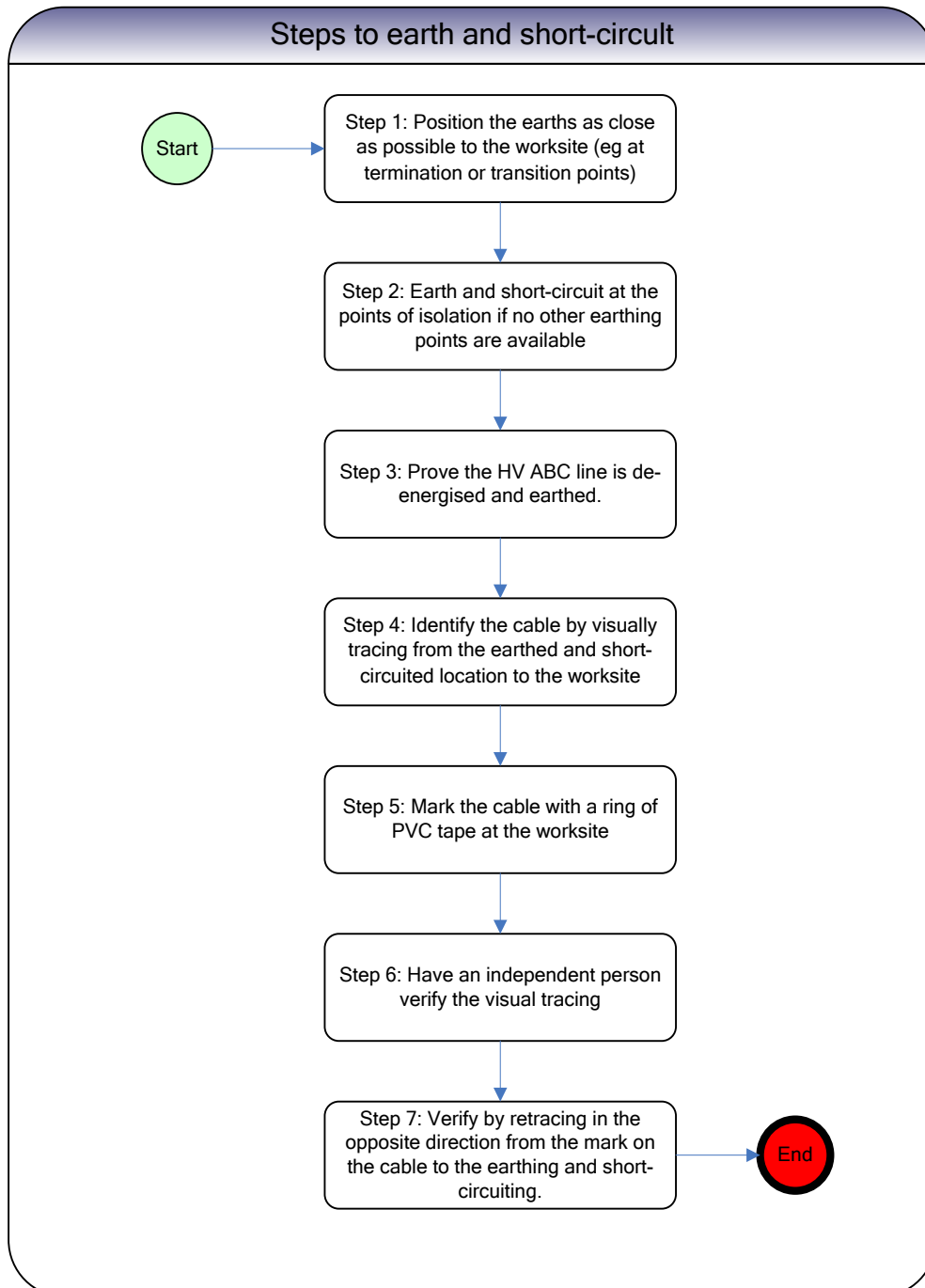


Figure 112 - Steps for earthing and short-circuiting HV ABC (before working on HV ABC)

Where HV ABC has been installed as an underground cable, underground cable identification equipment is to be used to identify the cable.

HV Covered Conductors

You do not need to earth and short-circuit high voltage covered conductors at the worksite if they are earthed and short-circuited between all points of isolation and the worksite (using permanent earthing installation). As an alternative, short-circuit and earth the HV covered conductors by using earthing tags or connectors specially installed for the purpose. The necessary steps are the same as for HV ABC.



Figure 113 - CCT with earthing and short-circuiting equipment

9.8.4 Situations where Earthing and Short-Circuiting Equipment is not Required

For work carried out on isolated HV mains and apparatus (provided the conductors are discharged to earth immediately before the work is started), earthing and short-circuiting is not required for HV mains and apparatus in any of the following situations:

- draw-out type equipment withdrawn clear of live conductors
- mains and apparatus (other than overhead) separated from all possible sources of HV supply by other mains and apparatus which are earthed and short-circuited
- dismantled HV equipment where it is not practical to use fixed earths
- when work involves the application of test voltages
- in approved circumstances, when it is not practical to do the work if earth leads are attached.

9.8.5 Removing Earthing and Short-Circuiting Equipment

Work in Progress

Unless earthing and short-circuiting equipment (specified on the access permit) must be moved or altered, it must remain connected while work is in progress. The only possible exceptions are as follows:

Exception 1: The System/Area Operator can give approval for workers to remove earthing and short-circuiting equipment before work is finished when either of the following applies:

- the work involves dismantling of isolated HV equipment and it is therefore impossible to use earthing and short-circuiting equipment.
- the applied earthing and short-circuiting equipment would prevent the work being done.

Exception 2: Provided the requirements for isolation will be met, the recipient of an access permit may partially or completely remove any earths applied by hand (or left intentionally unsecured) to do any of the following:

- perform protection system checks
- identify underground cables
- check phasing on underground cables
- locate faults on underground cables
- apply test voltages
- clean spouts or repair shutter gear.

Ensure the requirements of the following clauses are also followed:

- Clause 9.6.1 - Isolating High Voltage Mains and Apparatus
- Clause 10.6.3 - Testing with the Earth and Short-Circuit Removed
- Clause 10.6.2 - Applying Hazardous Voltages for Testing.

In the case of Exception 1 or Exception 2, the person who removed the earthing and short circuiting must restore the earthing and short-circuiting equipment as soon as possible.

Ensure that the recipients of all other access permits on issue (as listed on the access permit folder) are notified prior to removing the earths.

Note: In all other cases, where earthing and short-circuiting must be moved or altered, the existing access permit must be cancelled and a new one issued.

Work Completed

An operator within the limits of their operating authority, or a person under the supervision of a Class 1 Operator, can remove the earthing and short-circuiting equipment listed on the access permit when the work is finished and after the access permit has been cancelled.

Overhead access permit earths may be removed by trained and competent workers under the direct supervision of an appropriately authorised Operator.

Overhead access permit earths may also be removed by the recipient if approval is given by the System/Area Operator. In this case the recipient must only remove those access permit earths that were applied for the issue of their access permit.

The following process must be followed.

- The recipient must contact the System/Area Operator to gain approval to remove the access permit earths and confirm they are not required for another access permit which is on issue on the mains and apparatus.
- All members of the workgroup must then sign off the access permit. (The recipient must not commence removing the access permit earths until all members of the workgroup have signed off the access permit.)
- After all members have signed off, but prior to cancelling the access permit, the recipient removes the access permits earths.
- The recipient must then note on the access permit the specific access permit earths that have been removed
- The recipient must then cancel the access permit and advise the System/Area Operator.



When an earthing switch has been used to earth and short-circuit equipment (and has been locked on and danger-tagged as an access permit earth by a Class 1 Operator), the earthing switch must only be unlocked (and the earthing and short-circuiting removed) by a Class 1 Operator.

9.8.6 Equipotential Bonding

Equipotential bonding is used, in addition to access permit earthing, and working earths, to protect workers from induced voltages or transferred earth potentials. (See Section 9.11 for further information on the need for, and application of, equipotential bonding).

Workers must either wear LV insulating gloves or use insulated tools while attaching and removing equipotential bonds.

9.9 High Voltage Work – Cables

This section describes the requirements for identifying and remotely cutting high voltage (HV) cables and sub-transmission cables before starting work.

Only begin work on HV cables when:

- the standard requirements of Clause 9.1.3 are met;
- the cables are positively identified at the worksite (see Clause 9.9.3); and
- the cables are remotely cut at the worksite (see Clause 9.9.4).

9.9.1 Cutting Cables, Conduits or Cover Strips

To prevent damage to any adjacent buried cables, you must excavate removable soil or backfill to a minimum radius of 200mm around any cable, conduit, or cover strip, before cutting it. Additional precautions such as physical barriers may also be required to prevent damage to adjacent cables.

Note: Refer to Network Standard NS156 – Working Near or Around Underground Cables for the requirements for excavation near Ausgrid underground cables.

9.9.2 Excavation of Faulted Underground Cables

All workers involved in the excavation of faulted underground cables, within the following distances from the cable:

1. below a depth of 150mm above the cable cover strip (identified by hand excavated “pot holes”); or
2. within 300mm of the cable;

must sign onto the relevant access authority/permit issued for the testing and/or repair of that cable, before commencing work.

9.9.3 Identifying High Voltage Cables Before Starting Work

Where it is reasonably practicable, a worker who is authorised to identify underground cables must identify the cable(s) using one of the methods in Table 33.

The cable identification must be verified by a second authorised person.

Table 33 - HV cable identification methods

ID	Method	Description
a	Visual identification	Visually trace the cable along its entire length from the point where it has been isolated, earthed, and short-circuited to the work site. For HV ABC and CCT, you must see and visually trace the cable to the worksite from the visible earthing and short-circuiting equipment which has been applied to the exposed conductors (see Figure 113).
b	Signal generation and detection	Use an approved signal generator and associated signal detector, in accordance with Technical Guide T0003 – Cable identification and Phasing. For two or more cables laid together, uncover all the cables and apply the detector to them all before the identification is accepted. For multi-core cables, the identification must also be confirmed by tracing the lay or roll of the cores for maximum signal strength.
c	Fault location tests	Apply HV to the faulty core or sheath and identify the generation of smoke, flame or sparks, or other clear evidence of a breakdown at a fault at the worksite.
d	Conduit “rodding”	Where a cable in a conduit cannot be identified using methods b) or c), the cable may be traced by “rodding” (inserting non-conductive rod(s) into the conduit).

Note: If it is not reasonably practicable to identify the cable(s) using one of the methods in Table 33, the remote cutting of the cable(s), as required by Clause 9.9.4, may proceed only if a proposal detailing:

- the reasons why the cable identification methods in Table 33 are not reasonably practicable to implement;
- the available cable information; and
- the alternate controls that have been, or will be, implemented to confirm the correct cable is to be remotely cut;

is endorsed by System Control and approved by the Level 3 Ausgrid manager (or their delegate) of the workgroup carrying out the work or submitting the NAR.

9.9.4 Remote Cutting of High Voltage Cables

Immediately after the identification, remotely cut the cable:

- using approved equipment (See Clause 6.2.22)
- in the presence of the person who is going to do the work and
- at the point where the work will be done,
- in accordance with the Ausgrid Technical Guide T0031 – Remote Cable Cutting Equipment.

Note: Steel wire armour may be removed, if required, to allow the cable to be remotely cut.

Exception: It is not necessary to remotely cut a high voltage cable where work is not being performed on the cores (e.g. for serving or sheath repairs).

9.9.5 Identifying Sub-transmission Cables before Starting Work

Where it is reasonably practicable, the cable(s) must be identified, by a worker who is authorised to identify underground cables, using at least two (2) of the methods in Table 34 in accordance with the order of preference in Table 35.

The cable identification must be verified by a second authorised person.

Table 34 – Identifying sub-transmission cables

ID	Method	Description
a	Signal generation and detection	Use an approved signal generator and associated signal detector, in accordance with Technical Guide T0003 – Cable Identification and Phasing.
b	Fault location tests (from end of cable)—capacitor discharge	Apply HV to the core at the end of the cable and identify the generation of smoke, flame or sparks, or other clear evidence of a breakdown at a fault at the worksite.
c	LV 50 Hz current injection at the end of the cable	Inject an interrupted 50 Hz current into the cores and measure the current with a tong ammeter or similar device at the worksite.
d	LV audio frequency or 50Hz current injection into a metallic sheath	Apply the same method as described in tests a. and c. to identify cables with insulated sheaths by isolating the cable sections at the sheath link box positions. Cable link boxes may be identified by permanently affixed labels that provide the correct feeder number as per the System Diagram.
e	Direct current simulated sheath fault location test—pool of potential	Apply HV to the sheath at the end of the cable and identify the generation of smoke, flame or sparks, or other clear evidence of a breakdown at a fault at the worksite.
f	Visual identification	The supervisor and another worker see and visually trace the cable to the worksite from the visible earthing and short-circuiting equipment which has been applied to the exposed conductors. Where the cable is in a conduit the visual trace may be achieved by “rodding” (inserting non-conductive rod(s) into the conduit).
g	Identification by plans	Identify the cable from cable route plans, provided that the route plans are considered a true record.
h	Detection of oil or gas leaks	Identify by positive evidence of major gas or oil leaks, or a primary fault with a corresponding rapid reduction of oil or gas pressure.

Table 35 – Order of preference for methods of identification for sub-transmission cables (from Table 34)

Preferred	Use method (a) with either method (b) or (c)
Alternate	Repeat (a) or (b) from a different location or from the same location, but with different personnel.
	Use a combination of any two of methods (a) through (f).
	Use one of the methods in (a) through (f) plus either (g) or (h).
Exception	You must not use (g) and (h) together as the two methods.

Note: If it is not reasonably practicable to identify the cable(s) using the methods required by Table 34 and Table 35, the remote cutting of the cable(s), as required by Clause 9.9.6, may proceed only if a proposal detailing:

- the reasons why the cable identification methods as required by Table 34 and Table 35 are not reasonably practicable to implement;
- the available cable information; and
- the alternate controls that have been, or will be, implemented to confirm the correct cable is to be remotely cut;

is endorsed by System Control and approved by the Level 3 Ausgrid manager (or their delegate) of the workgroup carrying out the work or submitting the NAR.

9.9.6 Remote Cutting of Sub-transmission Cables

Immediately after the identification, remotely cut the cable:

- using approved equipment (See Clause 6.2.22)
- in the presence of the person who is going to do the work and
- at the point where the work will be done.

consistent with the requirements and methods of the Ausgrid Technical Guide T0031 – Remote Cable Cutting Equipment.

Note: Steel wire armour may be removed, if required, to allow the cable to be remotely cut.

Exception: It is not necessary to remotely cut a sub-transmission cable where work is not being performed on the cores (e.g. for serving or sheath repairs).

9.10 Specified Customers

This section describes low voltage (LV) and high voltage (HV) isolation from a specified customer and apparatus owned by a specified customer.

9.10.1 Ausgrid Specified Customers

Specified customers are large customers that routinely interface with Ausgrid.

There are two categories of specified customer in Ausgrid—Category 1 and Category 2:

- Category 1—Individual customers or groups of multiple occupancy customers who are supplied at HV.
- Category 2—Individual customers or groups of customers who are supplied at LV via a common set of mains directly from an Ausgrid distribution centre.

Details of specified customers are stored on the key customer contact management (KCCM) system maintained by the Customer Liaison Officers in each regional area.

9.10.2 Isolation from a Category 1 and Category 2 Specified Customer

To isolate Ausgrid mains and apparatus from a specified customer's mains and apparatus, ensure you comply with the requirements of these Rules (particularly Clause 9.1.3) and take any necessary precautions, including:

- applying Ausgrid's locking devices (if the equipment can be locked) and danger tags
- prove de-energised and apply earthing and short-circuiting equipment, where appropriate. (**Note:** LV shorts are not suitable for use on LV direct distributors).
- receive an operating agreement from the customer or their representative
- issuing an access permit (**Note:** a clearance to work may be issued for work by or for Ausgrid on interconnections with category 2 specified customers – direct distributors).

Ensure the representative or contractor of the specified customer is authorised to carry out the isolation on the specified customer's installation.

9.10.3 Apparatus owned by a Specified Customer

To isolate the specified customer's equipment from Ausgrid's mains and apparatus, follow the isolation procedures in Clause 9.2.1.

The Ausgrid operator carrying out the isolation must take any necessary precautions, such as:

- applying Ausgrid locking devices (if the equipment can be locked) and danger tags
- prove de-energised and apply earthing and short-circuiting equipment (where appropriate)
- issue an appropriate access authority, but only to an authorised representative of the specified customer or an electrical contractor employed by the specified customer.

The operator must explain the precautions taken for the isolation to the representative or contractor before the access authority is handed to the representative or contractor.

The representative or contractor of the specified customer does not need authorisation before accepting the access authority to allow work on LV mains and apparatus.

9.11 Earth Potential Rise and induced Voltage Mitigation

This section describes the dangers of induced voltages, earth potential rise, step, and touch potential, and transferred earth potential. Precautions are reviewed for work on overhead lines, underground cables, and in switchyards.

9.11.1 Hazard Conditions

There are several potentially hazardous conditions routinely found on equipment connected to the electrical network including earthing conductors and interconnected structures. These hazardous conditions include:

- earth potential rise (EPR) and the resulting step and touch potential
- induced voltages (including magnetic induction and capacitance)
- transient voltages (from lightning and some high voltage (HV) switching surges).

While these conditions are more likely to be found during a fault somewhere on the electrical network (or during storm conditions), they can also occur during normal working conditions. Earth faults can result where the insulation of the electrical system breaks down.

Potential causes of hazards include bush fires, wires falling down, cables damaged during excavation, animals climbing or approaching the network, or by tree branches touching wires during a rain or wind storm. These events occur regularly on the network (as frequently as once a week—more in some locations).

These hazards exist even though the fault can be at an entirely different (even remote) location. Take appropriate precautions and ensure that you have the correct network access requirements before working on or adjacent to the electrical network.

Certain parts of the electrical network (such as cable screens, earth continuity conductors and neutral conductors) must remain earthed whenever in service. They should not be disconnected from earth unless required as part of replacement or planned work.

9.11.2 Induced Voltages

Induced voltages can occur in overhead lines, underground cables, or in switchyards. Wherever a line is adjacent to or connected to lines/cables which run near live parts of the system, induced voltages can develop (particularly if a fault occurs on the other line). Induced voltages most often occur between an energised line and a non-energised line but can occur wherever there are parallel conductors. Electrical induction transfers energy by using either of the following:

- magnetic field (where there is current in a live line, other nearby lines or earth conductors can induce current or voltage even if they are earthed)
- electric field or capacitance (nearby energised lines can induce charges on equipment, out of service lines, or even people).



Figure 114 - Transmission lines running close together may cause induced voltages by magnetic induction or by capacitance.

Overhead Lines – Induced Voltages

Induced voltages may occur (especially during fault conditions) in the following:

- aerial pilot cables and earth wires
- communication cables
- out of service power cables
- overhead conductors
- cable sheaths
- cross-bonding cables
- steel and concrete poles
- double-circuit lines
- lines running together for part of their length
- catenary wires
- pipelines
- conveyors.

Induction hazards most likely occur on dual circuit lines and under-built lines (e.g. 11kV line on same poles as 33kV line). Higher levels of induction depend on the length of sub-transmission lines, higher loads, and fault current levels. Where any overhead line is in the vicinity of another line (of any voltage with a high load current or during a fault), hazardous induced voltages can occur.

Example: Induced voltages can be produced when links are removed or replaced in the end boxes of tail-ended transformers, or when moving earths during testing.

Underground Lines - Induced Voltages

Hazardous voltages can be induced in any underground power, pilot or communications cable (of any voltage rating) where they run close together with any power cable. Examples include:

- sub-transmission HV cables
- RailCorp cables
- Sydney CBD 11kV cables
- pilot cables
- low voltage (LV) cables.

This mechanism is most likely to present a hazard when the affected asset is adjacent to single-core insulated sheath cables (including associated pilot cables). The earth connection to cable screens of in-service circuits is of critical importance to the safe operation of the circuit.

High Voltage Switchyards – Induced Voltages

Voltages can be transferred (capacitively coupled) from exposed HV busbars and lines in substations to workers and metallic objects. These voltages can be managed by bonding to the substation earthing system. Typical examples include trailing earths to mobile plant or scaffolding.

9.11.3 Earth Potential Rise

Earth potential rise (EPR) occurs when electrical current enters the ground (e.g. due to a flash over or fallen or damaged cables). The voltages produced by an earth potential rise can be hazardous to personnel and equipment. The earth potential is highest at the point where the current enters the ground, and declines with distance from the source (i.e. potential gradient).

The earth potential rise also occurs at the substation to which the earth fault current returns. Metal objects can also transfer the earth potential rise to locations remote from the fault (see Clause 9.11.5).

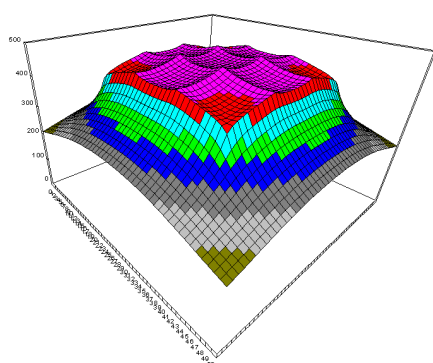


Figure 115 - Soil voltage response from an earth potential rise

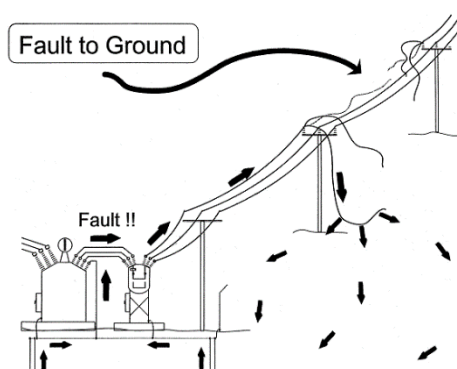


Figure 116 - Earth fault current flow

9.11.4 Step and Touch Potential

Step and touch potential are shock hazards resulting from an earth potential rise.

Step potential occurs when you have your feet at different points in the potential gradient. The resulting potential difference can result in a shock.

Touch potential is the potential difference between the ground on which you are standing and a metal object which might be touched (such as a fence, a water tap or earthed equipment in the electrical network).

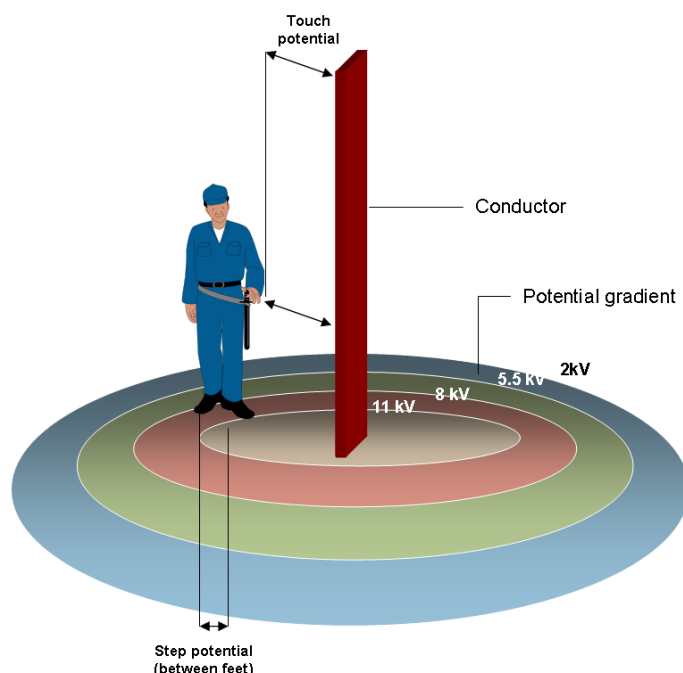


Figure 117 - Soil potential rise gradient illustrating step and touch potential

9.11.5 Transferred Earth Potential

During fault conditions, the earth potential rise can be transferred along any conductor to a remote location. A person may receive a shock by touching the conductor and the local soil. Conversely a conductor may transfer a remote low potential into a high soil potential area also creating a touch voltage hazard.

Some examples of transferred earth potential rise include:

- metal pipes (water or gas pipes) especially if the pipes are earthed
- copper (or other metallic) wires, such as cable screens or armouring
- fencing (especially if a neighbouring fence connects to a substation fence)
- railway lines
- underground cables
- concrete (such as a steel reinforced concrete driveway next to a substation).

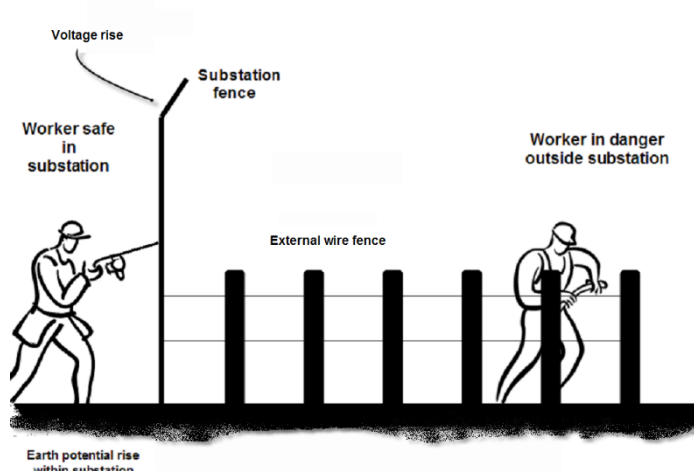


Figure 118 - Transferred earth potential from a substation along an external wire fence

9.11.6 Lightning

During a lightning strike, large voltages and currents can be transferred onto other equipment and to remote locations of the network. Lightning transient voltages and currents can present a serious hazard.

Workers must cease work on or near mains and apparatus when there is nearby lighting activity. Work may only resume once the storm has passed. Consideration must also be given to the location of the storm and the associated affected network.

9.11.7 Risk of Shock

All these hazards can present dangerous conditions to workers accessing the electrical network. The risks can be managed by using the following:

- access permit earths
- working earths
- appropriate work methods, such as:
 - considering the specific hazards to the specific task/job
 - developing task or job specific work procedures to mitigate the hazards
 - completing a written risk assessment.

Even where appropriate mitigation options are employed, some risk of shock remains when working on overhead lines, underground cables/conductors, or in electrical substations.

There is no one solution to address induction and earth potential hazards on all electrical assets for all types of work. It is important to address the risks to ensure safety and this must be done considering the specific hazards to the specific task/job.

These hazards (and the subsequent risk) are partially addressed by isolating and earthing the network prior to access. Task or job specific work procedures are also usually required to mitigate the hazards. These work procedures should be included in the risk assessment. The work procedures do not form part of the network access requirements but are essential to addressing shock risk while undertaking the work.

If more information is required, seek expert advice.

9.11.8 Controls - Overhead Lines

The following table sets out the minimum controls required to manage the induction and transferred earth potential risks associated with work on:

- overhead sub-transmission lines; or
- overhead distribution lines in common spans with an energised sub-transmission line; or
- overhead distribution lines which run parallel (less than 20m apart for more than 500m) to an energised sub-transmission line between the worksite and the access permit earths.

Table 36 - Overhead lines— - induction and transferred earth potential controls

Category & Description	Examples	Controls required
Outside MSWD Task does not require a worker to come within the MSWD of phase conductors or make contact with earthing systems.	Climbing inspection Street lighting maintenance	Nil
No break Task requires work on or near a phase conductor or earth wire, but does not require a break in the continuity of these systems. The task can involve controlled detachment /	Insulator replacement. Vibration damper replacement. Transfer from old to new pole.	1. The mains must be isolated and access permit earths applied in accordance with these Rules, and 2. A visible earth (access permit or working earths) must be located within 250m of the work location, and 3. If working from an uninsulated EWP, and greater than 30m from a structure (i.e. midspan):

Category & Description	Examples	Controls required
attachment of these systems, with continuity being maintained.	Crossarm replacement	- Bond⁶ the EWP to the conductor; and - Earth⁷ the EWP via an earth stake; and - Persons must not make contact with the mobile plant and the ground at the same time - If working from an uninsulated EWP, and within 30m from a structure: - Bond⁷ EWP chassis to the structure.
Break/make Task requires breaking and/or remaking in the continuity of a phase conductor or earth wire, with work being performed above ground level. (Excluding UGOHs and earthing downloads).	Re-tensioning. Mid-span joint replacement. Replacement of short conductor sections.	- The mains must be isolated and access permit earths applied in accordance with these Rules, and - The mains must be earthed either side of the work location (access permit or working earths) - within one structure distance, and - Prior to making or breaking connections of phase conductors or earth wires, a bridging lead⁷ must be applied across the intended break in continuity, and - If working within from an uninsulated EWP, and greater than 30m from a structure (i.e. midspan): - Bond⁶ the EWP to the conductor; and - Earth⁷ the EWP via an earth stake; and - Persons must not make contact with the mobile plant and the ground at the same time. - If working from an uninsulated EWP, and within 30m from a structure: - Bond⁷ EWP chassis to the structure.
Break/make – UGOH Task requires breaking and/or remaking of conductor connections at a UGOH		- The mains must be isolated and access permit earths applied in accordance with these Rules, and - The overhead mains must be earthed (access permit or working earths) within one structure distance, and - The underground cable must be earthed at the point of isolation, or next UGOH, whichever is closer. - If working from an uninsulated EWP: - Bond⁷ EWP chassis to the structure.
Conductor on the ground Task requires contact with a phase conductor or earth wire, with work being performed at ground level.	Recovery of a fallen conductor.	- The mains must be isolated and access permit earths applied in accordance with these Rules, and - The mains must be earthed either side of the work location (access permit or working earths) - within one structure distance, and - Prior to making or breaking any phase conductor or earth wire connections, a bridging lead⁷ must be applied across the intended break in continuity, and

⁶ Must be a conductor with a minimum current carrying capacity equivalent to 16mm² copper. All earth leads and bridging leads must be inspected and tested as per the requirements for portable earthing equipment (see Clause 6.2.18).

⁷ Must be a conductor with a minimum current carrying capacity equivalent to 70mm² copper (unless otherwise approved). All earth leads and bridging leads must be inspected and tested as per the requirements for portable earthing equipment (see Clause 6.2.18).

Category & Description	Examples	Controls required
		4. All contact with the conductor must be performed either: a. Using equipotential bonding controls: i. The conductor/earth wire and all associated plant & equipment must be located entirely on a conductive equipotential mat; and ii. The conductor/earth wire must be bonded⁷ to the conductive mat; and iii. Persons must not make simultaneous contact both inside and outside of the equipotential zone; and iv. Access onto the equipotential zone shall be via an insulating mat; and v. If within 30m of a known earth (e.g. structure earth), the equipotential zone must be bonded⁷ to this known earth. or b. Using insulated controls: i. Wear 1000V insulated gloves with outers; and ii. Wear gumboots; and iii. Cover the conductor/earth wire with LV temporary insulation where there is a risk of contact between the conductor and uninsulated parts of the body.
Stringing Task requires significant longitudinal movement of a phase conductor or earth wire	Stringing new conductors. Reconductoring of more than one span. Replacement of overhead earth wire.	1. The mains must be isolated and access permit earths applied in accordance with these Rules, and 2. Prior to making or breaking phase conductors or earthing system, a bridging lead⁷ must be applied across the break, and 3. Earths (access permit or working earths) must be applied at the nearest practicable location, outside both ends of the stringing section, and 4. An induction study must be performed. 5. The following controls must also be applied, except where the induction study shows they are not required: Puller/tensioner machines, drums, blocks, and all associated equipment shall be located entirely on an equipotential zone. This equipotential zone shall: a. be situated on a conductive grid, connected⁷ to two earth stakes at opposite ends; and b. have a barricaded physical perimeter, establishing an exclusion zone preventing persons from making contact inside and outside of the equipotential zone simultaneously, and c. have a single defined entrance, utilising an insulating mat entirely traversing the exclusion zone, and d. have a rolling earth connected to the conductor/earth wire at both equipotential

Category & Description	Examples	Controls required
		zones. This rolling earth shall be connected both to a separate earth stake and the conductive grid; and e. have all equipment within the equipotential zone bonded⁶ to the equipotential zone; and f. if within 30m of a known earth (e.g. structure earth), the equipotential zone shall be bonded⁷ to this known earth. 6. Any additional controls that are required by the induction study must also be implemented.
Splicing Task requires accessing earthing system to perform fibre splicing, with work being performed at ground level.	Splicing of optical ground wire (OPGW) to OPGW fibre cables. Splicing of OPGW to 'all dielectric self-supporting' (ADSS) fibre cables.	1. Prior to making or breaking the earthing system continuity, a bridging lead⁷ must be applied, and 2. The connection of the earth wire to earth at adjacent structures must be visually confirmed, and 3. The work and all associated equipment must be located entirely on an equipotential zone: a. The earth wire and all associated equipment must be bonded⁷ to the conductive mat; and b. The conductive mat must be bonded⁷ to the nearest structure or substation earth; and c. Persons must not make simultaneous contact both inside and outside of the equipotential zone; and d. Access onto the equipotential zone shall be via an insulating mat.
Sub-transmission earth downleads Task requires the make and/or break of a sub-transmission feeder earth downlead - without breaking the longitudinal integrity of the line earthing system.	Replacing a corroded downlead or earth bond. Reinstall a stolen downlead. Replacing an earth rod/stake	1. Prior to making or breaking connections on the earthing system, a bridging lead⁷ must be applied across the intended break in continuity, and 2. Workers must not make any uninsulated contact with earth downlead until the bridge is in place.

9.11.9 Precautions - Underground Cables

Precautions and Safe Working Methods

Cable sheaths may be subject to induced voltages or transferred earth potentials. Cable sheath link boxes require special care when gaining access. Precautions must be taken to prevent workers coming in contact with any cable and a local earth at the same time. A local earth could be the local soil or concrete pit, another cable sheath, or a metal pipe.

Work may be undertaken using either an insulated or bonded worksite depending on the site configuration and the stage of the work. Both working conditions may apply on a single job.

Precautions—Insulated Conditions while Working on Cables

Table 37 - Underground cables—Precautions for insulated conditions

Type of Precaution	Description / Purpose
Access permit	Access permits set out boundaries of work to be carried out on or near mains and apparatus in accordance with these Rules. It will also identify where access permit earths have been applied.

Type of Precaution	Description / Purpose
Screen earthed components	Screen earthed metalwork and exposed conductors (e.g. neutral, cable screens and earth conductors) to prevent contact with local earth. Note that this includes pit walls if within reach.
Insulating mats	Screen pit walls and floors to prevent contact with the local earth. Note moisture and mud will compromise the insulation
Common-point earths and temporary jumpers with insulated handles	Use where connections will be broken to maintain earthing continuity as the system configuration changes.
Insulating gloves	Unless the work area can be fully insulated, wear an insulating glove on each hand (and use eye protection) if two different earthing systems or grids can be contacted.
Stand down in event of lightning activity	Stand down to avoid risk of shock due to nearby lightning activity. Work may only proceed once the storm has passed. Consideration must be given to the location of the storm and the associated affected network.

Precautions—Bonded Conditions while Working on Cables

Table 38 - Underground cable—Precautions for bonded conditions

Type of Precaution	Description / Purpose
Access permit	Access permits set out boundaries of work to be carried out on or near mains and apparatus in accordance with these rules. It will also identify where access permit earths have been applied.
Equipotential bonding	Bond together all conductors, earthed metalwork and exposed neutral and earth conductors and conductive mat to create an equipotential worksite.
Equipotential earth mat	A wire mesh, bonded to the cable and covering the adjacent floor and walls (and earthed to a minimum of two earth stakes) may create a bonded earth mat condition. Alternatively, bonding to the steel reinforcement within the pit walls and floor (via earth tag) may provide the same function as the mesh. This equipotential area should extend to the nominated exit point.
Insulated mats	Insulated mats placed at every entry to the bonded earth mat area to control the step voltage risk.
Screen earthed components	In addition to the common bonding, screening may also be used in the work zone.
Common-point earths and temporary jumpers with insulated handles	Use where connections will be broken in order to maintain earthing as the system configuration changes.
Insulating gloves	Wear an insulating glove on each hand (and eye protection) if two different earthing systems or grids can

Type of Precaution	Description / Purpose
	be contacted, unless the work area may be equipotential bonded.
Stand down in event of lightning activity	Stand down to avoid risk of shock due to nearby lightning activity. Work may only proceed once the storm has passed. Consideration must be given to the location of the storm and the associated affected network.



Figure 119 - Equipotential area using wire mesh

9.11.10 Precautions – High Voltage Substations and Switchyards

When working in a substation or switchyard:

- Temporary conductive structures must be connected to the earth grid
- Mobile plant must be connected to earth grid as required by Clause 7.5.7
- Vehicles must be bonded to the earth grid as required by Clause 7.6.2
- Equipotential bonds (with a minimum current carrying capacity equivalent to 6mm² copper) must be used for work on links within the end boxes of tail-ended transformers.
- Use additional earthing and/or bonding as needed for work on HV mains and apparatus which are adjacent to live equipment in HV outdoor switchyards.

Precautions—Working in HV Switchyards

Table 39 - HV Substations—Precautions when working in HV switchyards

Type of Precaution	Description / Purpose
Access permit	Access permits set out boundaries of work to be carried out on or near mains and apparatus in accordance with these rules. It will also identify where access permit earths have been applied.
Apply working earths to any disconnected mains and apparatus	Applies where the breaking of bonds or operation of isolators or circuit breakers removes connection to access permit earths
Common-point earths and temporary jumpers with insulated handles	Use when connections will be broken in order to maintain earthing as the system configuration changes. Included in this category are transformer neutral conductors and cable earth continuity conductors.
Insulating gloves	Wear an insulating glove on each hand (and use eye protection) if two different earthing systems or grids

Type of Precaution	Description / Purpose
	can be contacted, unless the work area may be equipotential bonded or adequately screened.
Stand down in event of lightning activity	Workers to stand down to avoid risk of shock due to lightning. Work may only proceed once the storm has passed. Consideration must be given to the location of the storm and the associated affected network.
Insulated EWP, mobile cranes, and scaffolding	If work is to be undertaken using moveable or temporary plant, consideration shall be taken to bond the plant (e.g. vehicle frame) to the local earth grid.
Electrostatic straps	These are primarily used to bleed away any induced voltages

9.11.11 Earth Connections to HV Mains and Apparatus

Some components of HV mains and apparatus are designed to be permanently connected to earth. Workers must maintain a continuous low impedance electrical path from these components to earth while the apparatus is energised.

If the electrical path to the earth connections listed immediately below is found to be inadvertently open-circuited, restoration of the electrical connection must be carried out under an access permit covering the mains and apparatus:

- HV cable screens;
- Surge diverters (lightning arrestors) connected to HV conductors or transformer HV windings, including:
 - Star point connection of star-connected transformer HV windings;
 - Delta connected tertiary HV windings;
 - Phase-to-earth connected VT's; or
 - SWER transformers.

Restoration of earth connections to mains and apparatus other than those listed directly above, may be carried out with the mains and apparatus remaining energised, only where the controls required to carry out the work safely are documented:

- in an approved Ausgrid Technical Document; or
- in a risk assessment, which is approved by the Level 3 Ausgrid Manager (or their delegate) of the workgroup planning to carry out the work.

9.11.12 Work on Earthing Systems – Temporary connections

Where the work involves the making or breaking of connections within an earthing system that is connected to energised HV mains and apparatus (other than the phase-to-earth connected apparatus listed in Clause 9.11.13) workers must install a temporary bridging lead across the point of connection/disconnection prior to carrying out the work. Workers must not make any uninsulated contact with an earthing system that has an open-circuit connection until a bridging lead is in place across the open-circuit.

If a temporary bridging lead is to be left in place (where the workers who applied the bridging lead are not at the worksite) a warning tag must be applied to the bridging lead. The warning tag must indicate the purpose of the bridging lead and what works are required to enable its removal

9.11.13 Work on Earthing Systems – Phase-to-Earth Connected Apparatus

Workers are not permitted to make or break any connections on earth systems that are connected to the following apparatus on HV distribution lines while the apparatus is energised:

- SWER substations;
- NULEC reclosers with internal VTs; or
- S&C intellirupter reclosers with phase-to-earth connected VTs.

10 Task Specific

10.1 Safe-to-touch Testing of Network Assets

Workers must test the following apparatus to confirm the absence of hazardous voltages, due to a breakdown of insulation, before they make contact with the apparatus:

- Any metallic structure, external to a substation, containing low voltage (but not HV) mains and apparatus (this includes metallic pillars, metallic streetlight outreach brackets, and customer meter boxes); and
- All poles (whether wood, composite fibreglass, concrete, or steel); and
- Exposed conductive sheathed or armoured cables.

Note: Where a workgroup will be working on the above apparatus, at least one member of the workgroup must test the apparatus before any member of the workgroup makes contact with the apparatus.

10.1.1 Testing Methods

For conductive sheathed or armoured cables, refer to the testing requirements in Clause 9.3.4

For metallic structures and all poles, the following testing requirements apply.

The initial testing (testing that is carried out by persons other than those investigating reported voltages) must be carried out using either:

- a non-contact (proximity) type detector, which is capable of detecting an electric field from a source voltage of 50Vac and greater, or
- a low impedance volt meter.

If the non-contact detector indicates a voltage is present, further testing must be carried out using a low impedance voltmeter to determine the actual voltage that is present. Persons must not come into uninsulated contact with the asset until the actual voltage is determined.

If the voltage measured with a low impedance meter is 5Vac or greater, persons must not come into uninsulated contact with the asset until the source of the voltage is investigated, identified, and rectified.

10.1.2 Personal Protective Equipment (PPE)

For conductive sheathed or armoured cables - refer to the PPE requirements in Clause 9.3.4.

For metallic structures and all poles - the use of LV insulating gloves is not mandatory for the initial testing with an approved non-contact LV detector (as verifying that these normally de-energised assets are safe to touch is not classed as work on or near live exposed low voltage mains and apparatus). However, if the non-contact detector indicates a voltage is present, or if persons report receiving a shock from the asset, LV insulating gloves must be worn for the further testing to determine the actual voltage present.

10.2 Working on or near Overhead Mains and Apparatus

This section describes the specific controls for working on or near overhead mains and apparatus.

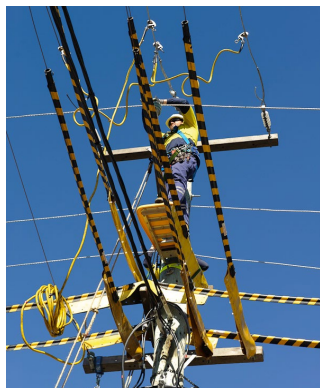


Figure 120 – Working on overhead mains.

10.2.1 Poles

Electrical Test

As required by Section 10.1 all poles must be tested for hazardous leakage voltages before contact is made with the pole.

Mechanical Test

Before climbing or working on any pole or structure, workers must inspect and test the mechanical condition of pole or structure, as required by Network Standard NS146, to ensure it is not in danger of collapsing during the course of the work.

Conductive Poles and Structures

All poles or structures must be treated as conductive for HV lines.

For work on or near live exposed LV mains and apparatus:

1. Steel or concrete poles must be regarded as conductive.
2. Timber, fibreglass, or fibreglass composite poles and crossarms need not be regarded as conductive.

Note: The conductivity of timber poles and crossarms can be affected by moisture.

10.2.2 Working on Conductors in the Vicinity of Live Overhead Mains and Apparatus

When working on or erecting an overhead line in the vicinity of an existing overhead line, the risk of the conductor being worked on becoming energised through contact with, or coming within flashover distance of, an adjacent live conductor must be assessed, and appropriate controls must be implemented.

When erecting, removing, restringing, or tensioning overhead mains that cross, or share a common span with other live exposed conductors⁸, the adjacent live conductors may remain live only if approved, documented, safe work methods⁹ are followed that prevent the isolated mains coming within the relevant MSWD from the energised conductors.

Refer to Section 7.5 for the controls required when working with mobile plant on conductors in the vicinity of exposed live mains and apparatus.

10.2.3 Work on or near Insulated Live LV Overhead Mains

The insulation of overhead conductors covered with PVC or XLPE insulation (e.g. services and LV ABC) can be subject to breakdown due to ultraviolet exposure.

For that reason, the following controls must be implemented for any work within 500mm of these conductors:

- Only electrically qualified workers may carry out work (other than the operation of mobile plant) within 500mm of these conductors when they are energised;
- Electrically qualified workers must visually assess the condition of the insulation prior to carrying out any work;
- If the insulation is visually assessed as being in good condition, workers must only contact the insulated conductors with their LV insulating glove covered hands.
- If the insulation is visually assessed as being in poor condition and the conductors are bundled, the conductors must be isolated in accordance with these Rules (due to the risk of creating an arc). If the conductors are not bundled, the mains may either be isolated or the live controls of Clause 9.5.4 utilised.

Mobile plant

Authorised persons, as defined by Clause 7.5.2, may operate mobile plant within 500mm of PVC or XLPE insulated cables provided the cables are covered with temporary insulation compliant with AS4202. The mobile plant must not be brought into contact with the covered conductors.

⁸ Live exposed conductors include, but are not limited to, street lighting circuits that are not isolated in accordance with Section 10.3.

⁹ The approval of Safe Work Methods must be by a suitably authorised officer of the employer, after consultation with persons who have a clear understanding of the work being performed and the risks associated with that work. For work by or for Ausgrid, refer to Safety Alert 13-14_007.

10.2.4 De-energised Overhead Conductors on the Ground

The following controls are required to manage the risk of a worker receiving an electric shock, in the event of the conductor being worked on becoming inadvertently energised through contact with an adjacent live exposed conductor.

When working (under a relevant access authority/permit) on a de-energised overhead exposed conductor which is:

1. on the ground; and
2. electrically connected to overhead spans that are not lowered to the ground, and
3. those spans cross or share a common span with live exposed conductors between the worksite and the conductor termination or strain point.

Persons working on or near the conductor at ground level must implement either the equipotential or insulated controls set out below:

Equipotential Controls

Workers at ground level must only work on the conductor from a conductive equipotential mat which is bonded to the conductor.

The bonding cable must be a minimum of 35mm² flexible copper cable, fitted with a clamp which allows connection to the conductor using an appropriately rated insulated handle or tool.

The worker(s) must complete the following prior to making any contact with the conductor:

- Place all tools for the job onto the mat; and
- Stand completely on the mat; and
- Attach the clamp to the conductor using an appropriately rated insulated handle or tool.

Tools, or other conductive material, must not be passed between any worker standing on the conductive mat and any worker who is not.

Insulated Controls

Workers at ground level must:

- wear LV insulating gloves; and
- stand on an insulating mat, or wear gumboots; and
- Cover the conductor with LV temporary insulation where there is a risk of contact between the conductor and uninsulated parts of the body.

10.3 Work on or near Street Lighting Circuits

10.3.1 Isolation

To reduce the risk of an isolated street lighting circuit becoming inadvertently energised, workers carrying out the isolation of the street lighting circuit must create isolation points as close as reasonably practicable to the worksite. (This may require the breaking of bonds to create isolation points).

10.3.2 Verifying isolation

Street lighting circuits are generally de-energised during daylight hours. Therefore, isolation from a de-energised street light control point (SLCP) that is identified by plans only is not acceptable. Isolation from the correct SLCP must be verified, as follows:

- If the street lighting circuit is de-energised at the time the point of isolation is to be created, the SLCP must be operated, and the circuit tested at the worksite to confirm that the energising and de-energising of the circuit aligns with the operation of the SLCP.
- If the circuit is energised at the time the point of isolation is to be created, the circuit must be tested at the worksite to confirm that the de-energising of the circuit aligns with the operation of the SLCP.

(This is not required for fault finding on a circuit where the SLCP fuse has blown, or where a circuit has developed an open circuit fault).

- Where the isolation points are open bonds, the verification must be achieved by visually tracing the circuit to all isolation points.

10.3.3 Proving De-energised

Once the isolation is verified, the street lighting circuit must be proved de-energised as per Clause 9.2.2.

10.3.4 Neutral conductors

Workers must not break any street lighting circuit neutral conductor connections until they confirm:

- there are no luminaires connected to any section of neutral conductor planned to be disconnected; and
- any remaining sections of street light neutral conductor are bonded to the low voltage distributor neutral.

10.3.5 Additional Controls

Even though street lighting conductors are isolated, verified as isolated, and proven de-energised as required above, there remains a risk of the conductors becoming inadvertently energised through:

- an additional unidentified SLCP, or an incorrectly connected luminaire, providing an inadvertent parallel supply; or
- the street lighting conductor coming into contact with another live exposed conductor in an adjacent span.

Therefore, workers must:

- wear LV insulating gloves when working within 500mm of these exposed conductors; and
- only make contact with the conductors (one conductor at a time) with their insulating glove covered hands.

These additional controls must be listed on any access authority/permit issued for work on the conductors under “Additional precautions/warnings”.

Exemption: These additional controls are not required for work by external parties working near, but not on, streetlighting conductors under the WorkCover NSW Code of Practice (Work Near Overhead Power Lines).

10.4 Mains and Apparatus that are not Connectable

This section describes the requirements for work on or near exposed mains and apparatus that are not connectable to the network (i.e. new mains and apparatus that have not yet been made connectable, or mains and apparatus that have been made permanently disconnected).

10.4.1 Permits

An access authority/permit is not required for work on mains and apparatus that are not connectable to the network.

As required by Clause 5.8.1, an equipping permit is required for work on or near new, or permanently disconnected mains and apparatus, that are intended for connection to the network.

10.4.2 Cables

Before commencing work on cables that are not connectable to the network, they must be identified and remotely cut at the proposed location of the work, as required below.

Cable Identification

Table 40 details the two options to identify cables that are not connectable to the network.

Table 40 – Methods to identify non-connectable cables

Methods Available	Description
Physically trace the cable	Identify the ends of the cable using appropriate cable plans. Where it is reasonably practicable to do so, physically trace the entire length of the cable from end to end. Where this is not reasonably practicable, the cable may be physically traced from one end to the location of the proposed work.

Methods Available	Description
	The physical trace must be verified by a second person.
Unable to physically trace (e.g. direct buried cables)	Identify the ends of the cable using appropriate cable plans. Where it is reasonably practicable to do so, locate and uncover both ends of the cable. Where it is not reasonably practicable to locate and uncover both ends of the cable, one end of the cable must be located and uncovered. The cable is then to be identified at the location of the proposed work using approved cable identification methods and equipment. The cable identification must be verified by a second person.

Note: Where it is not reasonably practicable to carry out the cable identification requirements of Table 40 above, the remote cutting of the cable(s) may proceed only if a proposal detailing:

- the reasons why the cable identification methods in Table 40 are not reasonably practicable to implement;
- the available cable information; and
- the alternate controls that have been, or will be, implemented to confirm the correct cable is to be remotely cut;

is endorsed by System Control and approved by the Level 3 Ausgrid manager of the workgroup carrying out the work or submitting the NAR (or their delegate).

Remote Cutting

Immediately after the identification, remotely cut or remotely stab the cable:

- using approved equipment (See Clause 6.2.22)
- in the presence of the person who is going to do the work, and
- at the point where the work will be done.

in accordance with the requirements of the Ausgrid Technical Guide T0031 – Remote Cable Cutting Equipment.

Leave all cut cables short-circuited and appropriately capped in accordance with the sealing of cables procedures in Ausgrid - Network Standard—Specification for Laying of Underground Cables up to 11kV (NS 130). This includes abandoned cables that are disconnected from the network.

An access permit is not required for work on cables that are not connectable to the network.

An equipping permit is required for new mains or permanently disconnected mains that are intended to be connected to the network, or to other mains and apparatus covered by an equipping permit.

10.4.3 Overhead High Voltage Mains

Before commencing work on or near any overhead HV mains that are not connectable to the HV network, the mains must be positively identified as not connectable, proven de-energised, earthed, and short-circuited.

Equipotential bonding or additional temporary earthing may be required to guard against the possibility of induced voltages.

10.4.4 Overhead Low Voltage Mains

Before commencing work on or near any overhead LV mains that are not connectable to the network, the mains must be positively identified as not connectable, and proven de-energised.

Equipotential bonding or additional temporary earthing may be required to guard against the possibility of induced voltages.

10.5 Vegetation Management

This section details the requirements for carrying out vegetation management near Ausgrid mains and apparatus.

10.5.1 General

Where vegetation management is carried out in accordance with the Electricity Supply (Safety and Network Management) Regulation 2014, and within the Minimum Safe Working Distances (MSWD) of an Ordinary Person, only the following methods can be used:

- Standard Vegetation Control – Vegetation management performed by persons authorised to conduct Standard Vegetation Control up to the clearances shown in Table 41, Table 42 and Table 43.
- Close Approach Vegetation Control (CAVC) – Vegetation management performed by persons authorised to conduct CAVC work up to the clearances shown in Table 44, Table 45 and Table 46.
- HV Live Work – Vegetation management performed in accordance with Ausgrid's HV Live Work Manual. Persons carrying out this method must be authorised for HV Live Work.
- Network outage – Where the above conditions cannot be safely maintained, then a network outage is required.

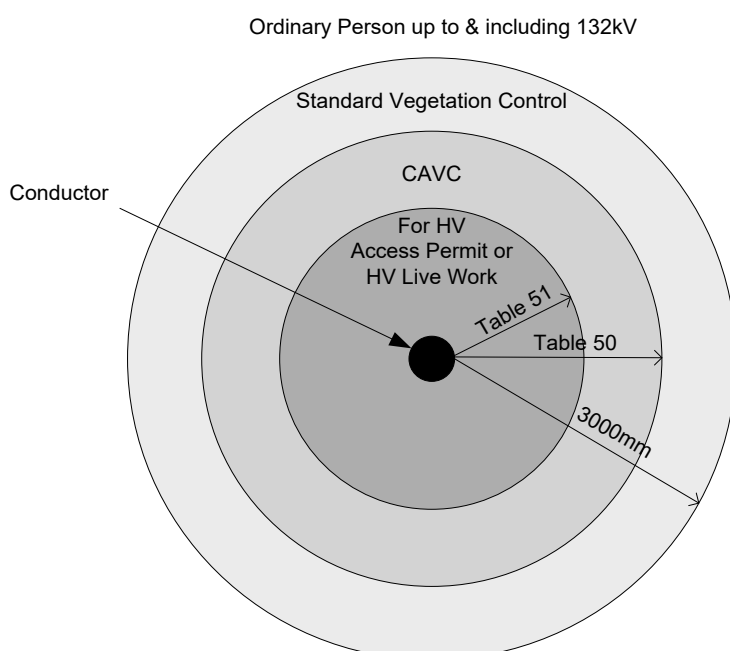


Figure 121 - Vegetation clearance from energised overhead mains

10.5.2 Regulations Related to Vegetation Management

The following documents relate to vegetation management under these Rules

- WorkCover Code of Practice - Amenity Tree Industry
- Industry Safety Steering Committee - Guide to Managing Vegetation near Power Lines (ISSC 3)—for general information and for some safety aspects of clearing operations
- Energy Network Association ENA DOC 023-2009 - Guidelines for safe vegetation management work near live overhead lines.

10.5.3 General Precautions

Workers carrying out vegetation management activities must ensure such activities do not:

- Place members of the public at risk;
- Damage Ausgrid mains and apparatus; or
- Damage third party property.

Vegetation in Contact with Mains and Apparatus

If any part of a tree is in contact with live exposed mains and apparatus, there may be hazardous voltages present. This is especially applicable during wet conditions when contact occurs with live high voltage mains and apparatus. Hazardous voltages may also be present for some distance around the bases of these trees. Intermittent contact hazards may also occur during strong wind conditions.



Reporting

Report any known hazardous situations that may affect workers or members of the public to Ausgrid (see emergency phone numbers) and take effective measures on-site to prevent workers or members of the public from entering areas where hazardous voltages are likely to be present.

10.5.4 Standard Vegetation Control

Standard Vegetation Control refers to the control of vegetation where the vegetation clearance from overhead mains and apparatus is less than 3000mm (for up to & including 132kV) but greater than the minimum vegetation clearance specified in the Standard Vegetation Control - Table 41, Table 42 and Table 43. Also refer to Figure 121 above.

Standard Vegetation Control work may be carried out from either an insulated EWP, the ground (ground line), or from a tree (climber).

Authorisation

To perform Standard Vegetation Control, workers must:

- hold a current Standard Vegetation Control authorisation; and use approved Standard Vegetation Control work procedures.

Exemption:

Electrically qualified Ausgrid employees may carry out Standard Vegetation Control in emergency situations, without holding a Standard Vegetation Control authorisation, provided they:

- are trained in the use of approved tools required for the task; and
- use approved tools; and
- work to an approved procedure.

Safety Observer

During Standard Vegetation Control work one or more members of the workgroup must be appointed as the safety observer. The safety observer(s) shall:

- Hold standard vegetation control authorisation and be trained and competent in the task being undertaken;
- Not perform any other task while acting as safety observer;
- Remain on the ground;
- Not observe more than one vegetation management work activity at any time;
- Maintain a clear line of sight to the work being performed;
- Be in a position to alert the workgroup to any potentially unsafe actions that may inadvertently occur including infringement of MSWD or any non-compliance with approved work procedures;
- Have the authority to temporarily stop the work at any time.

Exemption:

Electrically qualified Ausgrid employees may carry out Standard Vegetation Control in emergency situations without a Safety Observer, provided they:

- are trained in the use of approved tools required for the task; and
- use approved tools; and
- work to an approved procedure.

Insulated Mobile Plant

Insulated mobile plant used for standard vegetation control must comply with Cranes, hoists and winches Part 10: Mobile elevating work platforms (AS/NZS 1418.10:2011) and be tested and certified in compliance with Clause 7.5.11. Insulated mobile plant must be rated and tested to the relevant voltage.

Insulated Tools

Insulated tools used for standard vegetation control must comply with Clause 6.2.20.

When carrying out standard vegetation control work from a groundline position, no part of any insulated tools may extend beyond the height of the overhead powerlines being cleared.

Uninsulated Tools

Uninsulated tools (e.g. chainsaws) may be used, provided the uninsulated tool and vegetation clearance maintain same clearance as the relevant vegetation worker MSWD at all times.

Climbing

Climbers must not climb any tree where any part of that tree is within, or may move within, minimum vegetation clearances during the work activity, and must not position themselves so that they could fall or swing inside the relevant MSWD.

10.5.5 Standard Vegetation Control – MSWD and Vegetation Clearances

Table 41, Table 42 and Table 43 show the minimum safe working distances that must be observed for the relevant voltage by standard vegetation control authorised persons and the equipment they are using, and the minimum allowable vegetation clearances from the mains and apparatus.

Table 41 - Standard vegetation control from an insulated EWP

Insulated EWP		Insulated Mobile Plant Clearance (mm)	Using Insulating Tools/Equipment			Using <u>Non-Insulating</u> Tools/Equipment		
Voltage (kV)	Worker MSWD (mm)		Insulated Tool Clearance (mm)	Vegetation Clearance Below/ Beside (mm)	Vegetation Clearance Above (mm)	Non-Insulated Tool Clearance (mm)	Vegetation Clearance Below/ Beside (mm)	Vegetation Clearance Above (mm)
LV insulated	500	Physical Clearance (No Contact)	300	No Clearance Required		500	No Clearance Required	
LV bare	1000		300			1000	1000	1000
11	1200	700	700	700	Not Permitted	1200	1200	Not Permitted
22	1200	700	700	700		1200	1200	
33	1500	1000	1000	1000		1500	1500	
66	1500	1000	1000	1000		1500	1500	
132	2000	2000	2000	2000		2000	2000	

Table 42 - Standard vegetation control from a tree (climber)

Climber		Using Insulating Tools/Equipment			Using <u>Non-Insulating</u> Tools/Equipment		
Voltage (kV)	Worker MSWD (mm)	Insulated Tool Clearance (mm)	Vegetation Clearance Below/ Beside (mm)	Vegetation Clearance Above (mm)	Non-Insulated Tool Clearance (mm)	Vegetation Clearance Below/ Beside (mm)	Vegetation Clearance Above (mm)
LV (insulated)	500	300	No Clearance Required		500	No Clearance Required	
LV (bare)	1000	300	No Clearance Required	Not Permitted	1000	1000	Not Permitted
11	1200	700	1200		1200	1200	
22	1200	700	1200		1200	1200	
33	1500	1000	1500		1500	1500	
66	1500	1000	1500		1500	1500	
132	2000	2000	2000		2000	2000	

Table 43 - Standard vegetation control from the ground (ground line)

Ground line		Using Insulating Tools/Equipment			Using <u>Non-Insulating</u> Tools/Equipment		
Voltage (kV)	Worker MSWD (mm)	Insulated Tool Clearance (mm)	Vegetation Clearance Below/ Beside (mm)	Vegetation Clearance Above (mm)	Non-Insulated Tool Clearance (mm)	Vegetation Clearance Below/ Beside (mm)	Vegetation Clearance Above (mm)
LV (insulated)	500	300	No Clearance Required		500	No Clearance Required	
LV (bare)	1000	300	No Clearance Required	Not Permitted	1000	1000	Not Permitted
11	1200	700	700		1200	1200	
22	1200	700	700		1200	1200	
33	1500	1000	1000		1500	1500	
66	1500	1000	1000		1500	1500	
132	2000	2000	2000		2000	2000	

10.5.6 Close Approach Vegetation Control (CAVC) Work

Close Approach Vegetation Control (CAVC) refers to the control of vegetation where the vegetation clearance from overhead mains and apparatus is less than the clearances specified for Standard Vegetation Control but greater than the minimum vegetation clearance specified for Close Approach Vegetation Control - Table 44, Table 45 and Table 46. Also refer to Figure 120 above.

CAVC work may be carried out from either an insulated EWP, the ground (ground line), or from within a tree (climber).

Authorisation

To perform CAVC, workers must:

- hold a current CAVC authorisation
- use approved CAVC work procedures that are documented in a relevant CAVC manual

In addition, all members of the workgroup must have already performed (and are familiar with) the approved work under de-energised conditions using an appropriate safe work method statement (SWMS).

Maximum Voltage

CAVC techniques are not permitted near energised conductors above 66kV.

Safety Observer

During all CAVC work one or more members of the workgroup must be appointed as the safety observer. The safety observer(s) shall:

- Hold CAVC authorisation and be trained and competent in the task being undertaken;
- Not perform any other task while acting as safety observer;
- Remain on the ground;
- Not observe more than one vegetation management work activity at any time;
- Maintain a clear line of sight to the work being performed;
- Be in a position to alert the workgroup to any potentially unsafe actions that may inadvertently occur including infringement of MSWD or any non-compliance with approved work procedures;
- Have the authority to temporarily stop the work at any time.

Vegetation above HV

Cutting vegetation above live high voltage is permissible only when working from an insulated EWP.

Cutting limits

When cutting vegetation above overhead mains, cutting lengths should be limited to a maximum of 200mm on vegetation with a maximum diameter of 50mm.

Cutting vegetation that has grown over multiple phases is allowed under CAVC conditions, provided the vegetation worker tools do not pass over two phases (where they exist in a horizontal construction) at any point in time. Multiple EWP set-ups may be required to achieve this.

Insulated Mobile Plant

Insulated mobile plant used for CAVC must comply with Cranes, hoists and winches Part 10: Mobile elevating work platforms (AS/NZS 1418.10:2011) and be tested and certified in compliance with Clause 7.5.11. Insulated mobile plant must be rated and tested to the relevant voltage.

Insulated Tools

Insulated tools used for CAVC must comply with Clause 6.2.20.

When carrying out CAVC work from a groundline position, no part of any insulated tools may extend beyond the height of the overhead powerlines being cleared.

Uninsulated Tools

Uninsulated tools (e.g. chainsaws) may be used, provided the uninsulated tool and vegetation clearance maintain same clearance as the relevant vegetation worker MSWD at all times.

Climbing

Climbers must not climb any tree where any part of that tree is within, or may move within, minimum vegetation clearances during the work activity, and must not position themselves so that they could fall or swing inside the relevant MSWD.

10.5.7 CAVC - MSWD and Vegetation Clearances

Table 44, Table 45 and Table 46 show the minimum safe working distances that must be observed for the relevant voltage by CAVC authorised persons and the equipment they are using, and minimum allowable vegetation clearances from the mains and apparatus.

Table 44 – CAVC from an insulated EWP

Insulated EWP Nominal Voltage (kV)	Worker MSWD (mm)	Insulated Mobile Plant Clearance (mm)	Insulated Tools Clearance (mm)	Vegetation Clearance (mm) Below / Beside / Above
LV (insulated)	500	Physical clearance (no contact allowed)	300	No clearance required
LV (bare)	1000	Physical clearance (no contact allowed)	300	No clearance required
11	1200	700	300	100
22	1200	700	300	150
33	1500	1000	300	200
66	1500	1000	300	400

Table 45 – CAVC from a tree (climber)

Climber Nominal Voltage (kV)	Worker MSWD (mm)	Insulated Tools Clearance (mm)	Vegetation Clearance (mm)	
			Below / Beside	Above
LV (insulated)	500	300	No clearance required	
LV (bare)	1000	300	No clearance required	
11	1200	300	700	Not Permitted
22	1200	300	700	
33	1500	300	700	
66	1500	300	1000	

Table 46 – CAVC from the ground (ground line)

Ground Line Nominal Voltage (kV)	Worker MSWD (mm)	Insulated Tools Clearance (mm)*	Vegetation Clearance (mm)	
			Below / Beside	Above
LV (insulated)	500	300	No clearance required	
LV (bare)	1000	300	No clearance required	
11	1200	300	100	Not Permitted
22	1200	300	150	
33	1500	300	200	
66	1500	300	400	



Figure 122 - CAVC workers allowing for minimum approach distances using an observer.



Figure 123 - CAVC work from groundline position ensuring insulated tool does not extend beyond the height of overhead high voltage powerlines.



Figure 124 - CAVC workers using an approved procedure to cut vegetation.

10.5.8 Network Configuration Requirements for CAVC Work

Distribution

The following network configuration requirements must be in place before CAVC work is carried out on 11kV or 22kV feeders:

- the auto-reclosing function of the circuit breaker which controls the section of feeder must be made 'non-auto'; and
- the sensitive earth fault protection covering the section of feeder must be operational; and

- where available (as shown on the system diagram) the upstream field recloser must have instantaneous protection (e.g. work tag / live line / hot line tag) enabled.
- The pick-up value of the primary protection system for the section of feeder must comply with the primary protection requirements of Network Standard NS263 for the fault levels at the work site.

Sub-transmission

The following network configuration requirements must be in place before CAVC work is carried out on 33kV or 66kV feeders:

- the auto-reclosing function of the circuit breaker which controls the section of feeder must be made 'non-auto'; and
- all protection schemes for the section of feeder are operational (or equivalent alternate protection systems in place); and
- if the work is to occur on closed-ring feeders, the feeders must be radialised.

10.5.9 Before Starting CAVC Work

Network Access Request

A person who is authorised to submit NARs must submit a NAR marked 'CAVC Work', as required by the System Control document NSEC 007 "Submitting Network Access Requests".

Person in Charge Responsibilities

Before commencing CAVC work at each worksite, the person in charge of the workgroup must:

- nominate an accredited member of the workgroup as the safety observer before CAVC work begins; and
- confirm there is radio or telephone contact available at all times between the CAVC work crew at the worksite and the System/Area Operator; and
- contact the appropriate System/Area Operator via radio or telephone to confirm:
 - the specific worksite; and
 - the network configuration requirements of Clause 10.5.8 are in place.

System/Area Operator

Before giving permission to the CAVC crew to proceed with the work, the System/Area Operator must confirm:

- the network configuration requirements of Clause 10.5.8 are in place; and
- the Control Room network diagrams are pinned with CAVC tags at the appropriate circuit breakers.

10.5.10 CAVC Work in Progress

During the CAVC Work, the System/Area Operator must:

- not alter the switching arrangements or the load flow on the feeder under work conditions; or
- not make the upstream reclosing device 'auto' before advising the CAVC workgroup to stand down; or
- not switch off the sensitive earth fault protection before advising the CAVC workgroup to stand down; and
- contact the CAVC workgroup and advise them to stand down before any attempt is made to close back a tripped feeder on which CAVC work is being done; and
- advise CAVC workgroups of any electrical storms forecast or seen on the lightning tracking system.

If the System/Area Operator must change the network arrangements, the workgroup must stop the CAVC procedure and move to a safe distance from the mains and apparatus until conditions are suitable for CAVC work to recommence.

10.5.11 On Completion of CAVC Work

When the work is finished, the person in charge of the CAVC workgroup must advise the System/Area Operator that all the work is complete, and all members of the workgroup are clear of the mains and apparatus.

10.6 Applying Test Voltages

This section describes the requirements for applying test voltages. Testing equipment must only be used by those instructed in the use of the equipment and the precautions required.

Hazardous or non-hazardous test voltages

Voltages applied for testing purposes may be either hazardous or non-hazardous.

A hazardous voltage is a voltage source with the capacity to produce a current of 30mA ac or 100mA dc within a human body (as per Australian Standard AS 60479 – Effects of Current on Human Beings and Livestock).

Example: A low voltage insulation resistance tester with a short circuit capacity of 1mA d.c. cannot produce a current of 100mA d.c. within a human body – therefore it is a non-hazardous voltage source.

Cables and Capacitors

If test voltages are applied to underground cables or capacitors, they should be shorted and/or discharged to earth at the completion of the testing to discharge any stored energy. Allow adequate time for the stored energy to discharge fully, as voltage recovery is possible when cables and capacitors are only momentarily shorted or discharged to earth following the application of test voltages.

10.6.1 Applying Non-hazardous Voltages for Testing

Although contact with a non-hazardous voltage will not produce a hazardous electric shock, the following controls are required to manage the risk of other hazards that may arise from a person's reaction to contact with some non-hazardous test voltages.

Before applying non-hazardous voltages for testing purposes to mains and apparatus under an equipping permit or access authority/permit, the person in charge of the test shall complete the following:

- Ensure other workers who are working on an equipping permit or recipients of all other access permits for work (as listed on the access permit folder) are notified and give verbal assurance that they will stand clear until the test is completed.
- Take precautions, where necessary, to prevent the close approach of people to mains and apparatus under test.

10.6.2 Applying Hazardous Voltages for Testing

Before applying hazardous voltages for testing purposes to any mains and apparatus being installed under an equipping permit or an access permit for test and ancillary work, the person in charge of the test shall complete the following:

- Ensure other workers who are working on an equipping permit or in the vicinity of the test location are notified and give a verbal assurance that they will stand clear until the test is completed, the mains and apparatus have been discharged and earthed and they have been instructed that it is safe to enter the area.
- Ensure workers assisting with the test are notified and give a verbal assurance that they will stand clear until the test is completed, the mains and apparatus have been discharged and earthed and they have been instructed that it is safe to enter the area.
- Prevent the close approach of people to mains and apparatus under test by the use of one or more of the following mandatory precautions. In all cases, a "DANGER – HIGH VOLTAGE TESTING" sign must be displayed when applying hazardous voltages for testing purposes.
- Attach "DANGER – HIGH VOLTAGE TESTING" notices to the mains and apparatus under test where live parts are not exposed or accessible without the use of a tool,
- Where live parts are accessible, define an exclusion area for the hazardous voltage test by erecting a black and yellow rope barrier* with "DANGER – HIGH VOLTAGE TESTING" notices attached,

Notes:

- In some situations (e.g. testing in cable pits) there are no adjacent structures to support a yellow and black rope barrier. In those situations, pedestrian pit guard barriers may be used in place of the black and yellow rope barrier - provided the top railing of the pedestrian barrier is a striped black and yellow colour and "DANGER – HIGH VOLTAGE TESTING" notices are attached to the barrier, as shown in Figure 128 below.

- Obvious physical barriers such as fences and walls etc may be used as part of the definition of the exclusion area.
- Preventing access to the mains and apparatus under test by the use of a means to secure and “DANGER – HIGH VOLTAGE TESTING” notice. Examples of this include locking a cage containing the mains and apparatus under test, locking shutters on metal clad switchgear or lockable cable terminations,
- Where mains and apparatus are remote from the point of application of test voltages and are exposed and accessible, the person responsible for the testing must ensure a suitable exclusion area is provided and a stand-by person or persons are present to prevent people coming into contact with the mains and apparatus under test.

Note: A stand-by person is not required where the mains and apparatus under test are in their normal in-service position and exposed, but not normally accessible without climbing above ground or floor level without the use of a ladder or other mechanical device.



No person shall cross over, under, or be within a black and yellow rope barrier (or testing exclusion area defined by other barriers) with “DANGER – HIGH VOLTAGE TESTING” notices attached.

Only the person in charge of testing can authorise the removal or lowering of a black and yellow rope barrier and notices.

People requiring access to the test area shall contact the person in charge of testing.



Figure 125 - Lockable cable termination with danger notice



Figure 126 - Black and yellow rope barrier with danger notice



Figure 127 – HV testing tag applied



Figure 128 – Pedestrian barrier with black and yellow rail and danger notice

10.6.3 Testing with the Earth and Short-Circuit Removed

When removing the earth and short-circuit equipment at a point of isolation, you must also provide one the following between the equipment under test and the live mains and apparatus:

- an approved barrier
- an earthed screen
- an earthed section of mains and apparatus.

If this cannot be done, provide isolation in air or by other approved procedures.

Air Gap - Low Voltage

The gap in air must be no less than the minimum safe working distances (MSWD) for authorised persons (see Table 19). They should not be minimum fixed clearances (see Table 21) which can only apply when the mains and apparatus are earthed and short-circuited. That is, a break in air is suitable for test voltages up to 1kV provided the air gap is equal to or greater than the MSWD for the nominal system voltage that would exist across the air gap.

Air Gap - High Voltage

Table 47 refers to minimum clearances in air for applying test voltages while the earths and short-circuits are removed at the point of isolation.

Table 47 – Applicable minimum clearances in air for applying test voltages while the earths and short-circuits are removed at the point of isolation.

Equipment Voltage (kV)	Minimum Clearance in Air (m)		Test Voltages used (kV)	
	AC Test	DC Test	AC Test	DC Test
11	0.7*	0.7*	30	25
33	1.0*	1.0*	70	85
66	1.9	1.2	140	150
132	4.5	2.2	250	270

*The minimum safe working distance figures from Table 19 are used for 11kV and 33kV equipment, as the calculated minimum clearance in air for the required test voltages is less than these figures.

10.7 Tong or Clip-on Ammeters

This section describes the requirements for using tong or clip-on ammeters.

Tong or clip-on ammeters may only be used by those instructed in their use and the precautions required.

Where possible, apply the ammeter to LV mains and apparatus where they are insulated rather than where they are exposed. Do not use them on exposed high voltage (HV) conductors unless you use insulated operating equipment appropriate to the voltage.

Use on or near Live Exposed LV Conductors

Refer to Clause 9.5.3 for the controls required for the use of testing/measurement equipment near live exposed LV mains and apparatus. In addition to those controls, the following controls apply to the use of tong or clip-on ammeters on or near live exposed LV conductors.

Where the ammeter is applied to exposed LV conductors, take care to prevent the ammeter from making contact with other exposed LV conductors (or conducting material) and earthed metal. Use suitable insulation or screens where necessary.

Never treat the insulation on the handle of tong or clip-on ammeters as adequate insulation.



Figure 129 - Two types of tong ammeters used to measure current

10.8 Paralleling and Phasing

This section describes paralleling and phasing.

10.8.1 Paralleling

The System/Area Operator must be informed of paralleling activities and provide approval before it proceeds (see Table 48).

The responsible manager must also provide System Control details of the exact location of all the switches available for paralleling the LV network by regularly updating LV plans or databases.

Persons involved in the assessment, installation, removal, and management of LV parallels must comply with Network Standard NS136.

Table 48 - Approvals and information flow required for paralleling

Paralleling	Approvals and information flow
Bulk Supply Points	Ensure the appropriate System/Area Operator or network operator gives approval before loads supplied from different bulk supply points are interconnected at HV.
LV Distributors	You must inform (and get approval from) the System/Area Operator before closing any LV paralleling devices (such as links, tees, or normally open distributor fuses). You must give the System/Area Operator details such as: - the distribution centres in parallel - LV underslung link numbers - the location of tees and temporary bonds. You must also inform the System/Area Operator when the LV parallel has been removed.

10.8.2 Phasing

All new mains and apparatus which can be paralleled at low voltage (LV) or interconnected at high voltage (HV) with existing mains and apparatus, must be phased when they are first energised.

Any existing mains and apparatus that are repaired or altered in some way must be phased before they can be paralleled or interconnected with live mains and apparatus.

Exception: Phasing is not required if there is no possibility of crossing phases (e.g. connections which have been disconnected during work). Other examples include:

- restoring connections between sealing ends and bushings
- repairs on a multi-core cable that does not involve new joints
- busbars associated with outdoor circuit breakers
- repairs on a single core cable.

11 Site Specific

11.1 Confined Spaces

This section outlines the requirements for working in confined spaces.

11.1.1 Working in Confined Spaces

Work in a confined space can expose workers to particular hazards, especially atmospheric contamination, accumulation of dangerous gases, or oxygen deficiency.

Some Ausgrid assets exist in confined spaces. Examples include:

- underground substations;
- some basement chamber substations;
- a joint hole with a cover or tarpaulin which is not open on more than one side;
- cable pits, cable vaults and tunnels;
- jointing chambers where entry is through a manhole or door;
- open-topped spaces which do not have good natural ventilation and where a person is working head and shoulders below ground level;
- transformer tanks; or
- under certain conditions, parts of substations, chambers or switching stations may potentially be subject to atmospheric contamination (or oxygen deficiency). They then become classified as confined spaces under the Work Health and Safety Regulation 2011.



To confirm the status of a location, refer to the Ausgrid Confined Spaces Register. This register is available on the Ausgrid intranet (the Wire) and Ausgrid's external website.

11.1.2 Requirements for Working in a Confined Space

When entering and working in a confined space, you must comply with:

- NSW Work Health and Safety Regulation 2011
- Australian Standard AS 2865-2009 - Confined spaces
- NSW Code of Practice – Confined Spaces – August 2019

Ausgrid employees must refer to the confined spaces requirements in the Ausgrid Health and Safety Management System.

You must not enter a confined space without a valid entry permit.

11.1.3 Emergency Situations

A confined space emergency plan must be developed as part of the confined space entry permit process.

Ausgrid employees must refer to the emergency procedure requirements in the Ausgrid Health and Safety Management System.

11.2 Indoor Distribution Substations

Indoor distribution substations include basement chamber, surface chamber, upper-level chamber, and underground style substations.

11.2.1 Entering and Working in Indoor Distribution Substations

General

Before working in an indoor distribution substation, workers must check that the entries/exits can be easily opened and are not obstructed.

Workers who are performing work in an indoor substation, must not block or obstruct any exits or passageways or access to fire extinguishers, telephones, control switches or other operating equipment.

Basement Chamber and Underground Substations

Before working in any basement chamber or underground substation:

- all hatch entries to the substation must be open, with authorised persons present to prevent the entry of unauthorised persons; and
- other entries/exits to the substation must be able to be easily opened and not obstructed.

11.2.2 Ventilation

When working in indoor substations, ensure there is adequate ventilation to maintain a breathable and non-explosive atmosphere especially in the following circumstances:

- after faults or explosions
- where there is a long entry (e.g. a tunnel)
- when using liquid petroleum gas (LPG) or other bottled gases (e.g. welding, soldering, de-compounding)
- when opening chambers or equipment containing heavier-than-air insulating gases (e.g. sulphur hexafluoride (SF₆) equipment)
- where exhaust fumes could enter (e.g. vehicles or stationary engines operating near the entrances or ventilation openings).

You must leave the area immediately if at any time you experience:

- eyes, nose or throat irritations
- difficulty in breathing
- a ringing sensation in the ears.

Do not return until the area has been checked with a gas detector and adequate ventilation has been re-established.

11.3 Working in Battery Rooms

This section describes working in battery rooms.

11.3.1 Working in Battery Rooms or near Batteries

All direct current battery systems are stored energy devices and should always be treated as energised equipment. Direct current battery systems are capable of causing harmful arcing if worked on while connected and may result in electric shock, electrical or chemical burns, fire, or explosion in adverse circumstances.

Toxic Gases

When working in a battery room (or near banks of batteries consisting of nickel cadmium batteries with liquid electrolyte while the cells are on charge and gassing), make sure the room is ventilated. Open all available doors and windows or activate exhaust fans.

The spray above gassing cells is strongly corrosive. Do not get this spray in your eyes or on your skin or clothes.

Risk of Explosion

In battery rooms containing nickel cadmium batteries (with liquid electrolyte or adjacent to nickel cadmium batteries with liquid electrolyte), always take the following precautions due to the risk of explosion:

- do not use an open flame while cells are on charge
- do not smoke
- limit the risk of sparks from jumper leads, metallic watch bands, jewellery, tools or construction materials.

Where it is necessary to use an open flame, or attach jumper leads in a battery room, ventilate the room and make sure the batteries are not on charge.

Note: Nickel cadmium batteries with liquid electrolyte are progressively being replaced with valve-regulated lead acid batteries which do not contain liquid electrolyte and do not produce significant quantities of flammable gas (under normal operating conditions). However, take the above precautions at all times.

11.4 Conductive Materials, Storage and Firefighting

This section describes dealing with conductive materials, material storage and fire extinguishers.

11.4.1 Dealing with Conductive Materials

Treat all materials as conductive (including liquids and gases) unless you have conclusive knowledge they are not.

Examples of Conductive Materials

- Earth, concrete and wet or damp timber are conductive materials.
- Fire flame conducts electricity. (Be careful when you use flame producing equipment.)
- Vehicle tyres are made of rubber containing a high percentage of carbon and other conductive materials.
- Most commercially available fabric tape measures are metal reinforced and will conduct a current.
- Many aerosol sprays contain volatile organic compounds and are conductive.

Precautions

- Take all specified precautions on work involving live exposed conductors.
- Do not use metal ladders, wire reinforced ladders, steel tapes, metal reinforced tapes or metal rulers near live exposed conductors. (Fabric tape may also be conductive.)
- Be careful with metal objects such as radio telephone units with telescopic aerials.
- Do not wear personal metal objects (bracelets, rings, neck chains, watches, clothing with metal threads or metal components) or other conductive items.
- Remove objects (e.g. tools) which could fall onto live exposed conductors. (Objects falling from pockets are particularly dangerous.)

11.4.2 Material Storage

Keep stored materials away from exposed mains and apparatus. Make sure materials do not block doorways, passageways, or stop normal work being done on mains and apparatus.

Once you have completed work in an area where there are exposed mains and apparatus, make sure you remove all portable ladders, tools, ropes, rubbish, and any other unnecessary materials.

11.4.3 Fire Extinguishers

Only use fire extinguishers marked Class (E), Suitable for Electrical Equipment (e.g. dry powder or Carbon Dioxide-CO₂) on live equipment. If using an extinguisher on live high voltage (HV) equipment, keep yourself and the fire extinguisher outside the minimum safe working distance (MSWD) until the equipment has been isolated and earthed.

The contents of other types of fire extinguishers (e.g. foam and pressurised water) can be conductive and must only be used after the equipment has been isolated.

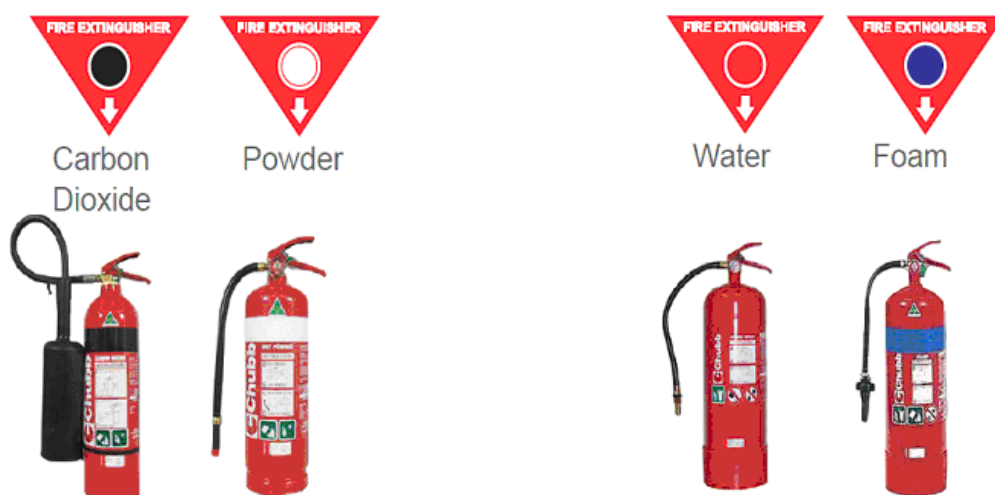


Figure 130 - Carbon dioxide (CO₂ red canister with a black band) and chemical powder (a red canister with a white band) are the appropriate fire extinguishers for a Class E – Suitable for Electrical Equipment fire.

Figure 131 - Pressurised water and foam must only be used after equipment is isolated.

11.5 Working on Specific Substation Equipment

This section describes voltage transformers, disconnected transformers, current transformers, capacitors, interlocks, and substation doors.

11.5.1 Voltage Transformers

Magnetic voltage transformers

Before any work begins on a voltage transformer (other than a withdrawable-type voltage transformer), ensure:

- high voltage (HV) and secondary windings are isolated
- HV windings are earthed and short-circuited.

Exception 1

If the voltage transformer is connected to HV mains and apparatus via fuses that are not designed to be readily accessible for withdrawal, then isolate the busbar to work on the voltage transformer provided that:

- the busbar is earthed and short-circuited
- the low voltage (LV) winding is isolated
- any exposed conductors associated with the HV winding are momentarily discharged to earth immediately before work is started on the voltage transformer.

Exception 2

If the voltage transformer is directly bonded to HV mains and apparatus (i.e. not connected by HV fuses or links), then isolate the busbar to work on the voltage transformer provided:

- the busbar is earthed and short-circuited
- the LV winding is isolated.

Exception 3

Gas insulated switchgear voltage transformers fitted with a primary isolator do not need to be isolated from the primary circuit provided:

- the secondary winding of the voltage transformer is isolated
- the associated feeder, busbar or power transformer to which the voltage transformer is normally connected is isolated and earthed.



Figure 132 - 11kV—110V voltage transformer

Capacitive Voltage Transformers

For capacitive voltage transformers, the following precautions apply:

- Connect the HV access permit earth as close as possible to the connection of the capacitive voltage transformer so that there is no form of inductive impedance between it and the earth.
- Do not apply the access permit earth immediately after isolation. Allow at least five minutes for the capacitors to discharge.
- Before undertaking work that involves the open circuiting of any connection in the primary circuit of the capacitive voltage transformer, you must short-circuit the primary connection to one of the following:
 - the frames of individual capacitors and to earth
 - the earthed metal base of an integrated type of capacitive voltage transformer—the main primary connection must then be disconnected.
- As an added precaution, prior to touching the secondary connections, the secondary connections must be momentarily discharged to earth.

There is no requirement to apply access permit earths to the secondary winding of capacitive voltage transformers.

11.5.2 Disconnected Transformers

For disconnected transformers, the following precautions apply:

- If a transformer is de-energised with the intention of disconnecting it from the network, do not leave the high voltage and low voltage cables connected.
- Change the labelling on the equipment to Warning Do Not Operate (WDNO).
- LV cables should be disconnected from the transformer terminals.
- If there is an endbox, either:
 - cut and seal the HV cables so they can be visually or physically traced between the endbox and the sealed ends
 - cut the LV cables (and if necessary, seal) so the cables can be visually or physically traced between the endbox and the ends.

During the course of a project, if a transformer is temporarily disconnected, any access permits covering the mains and apparatus must not be recovered or withdrawn. This applies in all case other than for the purpose of immediately re-issuing new access permits if there are changed conditions. The transformer must be covered by an access permit at all times except for a nominal period while the access permit is rewritten.

If HV cables connected to a transformer have not been cut and sealed, or have been sealed at a location that does not permit visual or physical tracing of the cable between the transformer and the cable ends, take the following precautions:

- Check on obvious indications that the transformer is not energised. (The transformer should not be warm, humming or vibrating.)
- If there are still connections terminated at WDNO panel(s), then issue an access permit and observe the appropriate safety procedures in these Rules.
 - Endorse the access permit – *‘subject to stabbing HV cable and verification of transformer connections’*.
 - Prior to the commencement of work, stab the HV cable.

Depending on connections or terminations, verification of transformer connections could include insulation testing after stabbing or other electrical tests (such as dc resistance).

11.5.3 Dangers of Current Transformers

To prevent dangerous induced voltages, you must not open the secondary winding of any energised current transformer.

Workers must not make uninsulated contact with exposed conductors on secondary circuits of energised current transformers.

When current transformers (or circuit breakers containing current transformers) are subject to HV testing, or current injection testing, the secondary terminals of the current transformers must be earthed and short-circuited before testing commences.

11.5.4 Capacitors

Treat capacitors as live until they are isolated, discharged, earthed and short-circuited in an approved manner. This includes capacitors in a frequency injection cell or ripple filters, and capacitors connected to form banks. Allow five minutes discharge time before applying earths.

11.5.5 Interlocks

Interlocks ensure that the correct operating sequence is carried out or prevents inappropriate access to equipment. Interlocks must not be forced or overridden.

Example: On a ring main unit (RMU), the feeder switch must be in the ‘Off’ position first before an interlock allows the earthing switch to move to the ‘Earth On’ position. This will free the endbox interlock and will then allow you to gain access to the endbox of the earthed feeder.



Figure 133 - Interlock engaged to prevent access to cable end box.

11.5.6 Substation Doors and Gates

Entrances to substations, switching stations, distribution centres, and any other areas where live exposed conductors are present, must always be locked when not in use.

Take every precaution to ensure that unauthorised persons cannot enter while still allowing for access (e.g. passage of materials, ventilation, or emergency exit).

Fire doors must be left closed when not required to be open for access.



Figure 134 – Locking a substation entrance



Figure 135 - Restricted access signs on gates at a substation

11.6 Community Batteries

This section provides the Rules relating to community batteries that are connected to the Ausgrid network.

11.6.1 Application of these Rules

These Rules apply to:

- any work on Ausgrid LV mains or services that are connected to a community battery; or
- any work involving community battery SCADA systems that are monitored by, or provide alarms to, System Control.

Workers who are carrying out work, other than the work listed directly above, on a community battery (on the battery side of the main a.c. isolation switch) must comply with the electrical controls required by the organisation which is authorised to carry out the work on the battery.

11.6.2 Isolation

The main a.c. isolation switch of a community battery may be operated by:

- an electrically qualified Ausgrid employee, who has received specific instruction on the operation of the switch; or
- an AEMO accredited metering provider with Level 2D ASP authorisation; or
- a worker who is authorised by an organisation which is authorised by Ausgrid to carry out work on the battery.

If an organisation which is carrying out work on the battery requires the isolation of Ausgrid LV mains or services that are connected to the community battery, an appropriately authorised Ausgrid operator is to confirm and secure the isolation through an operating agreement that is issued to the person nominated by the other organisation.

11.7 Stand Alone Power Systems

Some Ausgrid network customers may be supplied by Stand Alone Power Systems (SAPS) instead of the grid-connected network.

This section provides the Rules relating to SAPS that supply Ausgrid network customers.

11.7.1 Application of these Rules

These Rules apply to:

- any work on Ausgrid LV mains or services that are connected to a SAPS; or
- any work involving SAPS SCADA systems that are monitored by, or provide alarms to, System Control.

Workers who are carrying out work on a SAPS, on the SAPS side of the main a.c. isolation switch, must comply with the electrical controls required by the organisation which is authorised by Ausgrid to carry out the work on the SAPS.

11.7.2 Isolation

The main a.c. isolation switch of a SAPS may be operated by either:

- an electrically qualified Ausgrid employee, who has received specific instruction on the operation of the switch; or
- an AEMO accredited metering provider with Level 2D ASP authorisation; or
- a worker who is authorised by an organisation which is authorised by Ausgrid to carry out the work on the SAPS.

If an organisation which is carrying out work on the SAPS requires the isolation of Ausgrid LV mains or services that are connected to the SAPS, an appropriately authorised Ausgrid Operator is to confirm and secure the isolation through an operating agreement that is issued to the person nominated by the other organisation.

11.8 High Voltage Customer Equipment

This section describes requirements for high voltage (HV) customer equipment.

11.8.1 High Voltage Customer Equipment

HV Mains and Apparatus Forming Part of Ausgrid's Network

Any customer HV mains and apparatus which form part of Ausgrid's supply network (e.g. HV service mains paid for by the customer) are dealt with by the Ausgrid Group or Business Unit concerned as per normal procedures.

HV Mains and Apparatus Forming Part of a Customer Installation

HV mains and apparatus forming part of a customer installation must comply with Network Standard NS195 – High Voltage Customer Connections (HVCs).

12 Interconnected HV Mains and Apparatus

This chapter describes the controls required for work on HV mains and apparatus that are interconnected between Ausgrid and another organisation.

Other organisations include:

- NSW Electricity Network Operators (i.e. Transgrid, Endeavour Energy, Essential Energy, Sydney Trains);
- Electricity generators connected to the Ausgrid HV network; and
- HV customers.

The Head of System Control is responsible for establishing and maintaining operating protocols between Ausgrid and these other organisations with interconnected HV mains and apparatus.

12.1 Ausgrid Requesting Isolation by Another NSW Network Operator or HV Generator

This section describes the arrangements when Ausgrid requires another NSW network operator or HV generator to carry out isolation and earthing of interconnected HV mains and apparatus.

12.1.1 Arranging isolation and earthing

The person planning the work is required to submit a NAR. System Control will then arrange for the isolation and earthing by the other network operator or generator.

12.1.2 Securing Isolation and Earthing

All isolation and earthing must be secured by an operating agreement between Ausgrid and the other organisation.

12.1.3 Verbal Operating Agreement

Where verbal agreements (or clearances) are specified in the operating protocol between Ausgrid and the other organisation, operating agreements may be made verbally between the control rooms of the two organisations.

In this situation, the System/Area Operator and the other organisation's controller(s) must work together to isolate and earth the mains and apparatus as required by these Rules.

The System/Area Operator and the other organisation's controller must advise each other of the safety procedures followed before:

- any access permit is issued;
- any HV test is applied to the mains and apparatus;
- any access permit earths are removed; or
- the mains and apparatus are put back in service when the work is finished.

When the other organisation's controller informs the System/Area Operator of the isolation and earthing of the interconnected mains and apparatus, the System/Area Operator must relay the information to the Class 1 Operator who will be issuing the access permit.

Once the Class 1 Operator receives the information from the System/Area Operator, the Class 1 Operator must issue an Ausgrid access authority/permit for the work. The isolations and earthing by the other organisation must be recorded on the access permit.

Note: There may be additional access authority/permit requirements if the work is to occur within an electrical station controlled by the other network operator (see Chapter 13).

12.1.4 Written Operating Agreement

Where verbal agreements are not specified in the Operating Protocol between Ausgrid and the other organisation, isolation and earthing, as required by these Rules, must be secured by a written operating agreement. (See Section 5.7 for the use of Operating Agreements).

Once the Class 1 Operator accepts an operating agreement from the person authorised by the other organisation, the Class 1 Operator must issue an Ausgrid access permit for the work. The isolations and earthing by the other organisation must be recorded on the access permit, and the and the operating agreement referenced.

The Class 1 Operator must place the original copy of the operating agreement in the relevant permit folder.

12.1.5 Work on Ausgrid Assets totally Controlled by Transgrid

Occasionally work or testing is done on HV mains and apparatus owned by Ausgrid, where both ends terminate at substations owned by Transgrid. If neither end of the cable is controlled by an Ausgrid switch, the following applies:

1. For work on the cable end-box, Transgrid issues their own access authority (permit) to an Ausgrid worker who is authorised to receive Transgrid access authorities (permits) on the feeder panel at the place of work. The Ausgrid worker can then work on the termination.
2. For work on the cable remote from either substation, the Ausgrid Class 1 Operator must visually check Transgrid's isolation and also the Transgrid access authority (permit) issued to the Ausgrid worker. The Ausgrid Class 1 Operator must then issue an Ausgrid access permit for work on the cable. The access permit must reference the Transgrid access authority (permit) and note the requirement for cable identification. The access permit must be placed at the location specified in a receptacle folder.
3. The Ausgrid Class 1 Operator must place the permit folder at the Transgrid place of issue, as close as practicable to the point of isolation.
4. The Ausgrid worker must not cancel or otherwise surrender the Transgrid access authority/permit unless the Ausgrid access permit has been cancelled beforehand.

12.2 Ausgrid Requesting Isolation by a HV Customer

This section describes the requirements when Ausgrid requires a HV customer to carry out isolation and earthing of interconnected HV mains and apparatus.

12.2.1 Arranging Isolation and Earthing

The person planning the work must arrange for the HV customer to carry out the required isolation and earthing.

12.2.2 NAR

A NAR must be submitted and include the following details:

- the work location and specific work tasks on Ausgrid's mains and apparatus
- all arrangements made with the HV customer including:
 - appointments
 - specific earthing requirements
 - the name and contact details of the responsible person from the HV customer.

12.2.3 Arranging Permits

Once the mains and apparatus are isolated and earthed by the HV customer, a representative from the HV customer is to issue a written Operating Agreement to an Ausgrid Class 1 Operator, to secure the isolation and earthing.

The Class 1 Operator must confirm the following before issuing an Ausgrid access permit:

- the mains and apparatus of the HV customer are isolated and earthed at the specified points; and
- the HV customer's mains and apparatus are earthed within sight of and as close as practicable to the Ausgrid worksite.

Following receipt of the Operating Agreement from the HV customer's representative and confirmation of the above, the Class 1 Operator is to issue an Ausgrid access permit for the work. The isolations and earthing by the HV customer must be recorded on the access permit, and the operating agreement referenced.

The Class 1 Operator must place the original copy of the operating agreement in the relevant permit folder.

If an operating agreement is unavailable from the HV customer, an Ausgrid operating agreement must be used (see Section 5.7 for a sample of an operating agreement).

12.2.4 Cancelling Permits

Once the Ausgrid access permits are cancelled, the original and the duplicate copies of the operating agreement must be cancelled and exchanged with the HV customer's nominated person. The retained copy must be placed in the permit folder. The HV customer retains the cancelled original copy.

The permit folder, together with all the relevant papers, must be sent to the Head of Operating, Installations, and Emergency Response.

12.3 Another Organisation Requesting Isolation by Ausgrid

This section describes the requirements when another organisation (network operator, HV generator, or HV customer) requests isolation and earthing by Ausgrid, for work on interconnected HV mains and apparatus.

12.3.1 Securing isolation and earthing

All isolations, and earthing (if required), must be secured by an operating agreement between Ausgrid and the other organisation.

12.3.2 Verbal Operating Agreements

Where verbal agreements (or clearances) are specified in the operating protocol between Ausgrid and the other organisation - isolation and earthing (if required) may be secured by a verbal operating agreement between the control rooms of the two organisations.

The System/Area Operator and the other organisation's controller(s) must work together to isolate and earth the mains and apparatus as required by these Rules.

The System/Area Operator and the other organisation's controller must advise each other of the safety procedures followed before:

- any access permit is issued;
- any hazardous voltage test is applied to the mains and apparatus;
- access permit earths are removed;
- the mains and apparatus are put back in service when the work is finished.

12.3.3 Written Operating Agreements

Where verbal agreements are not specified in the operating protocol between Ausgrid and the other organisation, isolations and earthing (if required) must be secured by a written operating agreement.

Once the mains and apparatus are isolated and earthed as requested, a Class 1 Operator must issue an operating agreement to the person nominated by the other organisation to secure the isolation and earthing.

See Section 5.7 for details on the use of written operating agreements.

12.4 Isolation of Privately Owned Parallel Generation Plants

Parallel generation plants are designed to be connected to the network and to operate attended or unattended. They are equipped with a switch that is the point of common coupling between the HV supply network and the parallel generation plant and the low voltage (LV) air circuit breaker which is associated with each generator.

An auxiliary supply for lighting, battery charging, control circuits and automatic synchronisation may also be connected to the network.

For work on mains and apparatus that are inside the plant, the owner must isolate appropriately and take suitable precautions.

For work on the point of common coupling, a Class 1 Operator must issue an access permit to the person who is authorised to do the work.

High Voltage

When work must be done on Ausgrid's interconnecting mains and apparatus, treat the parallel generation plant as a possible source of HV supply for the purposes of isolation and earthing. Like other HV interconnections, the isolation and earthing must be secured with an operating agreement prior to the issue of an access permit.

Low Voltage

When work is done on Ausgrid's interconnecting mains and apparatus, customer generators may be connected which are intended to operate in parallel with Ausgrid's network and must be treated as a possible source of LV supply. Protect the isolation by identifying these customer generators and securing the access to these sites.



Figure 136 – Customer generator

13 Working in Electrical Stations Controlled by other Organisations

This chapter describes the controls required for work on Ausgrid HV mains and apparatus that are located within an electrical station that is operated or controlled by another organisation.

13.1 Working in Transgrid Electrical Stations

This section describes the controls required for work on Ausgrid HV mains and apparatus that are located within an electrical station owned or operated Transgrid.

13.1.1 Transgrid Access Authorities (permits)

If the work on Ausgrid mains and apparatus occurs within a Transgrid electrical station, Ausgrid workers will also need to sign onto a Transgrid access authority (permit) – which is issued in addition to the Ausgrid access permit, or equipping permit.

Exception: A Transgrid access authority is not required where the work is carried out under an Ausgrid access authority/permit on Ausgrid cables that are located in a cable basement within a Transgrid electrical station.

Note: Transgrid access permits are called access authorities.

A Transgrid access authority will not be issued until the Transgrid operator has completed all of the following:

- examined the Ausgrid access permit issued by an Ausgrid Class 1 Operator, or equipping permit.
- taken Ausgrid personnel to the worksite to explain the reasons for the yellow tape barrier (erected by Transgrid)
- identified the isolated mains and apparatus.

The permit recipient is responsible for the safety of Ausgrid workers under the permit recipient's control. The permit recipient is also responsible for keeping the gate to the Transgrid premises locked when the Transgrid authorised person in charge is not available.

13.1.2 Authorisations

Workers must be authorised by Transgrid to work under a Transgrid access authority in a Transgrid substation.

To accept a Transgrid access authority, workers must be authorised by Transgrid as an Authorised Person in Charge (APIC).

13.1.3 Place of Issue

The NAR must specify the 'place of issue' of the Ausgrid access permit. When the 'place of issue' is at a Transgrid electrical station, the access permit will be left in the permit container.

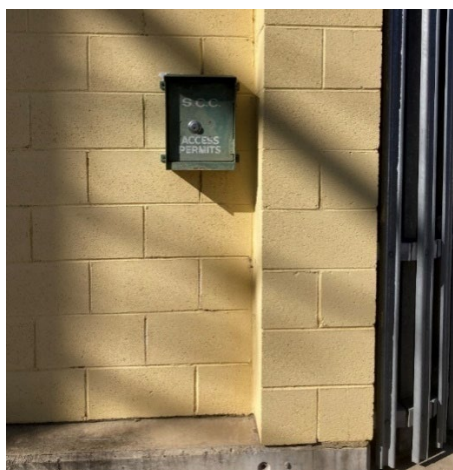


Figure 137 – Permit container on a Transgrid Substation

13.1.4 Access Permit Folders

After the access permit folder has been prepared, it is left at the Ausgrid zone substation or control point that controls the mains and apparatus (see Clause 5.9.1).

When the only switch available to isolate mains and apparatus is installed at a Transgrid electrical station, the access permit folder is left in the container provided for the issuing of access permits (e.g. a cable to a street excavation).

13.1.5 Connecting New or Altered Mains and Apparatus

When Ausgrid requires the connection of new or altered mains and apparatus at a Transgrid electrical station, the person planning the work must initiate a system alteration order (SAO) and send it to System Control. This must be submitted with the notification timeframe required by the System Control Document NSEC 007 "Submitting Network Access Requests." System Control will arrange with the Transgrid nominated person to make the connection.

13.2 Working in Electrical Stations Controlled by another Organisation – other than Transgrid

This section describes the controls required for work on Ausgrid HV mains and apparatus that are located within an electrical station owned or operated by an organisation other than Transgrid.

13.2.1 Access Permits

If the work on Ausgrid mains and apparatus occurs within electrical station owned or operated by another organisation (other than Transgrid) - in addition to the Ausgrid access permit or equipping permit, Ausgrid workers may also need to sign onto an access authority/permit which is issued by the other organisation - depending on the Electrical Safety Rules of the other organisation.

If work on Ausgrid mains and apparatus requires workers to work on or near the other organisations exposed mains and apparatus within the electrical station - in addition to the Ausgrid access authority/permit or equipping permit, the workers must sign onto an access authority/permit that is issued by the other organisation covering the mains and apparatus of the other organisation.

13.2.2 Place of Issue

The NAR must specify the 'place of issue' of the Ausgrid access permit.

The access permit **must be** placed in a receptacle folder in the container provided for the issuing of access permits or attached to the perimeter fencing of the electrical station as close as possible to the entrance.

13.2.3 Access Permit Folder

The access permit folder **must be** left at an Ausgrid point of isolation.

When the only switch available to isolate the mains and apparatus is at the electrical station (e.g. a cable to a street excavation), the access permit folder **must** be attached to the perimeter fencing of the electrical station as close as possible to the entrance, unless a container is provided for the issuing of access permits.

13.2.4 Operating another Organisation's Mains and Apparatus

Owners of HV mains and apparatus are required by the Network Management Plan to use trained and authorised personnel to carry out operating work.

An Ausgrid Class 1 operator may operate the interconnected HV apparatus of a HV customer only where it is not reasonably practicable for the HV customer to provide their own authorised operator.

Before carrying out any operating work, the owner or lessee of the mains and apparatus must sign an indemnity and authorise the Ausgrid operator to operate their equipment (see

Figure 138).

The Ausgrid operator must:

- Hold a current Class 1 operating authority; and
- obtain a current line diagram showing connections within the installation and information relating to the particular equipment; and

- investigate the isolation and earthing requirements necessary for the work; and
- assess, so far as reasonably practicable, the condition of the apparatus to confirm it is safe to operate.

When an Ausgrid access permit is issued by an Ausgrid operator, the operating work must comply with these Rules.

	Authorisation and Indemnity Form
---	---

The following Ausgrid employees are authorised to carry out the following:

- (a) Enter high voltage substations and switchrooms
- (b) Maintain and or repair high voltage electrical apparatus
- (c) Operate high voltage electrical apparatus
(strike out whichever is not applicable)

for a period of _____ from _____ to _____

It is understood that all Ausgrid employees listed below have been authorised by Ausgrid in accordance with their Electrical Safety Rules to carry out the above duties.

Employee	Operating Authority

_____ (Name of Company)	Hereby indemnifies Ausgrid and its employees against any damage or losses caused by equipment failure during the operation of the equipment.
_____ Company representative (print name and position)	_____ Witness (Ausgrid representative print name)
_____ (Signature)	_____ (Signature)
Date _____	

Figure 138 - Authorisation and indemnity form

14 Working on, near, or in the vicinity of another Organisation's Mains and Apparatus

This chapter describes the controls required to work on or near Ausgrid mains and apparatus that requires workers to work on, near, or in the vicinity of (but not electrically interconnected with) HV mains and apparatus owned or operated by another organisation.

14.1 Other NSW Network Operators

The requirements in this section apply to NSW Network Operators (i.e. Transgrid, Endeavour Energy, Essential Energy, Sydney Trains) and are based on the Industry Safety Steering Committee Guide ISSC37 – “Guide for working on, near, or in the vicinity of the mains and apparatus of another network operator”.

14.1.1 Work in the Vicinity

For work in the vicinity of the other network operator's mains and apparatus – the Ausgrid officer who is planning the work must notify the other network operator of the proposed work.

The other network operator will review the proposed work and either notify Ausgrid of:

- their approval for the work to proceed; or
- the need for the mains and apparatus to be isolated and earthed, and an operating agreement issued for work, as set out in Clause 14.1.2 below.

14.1.2 Work On or Near

For work on or near the other NSW network operator's mains and apparatus – the other NSW network operator is required to:

- isolate the mains and apparatus; and
- apply earthing and short circuiting:
 - between all HV points of isolation and the worksite;
 - as close as reasonably practicable to the worksite; and
 - (for overhead mains and apparatus) visible from the worksite.

NAR

The person planning the work is required to submit a NAR. The NAR must include the following details:

- the relevant Ausgrid mains and apparatus; and
- the relevant mains and apparatus owned or operated by the other network operator.

System Control will then arrange for the isolation and earthing by the other network operator.

Arranging Permits

Once the mains and apparatus are isolated and earthed by the other NSW network operator, a representative from the other NSW network operator is to issue a written Operating Agreement to an Ausgrid Class 1 Operator, to secure the isolation and earthing.

The Class 1 Operator must confirm the following before issuing an Ausgrid access permit:

- the mains and apparatus of the other network operator are isolated and earthed at the specified points; and
- the other network operator's mains and apparatus are earthed within sight of and as close as practicable to the Ausgrid worksite.

Following receipt of the Operating Agreement from the other network operator's representative and confirmation of the above, the Class 1 Operator is to issue an Ausgrid access permit for the work. The access permit must include the mains and apparatus of the other network operator and reference the operating agreement.

The Class 1 Operator must place the original copy of the operating agreement in the relevant permit folder.

If an access permit or operating agreement is unavailable from the other organisation, an Ausgrid operating agreement must be used (see Section 5.7 for a sample of an operating agreement).

Cancelling Permits

Once the Ausgrid access permits are cancelled, the other organisation's access permit or operating agreement must be cancelled by the Ausgrid Class 1 Operator and returned to the other organisation's nominated person.

If an operating agreement is used, the original and the duplicate copies of the operating agreement must be cancelled and exchanged with the other organisation. The retained copy is placed in the permit folder. The organisation that issued the operating agreement retains the cancelled original copy.

The permit folder, together with all the relevant papers, must be sent to the Head of Operating, Installations, and Emergency Response.

14.1.3 RailCorp Equipment

The safety procedures which apply to high voltage (HV) alternating current (ac) circuits and 1500V direct current (dc) traction circuits are set out in the RailCorp Electrical Safety Instructions.

All work is currently covered by the use of an operating agreement.

When RailCorp 1500V dc traction circuits are isolated (or if RailCorp HV ac mains and apparatus are isolated and earthed to allow work by Ausgrid workers to proceed), the switches which control the RailCorp's mains are danger-tagged by RailCorp staff.

A label must be attached to this danger tag displaying the serial number of the RailCorp Working High Voltage Instruction (WHVI) that shows the disconnection of the mains (see Figure 139).



WHVI No. _____		
EQUIPMENT TO BE ISOLATED: (Including other Electrical Network Operator's services)		

DATE AND TIME: _____		
SPECIAL INSTRUCTIONS:		

THE ELECTRICAL SYSTEM OPERATOR SHALL ARRANGE FOR THE FOLLOWING SWITCHING AND SAFETY EARTHING OPERATIONS:		
CIRCUIT BREAKER / SWITCH / LINK	LOCATION	ACTION
_____	_____	_____

Figure 139 – Portion of the RailCorp working high voltage instruction (WHVI).

An Ausgrid Class 1 Operator must ensure that at least one set of earths is installed on RailCorp's overhead HV mains and apparatus in sight of and as close as practicable to the Ausgrid worksite.

For underground mains and apparatus, earthing details must be included in the operating agreement.

Note: Isolated RailCorp 1500V dc traction circuits are deemed low voltage (LV) and are not required to be earthed. They are required to be rail-connected at the isolation points.

Disconnection of HV ac or 1500V dc Mains

When RailCorp 1500V dc traction circuits have been isolated, or RailCorp HV ac mains and apparatus have been isolated and earthed, the Ausgrid Class 1 Operator must get an operating agreement that has been signed by the RailCorp's authorised person.

The Class 1 Operator must ensure that there is a set of earths on the RailCorp HV mains and apparatus in sight of and as close as practicable to the Ausgrid worksite, before accepting a RailCorp operating agreement or access permit.

Emergency Reconnection of High Priority RailCorp Mains

When high priority RailCorp mains must be disconnected to allow Ausgrid workers to work on Ausgrid mains and apparatus, RailCorp can request a Class 1 Operator stand by to allow the RailCorp mains to be returned to service as quickly as possible (in case of emergency).

The System/Area Operator will direct the Class 1 Operator to use the following procedure:

1. Tell the access permit recipient(s) to make the mains and apparatus safe.
2. Have the recipient(s) cancel the access permit.
3. Recover all access permits on issue (including those not accepted).
4. Cancel the operating agreement and give it to the RailCorp nominated person (also standing by).
5. Advise the System/Area Operator that all Ausgrid workers are clear of the RailCorp mains.

The System/Area Operator will then confirm with the RailCorp Electrical System Operator (Trouble Officer) that the procedure is complete, and the RailCorp mains can be returned to service.

14.1.4 Sydney Light Rail – Aesthetic Power Supply System

The Sydney Light Rail Aesthetic Power Supply (APS) system consists of a centre third rail which is divided into 8m long segments to supply power to light rail vehicles. A centre rail segment can only be energised to 750Vdc when a tram is positioned on top of the segment. When a tram is not positioned on top of a segment, this segment is connected to the side rails.

When undertaking work within 3 metres of Sydney Light Rail tracks, the Sydney light rail operator must be notified. Where a Sydney Light Rail Operator Track Possession Permit has been issued all workers must sign onto the Permit. The Sydney Light Rail Operator will provide a “Person in Charge” to implement the permit. The track possession permit will prevent trams from travelling in the permit area, thus preventing the centre rail from being energised. This permit allows the centre rail section within the permit area to be treated as electrically safe and hence can be treated as isolated for this situation with no further permits or operating agreements required.

14.2 Organisations other than NSW Network Operators

The requirements in this section apply to HV mains and apparatus owned or operated by organisations other than NSW Network Operators (e.g. HV customers).

14.2.1 Work in the Vicinity

Where the work on or near Ausgrid mains and apparatus requires workers to work in the vicinity of the other organisations mains and apparatus – the Ausgrid officer who is planning the work must notify the other organisation of the proposed work.

If the Electrical Safety Rules of the other organisation require their mains and apparatus to be isolated and earthed for the work to proceed, the requirements of Clause 14.2.2 will apply.

14.2.2 Work On or Near

Where the work on or near Ausgrid mains and apparatus requires workers to work on or near another organisation’s mains and apparatus – the other organisation is required to:

- isolate the mains and apparatus; and
- apply earthing and short circuiting:
 - between all HV points of isolation and the worksite;
 - as close as reasonably practicable to the worksite; and
 - (for overhead mains and apparatus) visible from the worksite.

The person who is planning to work must make arrangements with the other organisation to carry out the isolation and earthing.

Network Access Request

The person planning the work must submit a NAR including the following details:

- the relevant Ausgrid mains and apparatus
- arrangements made with the other organisation (including appointments and specific earthing requirements)
- the name of the responsible representative from the other organisation.

Arranging Permits

The Class 1 Operator must confirm the following before issuing an Ausgrid access permit:

- mains and apparatus of the other organisation are isolated and earthed at the specified points
- other organisation's mains and apparatus are earthed within sight of and as close as practicable to the Ausgrid worksite.

The Class 1 Operator must either accept an access permit or exchange an operating agreement with the other organisation's nominated person.

Where an access permit is issued by the other organisation, the Class 1 Operator must accept it and sign as the transferor recipient (if this facility is available). If an operating agreement is exchanged, the Class 1 Operator must accept the original copy of the operating agreement.

The Class 1 Operator must place the access permit or the original copy of the operating agreement in the relevant permit folder.

If an access permit or operating agreement is unavailable from the other organisation, an Ausgrid operating agreement must be used (see Section 5.7 for a sample of an operating agreement).

The Class 1 Operator can then issue an Ausgrid access permit for the work. The Ausgrid access permit must include the mains and apparatus of the other organisation and reference the operating agreement or the other organisation's access permit.

Cancelling Permits

Once the Ausgrid access permits are cancelled, the other organisation's access permit or operating agreement must be cancelled by the Ausgrid Class 1 Operator and returned to the other organisation's nominated person.

If an operating agreement is used, the original and the duplicate copies of the operating agreement must be cancelled and exchanged with the other organisation. The retained copy is placed in the permit folder. The organisation that issued the operating agreement retains the cancelled original copy.

The permit folder, together with all the relevant papers, must be sent to the Head of Operating, Installations, and Emergency Response.

15 Work by Other Organisations On, Near, or in the Vicinity of Ausgrid Mains and Apparatus

This chapter sets out the requirements when another organisation is carrying out work on, near, or in the vicinity of Ausgrid mains and apparatus.

15.1 Other NSW Network Operators

The requirements in this section apply to NSW Network Operators (i.e. Transgrid, Endeavour Energy, Essential Energy, Sydney Trains) and are based on the Industry Safety Steering Committee Guide ISSC37 – “Guide for working on, near, or in the vicinity of the mains and apparatus of another network operator”.

15.1.1 Vicinity

For work by another NSW network operator in the vicinity of the Ausgrid mains and apparatus – the other network operator must notify Ausgrid of the proposed work.

Ausgrid will review the proposed work and either notify the other network operator of:

- approval for the work to proceed; or
- the need for the mains and apparatus to be isolated and earthed, and an operating agreement issued for work, as set out in Clause 15.1.2 below.

15.1.2 On or Near

For work on or near Ausgrid mains and apparatus by the other NSW network operator – Ausgrid is required to:

- isolate the mains and apparatus; and
- apply earthing and short circuiting:
 - between all HV points of isolation and the worksite;
 - as close as reasonably practicable to the worksite; and
 - (for overhead mains and apparatus) visible from the worksite.

NAR

The request from the other network operator may be received by either the Ausgrid business unit responsible for maintaining the mains and apparatus, or directly through to System Control between control rooms. Where the request is received by the relevant Ausgrid business unit, a responsible officer from the business unit must submit a NAR including:

- the relevant Ausgrid mains and apparatus;
- arrangements made with the other organisation (including appointments and specific earthing requirements); and
- the name of the responsible representative from the other network operator.

Arranging Permits

An Ausgrid Class 1 operator is to issue a written Operating Agreement to the representative from the other NSW network operator, to secure the isolation and earthing of the Ausgrid mains and apparatus.

The other NSW network operator will then be responsible for issuing their own access authority/permit for work on or near the Ausgrid mains and apparatus.

The work is to be carried out under the safe systems of work of the other network operator.

Note: This same arrangement will apply to Ausgrid exposed mains and apparatus that are non-connectable.

15.2 Organisations other than other NSW Network Operators

This section applies to other organisations who are not working under the Electricity Supply Act and Regulations - e.g. external parties.

15.2.1 Vicinity

Work in the vicinity of Ausgrid mains and apparatus by other organisations (other than NSW Network Operators) must comply with the safe approach distances of the WorkCover COP – Work Near Overhead Power Lines.

15.2.2 Near

Work near Ausgrid exposed HV mains and apparatus by other organisations must be carried out under an Ausgrid access permit, with the mains and apparatus isolated and earthed in accordance with these Rules. The access permit must be issued by a Class 1 operator to a person who is authorised by Ausgrid to receive access permits.

Work near Ausgrid LV mains and apparatus must be carried out under a Clearance to Work with the mains and apparatus isolated and shorted as required by these Rules.

Note: This same arrangement will apply to Ausgrid exposed mains and apparatus that are non-connectable.

15.2.3 Enquiry process

The process for receiving and managing enquiries relating to work by external parties working under the WorkCover Code of Practice – Work Near Overhead Power Lines, is set out in the Ausgrid Technical Guide T0113.

16 Glossary – Personnel

Energy Networks Association (ENA) generic definitions are included (where available) in italics.

Person	Description
Access Permit Recipient	See recipient.
Accredited Service Provider (ASP)	An accredited service provider (ASP) is either an individual or a company with current accreditation under the <i>NSW Government - Accredited Service Provider</i> scheme. There are three levels of accreditation: • Level 1 accreditation—involving the contestable construction of transmission and distribution works such as the installation of high voltage (HV) and low voltage (LV) distribution cables and substations (i.e. distribution work). • Level 2 accreditation—involving the contestable installation of overhead and underground service mains and metering equipment, the disconnection and reconnection of supply to carry out work on an installation and energising installations. • Level 3 accreditation—involving the design of electrical reticulation systems to be constructed as contestable works.
Authorised Person	<i>ENA—means a person with technical knowledge or sufficient experience who has been approved or has the delegated authority to act on behalf of the Network Operator, to perform the duty concerned.</i> An authorised person is a trained and competent person approved to carry out specific duties relating to the supply of electricity. A person authorised by another electricity network operator, organisation, high voltage customer or contractor is also a trained and competent person approved in writing by their employer, for work on their employer's network. Authorised person includes accredited service providers and their employees who are approved by Ausgrid in accordance with Electrical Standard - Service Provider Authorisation (ES 4).
CAVC Certified Persons	A worker who holds a current close approach vegetation control (CAVC) authorisation. Annual refresher training by a registered training organisation (RTO) is required to keep this accreditation. CAVC certified persons include climber/groundworkers and those working from an EWP.
Class 1 Operator	An authorised person who holds a class 1 operating authority.
Class 2 Operator	An authorised person who holds a class 2 operating authority.
Class 3 Operator	Not in use at this time
Class 4 Operator	An authorised person who holds a class 4 operating authority.
Class 5 Operator	An authorised person who holds a class 5 operating authority.
Class 6 Operator	An authorised person who holds a class 6 operating authority.
Classification	In relation to minimum safe work distances – whether a person is an ordinary, instructed, or authorised person. In relation to access authorities/permits - the trade, skill base, or role a worker is employed in. For example, line worker, cable jointer, technician, power worker, engineer, tester, etc.
Contract officer	An Ausgrid employee who is responsible for arranging access to the network for work carried out by contractors to Ausgrid.

Person	Description
Contractor	<i>ENA—means an entity engaged by a Network Operator to carry out work on the electricity network.</i> Employed by Ausgrid on a contract basis, a contractor can also be an employee of a corporate body, person or group of persons or organisation employed on a contract basis.
Electrically Qualified Person	A person who holds one or more of the following qualifications, or equivalent*, or greater. • UEE30811 – Certificate III in Electrotechnology Electrician • UET30619 – Certificate III in ESI – Power Systems – Distribution Overhead • UET30819 – Certificate III in ESI – Power Systems – Distribution Cable Jointing *Equivalence shall be determined by the Electrical Safety Manager.
Employee	An employee is a worker engaged by an employer (whether under a contract of employment or apprenticeship) and includes a contractor or sub-contractor, and a person employed by a contractor or sub-contractor, who carries out work for an employer.
Employer	An employer is a network operator or service provider, as the case may be, who engages an employee.
Instructed Persons	<i>ENA—A person who is adequately advised or supervised by an authorised person so they can avoid the dangers which electricity may create.</i> For the purpose of work on, near, or in the vicinity of mains and apparatus, an instructed person is deemed to be a person providing specialist services, who are required to work on or near the network on a unique or infrequent basis. (e.g. apiarists removing bees from network assets, equipment specialists providing advice on apparatus such as transformer tap changers). An authorised person whose training has expired is not deemed to be an instructed person.
Network Operator	<i>ENA—means the owner, controller or operator of an electricity network.</i> Also known as an electricity supply authority.
Operator	An operator is a person authorised by, or on behalf of, the Executive General Manager – Field Operations to carry out operating work on the Ausgrid network. Operators may only carry out operating work within the limits of their operating authority.
Operator – Mobile Plant	A person who operates mobile plant.
Ordinary Person	<i>ENA—means a person without sufficient training or experience to enable them to avoid the dangers which electrical apparatus may create.</i>
Recipient	A recipient is an appropriately authorised person who receives an access authority/permit for work on or near, or testing of, mains and apparatus.
Safety Observer	<i>ENA—means a person competent for the task and specifically assigned the duty of observing and warning of unsafe approach to electrical apparatus or other hazards.</i> A safety observer's function is to witness the work being carried out to ensure the appropriate safety controls (precautions) are implemented and maintained. There are various types of safety observers such as: • safety observer for mobile plant

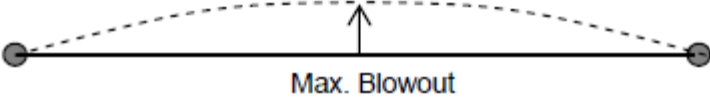
Person	Description
	• safety observer for LV live work • safety observer for HV live work. Typically, a safety observer must be hazard and risk-aware, be able to warn about any approach to electrical apparatus, be trained to do rescue, and be able to stop the work if necessary.
Specially Authorised	A person who is issued a special authorisation to receive Ausgrid access permits, for work near Ausgrid overhead mains and apparatus under the WorkCover Code of Practice “Work Near Overhead Power Lines”. The special authorisation is limited to a specific location and timeframe. The specially authorised person must successfully complete training in Ausgrid access permit procedures prior to being issued a letter of authorisation. This letter must be shown to the operator issuing the access permit to prove that the person is authorised to receive the permit.
Stand-by Person	A stand-by person is an employee who: • is an authorised person • may accompany unauthorised people into areas where there are live exposed conductors • may also be required to accept an access permit to enable work by unauthorised people (who must sign on to the access permit under ‘Sign On’). The stand-by person must be equipped and able to carry out the following procedures under emergency conditions: • rescue and resuscitation • de-energise the appropriate live mains and apparatus (if the control mechanism is at the site) • communicate with the control room to remotely de-energise the appropriate live mains and apparatus (if the control mechanism is remote from the site).
Transferor Recipient	The term transferor recipient is used when isolation is required on the Ausgrid system by another organisation, or if Ausgrid is working in the vicinity of mains and apparatus owned by another organisation. If an access permit is issued by the other organisation, the Class 1 Operator will accept the access permit and sign as the recipient. If access is needed on Ausgrid’s mains and apparatus, the Class 1 Operator will sign the access permit as the transferor recipient before issuing an Ausgrid access permit.
Worker	An authorised or instructed person who is carrying out work on or near the Ausgrid mains and apparatus in accordance with these Rules.
Workgroup	A workgroup is a team of workers specifically instructed to complete one job at a single worksite (as defined on the access permit). All workers who form part of a workgroup can work under the direction of the same access permit recipient. Under most circumstances, a workgroup consists of only one classification or skill set and an access permit is issued for each workgroup. Where completion of a task requires two or more different classifications (or skills sets) and the permit recipient has the technical and practical ability to ensure the safety of the work being performed by all classifications, participating workers can be considered part of a single workgroup and only one access permit issued.

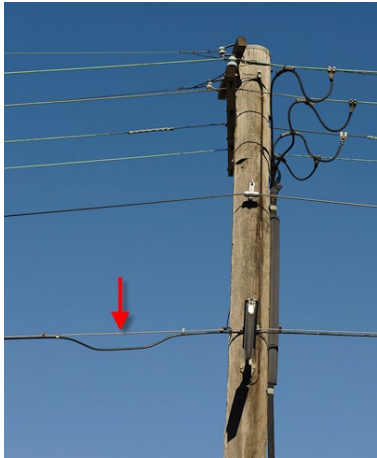
17 Glossary - General

Note: This glossary provides definitions of various terms and in no way replaces the descriptions and definitions described in these Rules. The purpose of this glossary is to explain or further describe the technical and unfamiliar words. Where there is any confusion between what is stated in the glossary and what is stated in these Rules, descriptions in these Rules prevail.

Energy Networks Association (ENA) generic definitions are included (where available) in italics.

Term	Description
Aerial Bundled Conductor (ABC)	ABC are overhead power conductors insulated with cross-linked polyethylene (XLPE) and tightly bundled together. Low voltage (LV) ABC consists of four insulated conductors. HV ABC consists of three insulated phase conductors and a bare catenary wire. Each phase conductor is screened and covered by a sheath of high-density polyethylene (HDPE).
Absolute Limit of Approach	An absolute limit of approach is the absolute minimum distance you must keep any part of your body (or anything you are holding) from an exposed live high voltage (HV) conductor when performing operating work or work which has been authorised in writing by an Ausgrid Group or Business Unit manager.
Access Authority/Permit	An access permit (as defined below) or clearance to work
Access Permit	A pre-printed form which, when issued in accordance with these Rules, allows the recipient and persons who sign onto the permit, to work on or near or carry out testing of mains and apparatus in accordance with these Rules. Includes the following documents: • access permit for work • restricted access permit for work • access permit for test and ancillary work
Access Permit Earths	Access permit earths are earthing and short-circuiting equipment. They are used as one of the controls required to allow persons to work on or near exposed HV mains and apparatus. Access permit earths must be applied as required by these Rules. Access permit earths are not the same as working earths (see definition of working earths).
Access Permit Folder	See permit folder.
Alive	See live.
Approved	<i>ENA—means having appropriate organisation endorsement in writing for a specific function.</i> Approved means authorised in writing by an Ausgrid Group or Business Unit Manager (or their delegate) and recorded in relevant Ausgrid documentation.
Arc Thermal Performance Value (ATPV)	Informal: The arc rating of protective personal equipment (PPE) usually expressed in calories/cm ² . Formal: In arc testing, the incident energy on a material or a multi-layer system of materials that results in a 50% probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second-degree skin burn injury based on the Stoll curve, without break-open.

Term	Description
Barrier	A temporary or permanent structure used to prevent access to live exposed conductors. A barrier is a physical structure that presents an obstacle to the electrical apparatus. The following conditions apply: • Unless the barrier is a screen manufactured from approved non-conductive materials, it must not be erected within MSWD (measured from live conductors) • Barriers must be erected and removed only by authorised persons.
Blowout	Blowout is the horizontal deviation in an overhead conductor position, from the centre line, due to wind forces. A line at the midpoint of each span (at right angles to the centreline) to a calculated catenary equation defines the maximum blowout for the span.  Figure 140 - Estimating maximum blowout
Bulk Supply Point	Supplies power to Ausgrid's supply network and can be: • a power station • a substation • a switching station • a connection to a HV feeder which is owned by another authority.
Cage	A cage is a fully fenced or walled area (of minimum height 1.5m), room, or compartment: • which contains exposed HV mains and apparatus; • where the minimum safe working distances cannot be maintained. Kiosk Type Distribution Centre A kiosk type distribution centre with exposed HV conductors (such as exposed cables and connections) is not considered a cage. However an access permit is required if work will be done on or near exposed HV conductors inside the kiosk.
Capacitor Voltage Transformers (CVT)	A capacitor voltage transformer (CVT), or capacitance coupled voltage transformer (CCVT) is a transformer used in power systems to step down HV and provide a LV for measurement or to operate a protection relay. A CVT uses capacitance (i.e. uses electrical forces to create voltage) rather than induction, which uses magnetic forces to induce voltage.

Term	Description
Catenary Wire	A suspended wire, used to support a cable.  Figure 141 - A catenary wire supporting a communications cable
Clearance to Work	A pre-printed form which, when issued in accordance with these Rules, allows the recipient and persons who sign onto it, to work on or near low voltage mains and apparatus in accordance with these Rules
Clearance to Work Folder	A clearance to work folder is a pre-printed envelope which is completed by an appropriately authorised operator who records the operating work done in connection with issuing and cancelling clearances to work. The clearance to work folder is used to: • Coordinate multiple clearances to work that may be issued on the same mains and apparatus; • Record the number and location of all LV shorts that are applied to the mains and apparatus; • Hold all relevant field operating papers. The folder enables an operator to ensure all clearances to work are cancelled and all LV shorts are removed before the mains and apparatus are re-energised.
Close Approach Vegetation Control (CAVC)	Close Approach Vegetation Control (CAVC) refers to the control of vegetation where the vegetation clearance from overhead mains and apparatus is less than the clearances specified for Standard Vegetation Control but greater than the minimum vegetation clearance specified for Close Approach Vegetation Control. Refer to Section 10.5 for further information.
Commissioned	Commissioned means ready for normal service once all Factory Acceptance Tests (FAT), Site Acceptance Tests (SAT), energisation checks (e.g. phasing, “service voltage” tests, “soak” tests) and in-service checks have been satisfactorily completed. For example, a transformer is regarded as commissioned once: • the HV and LV connections have been made; and • the transformer is energised, phased and in-service checks have been completed; and • the transformer is deemed ready for normal service. See the definition of connectable for more information.
Conductor	<i>ENA - means a wire, cable, or form of metal designed for carrying electric current.</i> A conductor is any wire, bar, tube, or object that forms part of an electric circuit and can be energised.

Term	Description
Connectable	Connectable means physically capable of being made live (e.g. by closing a switch, inserting a fuse) or the new mains and apparatus being within fixed clearances. Once connectable, mains and apparatus form part of the network and must be shown on a system diagram.
Contestable work	Contestable work includes the design, construction, and installation of electricity works required to connect a customer's installation to an electricity network. Customers are required to fund the cost of contestable work and they have the choice of selecting an accredited service provider (ASP) to carry out the work. The following work has also been declared contestable and can only be carried out by ASPs with Level 2 accreditation (see definition for ASP) who have obtained authorisation from Ausgrid specifically for each category of work involved: • disconnection and reconnection of a customer's installation at the point of supply • installation and connection of an underground service cable • installation and connection of an overhead service main • installation and connection of Rule compliant whole current metering and load control equipment on behalf of an Ausgrid responsible person • energising installations (with a total electrical load less than 100 amps per phase) prior to inspection by Ausgrid. The legislation relevant to contestable work is the NSW Electricity Supply (General) Regulation (2001). It is also described in Electrical Standard - Service Provider Authorisation (ES 4).
Covered Conductors Thick (CCT)	CCT are covered conductors which have a specified thickness of covering for each of the nominated working voltages in accordance with Australian Standard (AS/NZS 3675:2002) - Conductors - Covered overhead - For working voltages 6.35/11 (12)kV up to and including 19/33 (36)kV. Covered conductors thick (CCT) are considered exposed.
Covered Tools	Covered tools are tools which have a coating of insulating material. As covered tools do not achieve the criteria for insulated tools, covered tools must only be used on live exposed mains and apparatus with the appropriate live work controls.  Figure 142 - Examples of covered tools

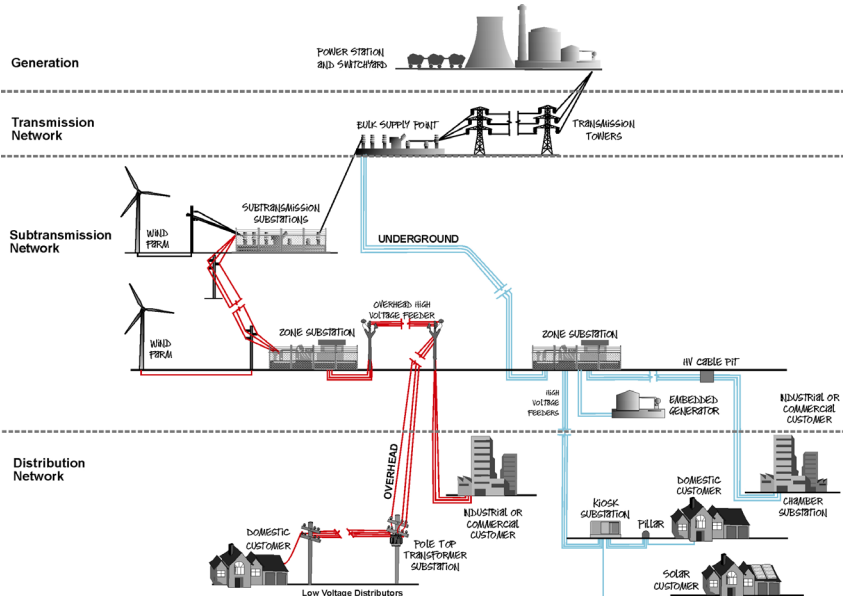
Term	Description
De-energised	<i>ENA - means not connected to any source of electrical supply but not necessarily isolated.</i> De-energised mains and apparatus are not isolated until action is taken to perform an isolation.
Direct distributor	Low voltage service conductors or consumer mains that: 1. supply a Category 2 specified customer; and 2. are connected directly to an Ausgrid substation.
Distributed Energy Resources	(Previously referred to as “embedded generation”). An electric energy source connected directly to a distribution network - not via a transmission network.
Drone	A remotely piloted aircraft
Earth/Earthed/ Earthing	The terms earth/earthed/earthing refer to mains and apparatus electrically connected to the general mass of the earth by a conductor to ensure and maintain the effective dissipation of electrical energy.
Earth Potential Rise	Earth potential rise occurs when a large current flows to earth through an earth grid impedance. As a declining gradient, the potential is highest at the point where the current enters the ground. Earth potential rise is a concern in the design of electrical substations because the high potential may be a hazard to people or equipment. The potential gradient (drop of voltage with distance from source) may be so high that a person could be injured due to the voltage differential between two different points of contact.
Electrical Station	An electrical station is any enclosed substation or switching station of the indoor, outdoor (including pole transformers), or underground type.
Embedded Generation	Note: This term has been replaced in these Rules by the term ‘distributed energy resources’.
Energised	<i>ENA - means connected to a source of electrical supply.</i>
Enclosure	An enclosure is an area surrounded by a chain-wire or mesh barrier (at least 1.2m high) containing exposed HV mains and apparatus. These barriers (when installed) restrict access to exposed HV mains and apparatus inside switchyards and substations. Minimum safe working distances can be maintained within an enclosure. 

Figure 143 - Enclosure in switchyard

Term	Description
Equipotential Bonding	Special purpose metal connections intended to bring exposed conductor parts or conductive parts to the same (or approximately the same) potential.  Figure 144 – Earthing mat used to create equipotential bonding
Equipping Permit	An equipping permit is a specially printed white card which details mains and apparatus that will be connected to the system, including low voltage mains and apparatus that are to be controlled by the operation of a switch which is located within a distribution centre. It allows installation or testing work on the mains and apparatus as detailed on the permit.
Exposed	<i>ENA - means an electrical conductor, approach to which is not prevented by a barrier of rigid material or by insulation which is adequate under a relevant Australian Standard specification for the voltage concerned.</i> A conductor is exposed if any barrier or insulation is not sufficient to achieve the requirements of Australian Standard AS 60529 ingress protection rating IP2X (i.e. allows access to hazardous parts with a 12mm “standard” finger). A conductor is effectively guarded when one of the following is used, and it is in good condition: • a fixed barrier • insulation • earthed metal barrier • earthed metallic or non-metallic screen • LV terminal shrouding. Notes: • Refer to Clause 9.1.2 for information on the effectiveness of insulation for LV mains and apparatus. • Refer to Clause 9.1.4 for information on the effectiveness of insulation for HV mains and apparatus.
Extra Low Voltage	Voltages not greater than 50V a.c. or 120V d.c.
Hazardous Voltage	A voltage source with the capacity to produce a current greater than 30mA a.c. or 100mA d.c. in the human body. (Refer to Australian Standard AS 60479 – Effect of Current on Human Beings and Livestock).

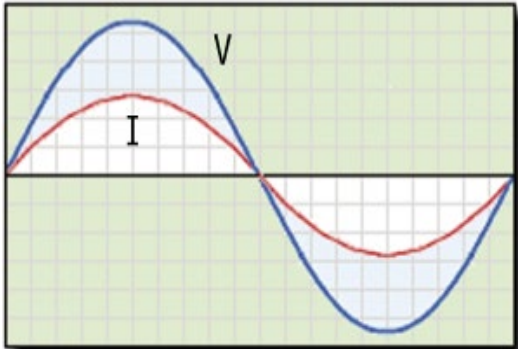
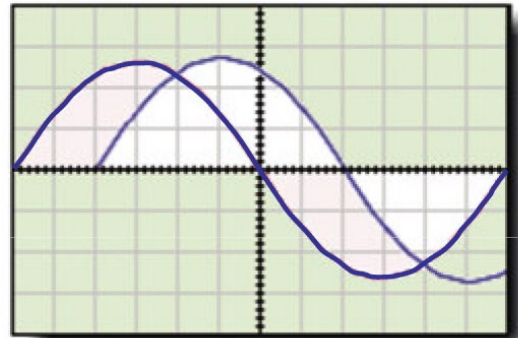
Term	Description
High Voltage	Voltages greater than 1000V a.c. or 1500V d.c.
High Voltage (HV) Live Work	HV live work is work performed on live, overhead HV mains and apparatus using either the hot stick method (insulating sticks, insulating barriers and tools) or the glove and barrier method. The work must be carried out by workers holding a current HV Live Work authorisation in accordance with the procedures documented in the Ausgrid – High Voltage Live Work Manual.
Hoarding	Hoarding is a temporary barrier between the worker and electrical conductors. Warning signs should be affixed to the safe side of the hoarding to warn of the presence of the electrical hazard on the other side of the hoarding. The warning must state that the hoarding should not be removed.  Figure 145 - Hoarding in use
Induced Voltage	Induced voltage is a voltage generated in a conductor when subjected to a moving magnetic field. Dangerous induced voltages (or transferred earth potential) may also occur (especially during fault conditions) in pilot cables, certain communication cables, out of service power cables, overhead conductors, cable sheaths, cross-bonding cables, and when the secondary of a current transformer is open-circuited.
Installation	An electrical installation as defined by the NSW Service and installation Rules.
Insulated	Insulated means separated from other conducting surfaces by a dielectric (non-conducting) substance permanently offering a high resistance to the passage of a current.
Insulated Tools	An insulated tool is a tool which is: • Appropriately rated for the voltage of the exposed mains and apparatus on which it is to be used; and • Designed to allow the user to maintain the relevant Minimum Safe Work Distance during use. Insulated tools must be periodically retested in accordance with ISSC14. Tools which do not achieve the above conditions must be regarded as covered tools and live work controls must be in place for their use on live mains and apparatus.

Term	Description
Isolate / Isolated / Isolation	<i>ENA - Isolated means disconnected from all possible sources of electricity supply by means which will prevent unintentional energisation of the apparatus and which is assessed as a suitable step in the process of making safe for access purposes.</i> Mains and apparatus are isolated if they are disconnected from all possible sources of electrical energy by operating work such as: • opening switches • withdrawing circuit breakers • removing fuses, links or connections • tie back bonds. Take precautions such as locking and danger-tagging.
Isolation Folder	An isolation folder is a specially printed envelope used by a Class 1 Operator to record the details of mains and apparatus that have been isolated and any initial earthing applied by the Class 1 Operator. Restricted operators also use the isolation folder to record: • the current status of any associated restricted access permits for work • the location of restricted access permits for work on issue. The isolation folder is used to hold cancelled restricted access permits for work.
Live	Live (or alive) means energised or subject to hazardous induced or capacitive voltages.
Live Low Voltage (LV) Work	Live LV work is work (other than operating work) carried out on or near exposed LV mains and apparatus that are live or have not been isolated in accordance with these Rules.
Low Voltage	Voltages greater than 50Va.c or 120V d.c. but not greater than 1000V a.c. or 1500V d.c.
LV Shorts	Short circuiting leads connected between all phases and the neutral conductor of a network distributor. LV shorts are designed to protect workers against the risk of shock arising from inadvertent back-feed from distributed energy resources with a capacity of up to 10kW per phase, by limiting the voltage rise.
Mains and Apparatus	Mains and apparatus includes: • any conductor normally live or intended to be connected forming part of the network. Mains and apparatus also include conductors disconnected from the network. • any equipment used in supplying electricity. For example: ▪ an overhead line ▪ a cable ▪ a generator ▪ a transformer ▪ switchgear ▪ fuses and links. • any other equipment that supplies HV (or is supplied at HV). For example: ▪ a metering unit ▪ cranes and motors. Mains and apparatus include all parts of the equipment (i.e. conductors, insulation, earthed metalwork and cable sheaths).

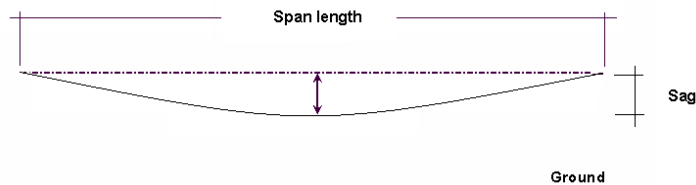
Term	Description
Minimum Safe Working Distances (MSWD)	Minimum safe working distances are distances you must maintain (including any tools or equipment you are using) when near live exposed conductors (refer to Clause 7.1.5).
Must	<i>ENA - Is to be interpreted as mandatory</i>
Near	<i>ENA - means a situation where there is a reasonable possibility of a person, either directly or through any conducting medium, coming within the relevant safe approach distances.</i> Near means there is a reasonable possibility a part of your body, or any moveable object you might be wearing, touching, or carrying (which is not designed for safe use on live conductors of the same or higher voltage) may come closer to a live exposed conductor than the minimum safe working distance.
Network	<i>ENA -An electrical network means transmission and/or distribution systems consisting of electrical apparatus which are used to convey or control the conveyance of electricity between generators' points of connection and customers points of connection.</i> The network includes all the mains and apparatus used to distribute electricity. In these Rules, the network ends at the customer's terminals, as defined in the Code of Practice Service and Installation Rules of New South Wales. The terms used to describe the parts of the network are: • transmission and sub-transmission network—all mains and apparatus energised at nominal voltages of 33kV and above • HV distribution network—all mains and apparatus energised at a nominal voltage above 1kV but less than 33kV • LV distribution network—all mains and apparatus energised at a nominal voltage above 50 volts, up to and including 1kV.  Figure 146 - Overview of an electrical distribution network
Nominal Voltage	Nominal voltage is the typical voltage (excluding variations). It is the system voltage during normal operations.
Operating Agreement	An operating agreement is a written agreement between Ausgrid and another electricity network operator (or other organisation). In the agreement, the authorised person ensures that the mains and apparatus specified will remain isolated until the operating agreement is cancelled.

Term	Description
Operating Work	Work involving: - the operation of switches, the opening or closing of links, fuses, or other connections intended for ready removal or replacement, - proving electrical apparatus de-energised for access, - access authority/permit earthing and/or short-circuiting, - enabling or disabling protection equipment and voltage regulation equipment, - locking and or tagging of electrical apparatus and erection of barriers and or signs, - issuing of access authorities/permits and operating agreements, - high voltage phasing, - commissioning electrical assets by switching, - operating transformer manual tap changers – provided MSWD from exposed HV conductors can be maintained.
Operator Danger tag	Operator danger tags are used only: - by operators as a warning to guard against unauthorised or accidental operation of switches used as points of isolation in conjunction with the issuing of an access permit or clearance to work - on substation doors and switchgear shutters to alert people not to enter or approach live equipment or conductors.   Figure 147 – Both sides of an Operators Danger Tag
Overhead Line	<i>ENA – means any aerial conductor or conductors with associated supports, insulators and other apparatus erected, or in the course of erection, for the purpose of the conveyance of electrical energy.</i> Overhead lines do not include: - any supporting structures (e.g. pole) - conductors within the boundary of an electrical station.

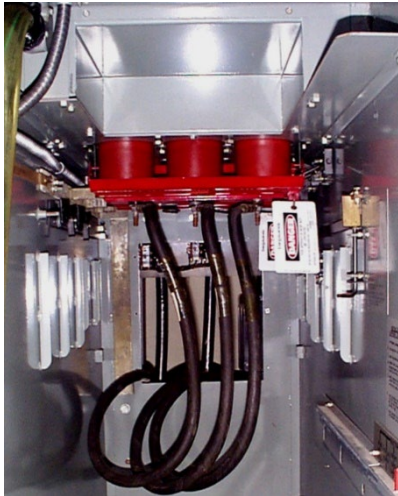
Term	Description
Permanently Disconnected	Permanently disconnected mains and apparatus were previously part of the network but cannot be energised by any operating work because of the absence of electrical connections to any source of supply and are outside minimum fixed clearances. Permanently disconnected mains and apparatus are not shown on any system diagram and are not intended to be reconnected for any immediate or proposed project. Permanently disconnected mains and apparatus must meet the following conditions: - Overhead conductors (excluding those on steel lattice towers) require a bay to be removed from any source of supply and be suitably short circuited and earthed. - Overhead conductors on steel lattice towers require the bolted bonds to be permanently removed from any source of supply and be suitably short circuited and earthed. - Underground conductors require that cables are cut away and ends short-circuited and sealed outside of fixed clearances to any other exposed conductors. - Plant and equipment require all primary connections (HV and/or LV, including any neutral connection) to be removed at the piece of equipment (see 11.5.2 for transformers). Disconnected plant and equipment must be suitably short-circuited.
Permit Folder (access permit folder)	An access permit folder is a pre-printed envelope completed by an appropriately authorised operator who records the operating work done in connection with issuing and cancelling access permits for work or test. The access permit folder is used to: - Coordinate multiple access permits that may be issued on the same mains and apparatus; and - Record the number and location of all access permit earths; and - Hold all relevant field operating papers (e.g. switching tags, link sheets); to ensure all access permits are cancelled and all access permit earths are removed before the mains and apparatus are re-energised.
Personal Danger tag	Personal danger tags are used to warn persons that the isolation / connections must not be restored. They are used when working on isolated LV mains and apparatus which do not require an access permit.   Figure 148 – A personal danger tag

Term	Description
Phase	One segment of a three-phase system, in which the three phases are displaced by 120 degrees.  Figure 149 – Voltage (V) and current (I) in-phase Note: When a load draws a current from an alternating supply, the load will have the same frequency as the supply voltage. When the voltage and current waveform pass through their zero values and increase to their peak values in the same direction and at the same instance in time, the current is regarded as being in phase with the voltage. (V = voltage and I = current).
Phase Difference	The difference between two voltage waves in time.  Figure 150 – Representation of phase difference
Phasing	Phasing is a test to prove that energised conductors on each side of an open point are in phase and can be safely joined together.
Pick-up	Pick up is the minimum current that will operate a relay
Pilot cable	The term pilot cable may be applied to conductors that convey voltage or current signals from one point to another for comparison with other voltage or current signals as part of a protection scheme. Pilot cables may also be used to transfer switching signals from one point to another. While the terminal points of a pilot cable may be within an installation, they may also be in different installations that could be some distance apart. Pilots can include fibre optic cables that convey light converted from electrical information.

Term	Description
Pole Transformer (PT)	A pole transformer is a transformer mounted on a utility pole.  Figure 151 – A pole-mounted transformer
Pot Head	A pot head is cable termination from multicore cable to overhead conductor or busbar.
Receptacle Folder	A receptacle folder is used to issue an access permit at a location other than the point of isolation (i.e. where the access permit folder is normally attached). The words '<i>permit receptacle</i>' must be printed across each additional access permit folder. The location of the original access permit folder must also be printed on the receptacle folder.
Redefining (a permit)	To allow for the transition between testing and work, an access permit for test and ancillary work can be redefined as a permit for test after the initial ancillary work is completed. When the testing is completed, the permit can be redefined again so work can be finished. The permit is redefined by the current recipient signing off their section of the permit. However, once it has been redefined for work after test, the access permit cannot be returned to test status. If further testing is required, the permit must be cancelled and a new access permit for test and ancillary work issued.
Regulation	When the word Regulation is used throughout these Rules, it means the NSW Electricity Supply (Safety and Network Management) Regulation 2014 and any regulation that subsequently amends or repeals the Regulation or any other State legislation that amends, repeals, or incorporates the requirements of the Regulation. These Rules (see definition) assist workers to comply with the requirements of the NSW Electricity Supply (Safety and Network Management) Regulation 2014 and Ausgrid's Electricity Network Safety Management System.
Remote cable cutting	Is a method of cutting an underground cable, where all workers are physically distant from the location of the cut. Remote cable cutting is used to prove underground cables are de-energised at the worksite.

Term	Description
Restricted Access Permit	The restricted access permit for work is a pre-printed form used by Ausgrid employees who are authorised as restricted operators. This permit has no transfer or temporary cancellation provision because the range of operating duties of the issuer is much more restricted than a conventional access permit. A restricted operator must issue the permit to another member of the workgroup and sign on the access permit. The restricted access permit for work also records the number and location of all earthing and short-circuiting equipment applied by the restricted operator prior to issuing the restricted access permit. The recipient can record any additional working earths applied during the work.
Restricted Operating Work	Restricted operating work is any operating work other than Class 1 and Class 6 Operator work.
Rules	Rules means Ausgrid's Electrical Safety Rules.
Safe System of Work (SSoW)	A Safe System of Work is characterised by an integrated, continually improved set of processes and procedures undertaken within a specified work context which together: • ensure that work tasks, work environments, processes and procedures are designed such that they are unlikely to result in physical or psychosocial harm to the relevant workers; • identify, eliminate (where possible) and control foreseeable risks to acceptable levels, to minimise the hazards and risks in workplace operations; • minimise harm when it occurs; • comply with consultation requirements of workers; and • facilitate return to work processes.
Sag	Sag is the vertical distance between the highest and lowest point of the curve of a conductor. The sag of the conductor varies depending on several factors, such as the tension, weight, and temperature of the line. If the sag is large (low tension), and the line becomes heavily loaded, the sag will further increase due to I^2R losses and may breach safety clearances. If the sag is too small (high tension), contraction in winter may breach safety clearances.  Figure 152 – Vertical sag distance on a span of overhead conductor

Term	Description
Screen – LV	A barrier of approved non-conductive material which is fitted over live exposed low voltage mains and apparatus to prevent inadvertent contact. Refer to Clause 6.2.13 for further information on LV screens.  Figure 153 – Screening of a low voltage board in a substation
Screen – Earthed	A barrier of earthed conductive material, designed to prevent access to live exposed HV conductors. Refer to Clause 6.2.15 for further information on earthed screens.
Screen – Cable	A conductive or semi-conductive layer surrounding the cores of an underground cable which is designed to be connected to earth.
Secondary Systems	Circuits and equipment associated with the control, indication, protection, or metering, of mains and apparatus.
Should	<i>ENA – Is to be interpreted as advisory or discretionary.</i>
Single Wire Earth Return (SWER)	A SWER is a single-wire line for supplying single-phase electrical power from an electrical grid to remote areas at low cost. Its distinguishing feature is that the earth is used as the return path for the current to avoid the need for a second wire (or neutral wire) acting as a return path. It is principally used for rural electrification.
Specified Customers	There are two categories of specified customers in Ausgrid—Category 1 and Category 2: • Category 1—Individual customers or groups of multiple occupancy customers who are supplied at HV. • Category 2—Individual customers or groups of customers who are supplied at LV via a common set of mains directly from an Ausgrid distribution centre.

Term	Description
Spouts	Spouts are apertures (openings) which allow access to contacts connected to busbar and feeder connections. The contacts are insulated from the frame of the switchgear housing. Circuit breakers have six bushings with contacts that engage with the busbar and feeder contacts in the spouts, when the circuit breaker is racked into the housing. The main interrupting contacts are within the circuit breaker. When a circuit breaker is racked into position, contact is made between the busbar and feeder spout contacts. Interlocks prevent a circuit breaker being racked in or out while the main contacts are closed, because the main contacts must interrupt the flow of current. As a circuit breaker is racked out, shutters close to cover the spouts to stop inadvertent contact with the contacts. Likewise, this occurs when a circuit breaker is racked in and the shutters open.  Figure 154 - Vertical spouts (red coloured)
Substation	<i>ENA - means a switchyard, terminal station or place at which high voltage supply is converted or transformed.</i> A substation is a part of an electrical generation, transmission, and distribution system. Generally, substations transform voltage from high to low (can be the reverse). Electric power may flow through several substations between a generating plant and a customer, and the voltage may change in several steps. A substation with a step-up transformer increases the voltage while decreasing the current, while a step-down transformer decreases the voltage while increasing the current. There are various types of substations on the Ausgrid network – see below.
Substation - chamber	A substation that forms a room within, or a part of, a building.
Substation - Distribution	A substation that converts HV supply to LV for supply to customers. These substations may be pole-mounted, kiosk, outdoor enclosure, chamber, or underground, type substations.
Substation - Zone	A substation that converts sub-transmission voltages (33kV & greater) to HV for distribution (generally 11kV).
Substation - STS	A substation that converts sub-transmission voltages (33kV and greater).
Sub-transmission	Relating to HV mains and apparatus at voltages 33kV or greater that transmit electricity supply.

Term	Description
Supervision	When considering the most appropriate level of supervision of workers, it is best to consider two (2) levels of supervision. Direct supervision—This means the personal supervision of a worker, at all times, on a close and continuous basis, within visual contact and audible to each other. General/intermittent supervision—This means the worker does not require constant oversight of specific tasks but requires personal contact with a qualified worker on a recurrent (periodic) basis when working on de-energised electrical mains and equipment and when performing non-electrical tasks. Periodic supervision means being under instruction and direction for tasks being performed with checks and tests being made prior to commissioning or energising of circuit(s) and apparatus/equipment.
Switch	A switch is a device designed and used to make or break an electric circuit. Switches include devices used to control LV mains and apparatus (such as LV links, switch fuses, and withdrawable fuses that control LV distributors).  Figure 155 - 132kV isolator  Figure 156 - LV link
Switchgear	Switchgear refers to a number of electrical disconnectors (e.g. HV and LV fuses and circuit breakers) used to de-energise and isolate equipment to allow work to be done, and also to clear faults by interrupting fault current and ensuring the arc is quenched. Typically HV switchgear is a metal-enclosed structure with circuit breakers that are tripped manually or automatically when electrical protection schemes sense fault currents. Circuit breakers can be either electrically operated via a solenoid or spring operated. Circuit breakers use one of the following insulating and arc extinguishing methods: • oil circuit breakers • air circuit breakers • vacuum components • sulphur hexafluoride (SF₆).
Switching Station	A switching station is an electrical station that does not contain transformers and operates only at a single voltage level. Switching stations are sometimes used as collection and/or distribution nodes for parallel circuits and may provide switching alternatives for back-up lines.

Term	Description
Switchyard	A large outdoor area, at ground level, identified by approved signage and surrounded by fences or walls that prevent unauthorised access. High voltage exposed conductors within the area must maintain standard design safety clearances.  Figure 157 - An example of a switchyard
Tail Ended Transformer	A tail ended transformer is where a cable feeds directly into the transformer without a switch.
Temporary Insulation	Insulating covers which are applied to exposed mains and apparatus as part of approved live work procedures. Temporary insulation must comply with Australian Standard AS 4202 – Insulating covers for electrical purposes.
Transferred Earth Potential	Transferred earth potential refers to the voltage-to-earth of grounding systems that will appear on conductors as a result of the source system grounding electrode being above normal earth potential. The larger voltages are usually developed by ground fault currents returning to their source through earth. Transferred earth potential occurs most frequently if the grounding of a facility (or associated equipment within the facility) is less than adequate.
Transformer	A transformer is a device that transfers electrical energy from one voltage level to another, inductively, through magnetically coupled conductors (the transformer's windings). There are also transformers for special applications (such as current transformers and voltage transformers) that enable metering and/or measurement of conditions in high voltage circuits. (Refer to capacitor voltage transformer for an example of alternative transformer technology).
Vicinity	A situation where there is a reasonable possibility that a person will, either directly, or through any conducting medium, come within the Minimum Safe Working Distance for an ordinary person, but not within the relevant Minimum Safe Working Distance for an authorised/instructed person.

Term	Description
Voltage	<i>ENA - means a potential difference between conductors or between conductors and the general mass of earth.</i> There are three common types: • Extra LV is normally not more than 50V alternating current or 120V ripple free direct current • LV is normally more than 50V alternating current or 120V ripple free direct current but is not more than 1kV alternating or 1500V direct current. • HV is normally more than 1kV alternating or 1500V direct current.
Warning do not Operate (WDNO) Labels	WDNO labels are used to warn people that mains and apparatus must not be energised.  Figure 158 - WDNO label in place
Working Earths	Working earths are earthing and short-circuiting equipment which are applied to HV mains and apparatus in addition to access permit earths. They are applied by, or under the direction of, an access permit recipient to meet the requirements of these Rules.
Worksite	For the purposes of access permits, a worksite is the immediate vicinity of the work, or includes several locations for work on or near mains and apparatus which are nominated on the access permit.

18 Terminology

18.1 Abbreviations and Acronyms

This list includes abbreviations used in these Rules, as well as common abbreviations used in the transmission and distribution industry.

Abbreviation / Acronym	Description
//	parallel
ABC	aerial bundled conductor
ABS	air break switch
ACB	air circuit breaker
ADSS	all dielectric self-supporting (fibre optic cables)
AEMO	Australian Energy Market Operator
AOp / ASO	area operator / assistant system operator
AP / APs	access permit(s)
APR	access permit recipient
ASP	accredited service provider
ATPV	arc thermal performance value
Aux	auxiliary
BI	bus isolator
BSP	bulk supply point
Bus	busbar
CBD	central business district
CAVC	close approach vegetation control
Cap	capacitor
C/O	changeover
CB	circuit breaker
CBD	central business district
CCT	covered conductor - thick
CLC	customer load control
CTW	clearance to work authority
CT	current transformer
CVT	capacitive voltage transformer
DATT	data acquisition telecontrol and tele-indication
Dist	distributor
DO or DOp	District Operator
DOLF	HV drop-out link fuse (term used in the Hunter). See HDO.
DT	danger tag
EFI	earth fault indicator
ESO	electrical supply operative
E/Sw or ESw	earth switch
EWP	elevating work platform
Fdr	feeder
FIU	frequency injection unit (associated with customer load control)

Abbreviation / Acronym	Description
FSw	fuse switch
GRN	government radio network
HDO	high voltage drop-out fuse
HV	high voltage
HVC	high voltage customer
IDT	inter-distributor tee
isol	isolator
Jntr	cable jointer
kV	kilovolt (thousand volts)
LA	lightning arrester / surge diverter
LBS	load break switch
LDC	line drop compensation
LDT	locked and danger-tagged
LI	line isolator
LLC	live line clamp
LV	low voltage
LVF	low voltage fuse
LVL	low voltage link
LW	lineworker
Maint.	maintenance
MDI	maximum demand indicator
MSDS	no longer in use. Refer to SDS.
MSWD	minimum safe working distance
NA	non-auto
NAR	Network access request
NATA	National Association of Testing Authorities
N/C	normally closed
N/O	normally open
NOC	network outage co-ordinator (previously 'Sydo' in Sydney)
No.	number
OCB	oil circuit breaker
ODT	open and danger tagged
OH	overhead
OHM	overhead mains
OLDT	open, locked and danger tagged
OOS	out of service
OPGW	optical ground wire
ORDT	open, removed and danger tagged
P	pole
Pa	panel
PE (cell or switch)	photo electric
PF	power factor

Abbreviation / Acronym	Description
PPE	personal protective equipment
protn.	protection
PT	pole transformer
PVC	polyvinyl chloride
PW	power worker (an electrically qualified worker authorised to work on or near the electricity network)
recl.	recloser
RAGCB	Reclosing, automatic, gas-insulated, circuit breaker
RMCB	ring main circuit breaker
RMI	ring main isolator
RMU	ring main unit (consisting of ring main isolators and a fuse switch)
Rx	reactor
SAPS	Stand-alone power systems
S/BY	stand-by
S/C	short circuit or sealing contactor (relay operations)
SAO	system alteration order
SCADA	Supervisory Control and Data Acquisition
SDS	safety data sheet. Formerly called a material safety data sheet (MSDS).
SE	sealed end (cable is terminated and is de-energised)
SEF	sensitive earth fault
SEL	sensitive earth leakage
SF ₆	sulphur hexafluoride gas
SL	street light
SLCP	Street Light Control Point
SOp/SO	System Operator
SRR	switching request register
STS	Sub-transmission substation
Sub	substation
SW	switch
SWER	Single wire earth return
tail-ended tx	tail-ended transformer
TC	tap changer
Trans mains	Transmission mains
Tx	transformer
T/Con	technician substation construction
T/PE	technician protection
T/Tele	technician telecontrol
T/Trans	technician transmission
T/VR	technician voltage regulation
UG	underground
UGOH	underground to overhead (a pot head is also a UGOH)
U/S	unserviceable
USL	underslung link

Abbreviation / Acronym	Description
VR	voltage regulator or voltage regulation
VT	voltage transformer
WDNO	warning do not operate
XLPE	cross-linked polyethylene

18.1.1 Ausgrid System Terminology

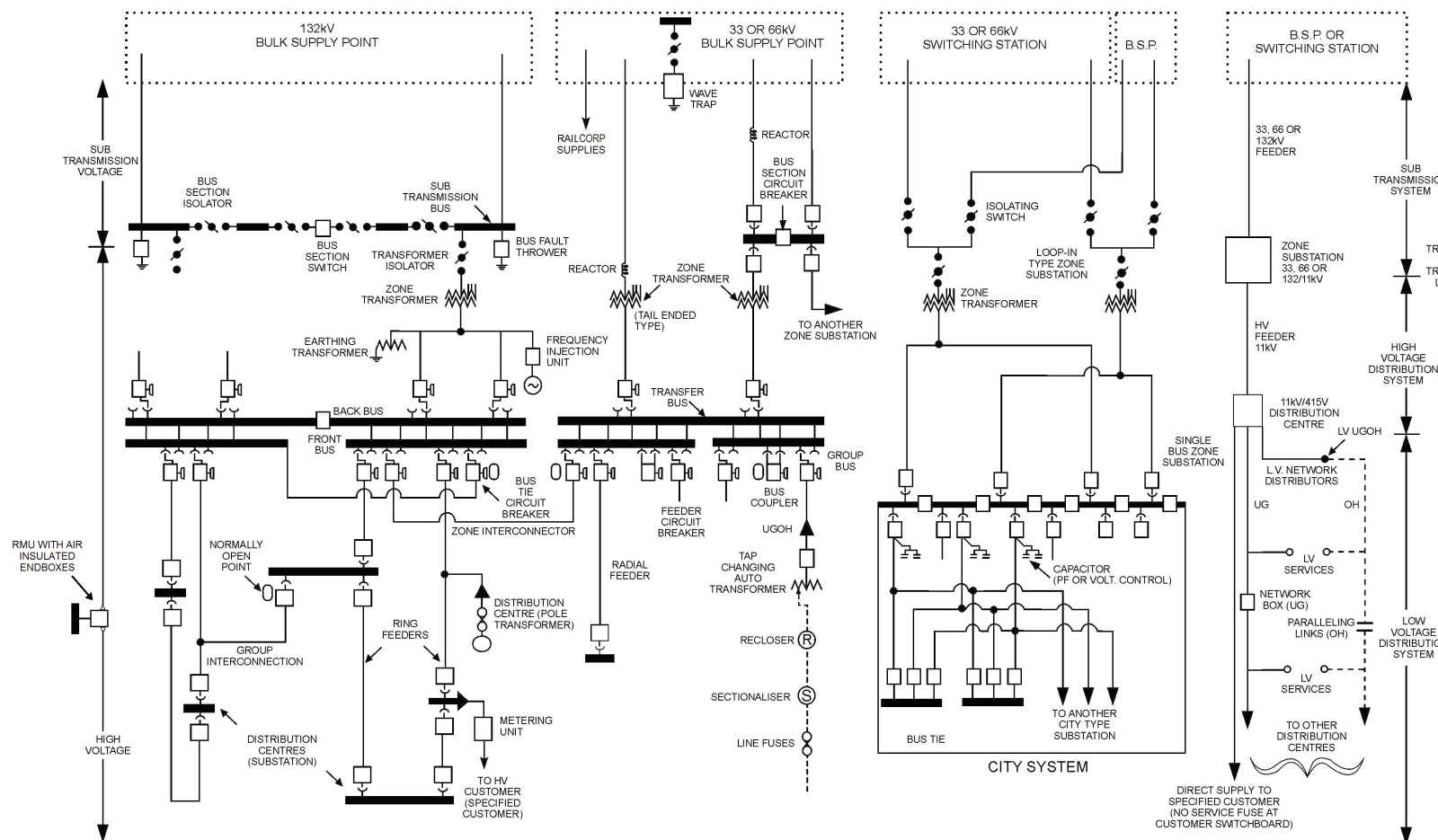


Figure 159 - Diagram showing appropriate usage of Ausgrid system terminologies

Note: System diagrams show UG as dotted lines and OH as solid lines. LV diagrams show OH as dotted lines and UG as solid lines.

19 References

This list includes references to documents included in the Rules and generally used in the transmission and distribution industry.

References
Ausgrid documents - Electrical Standard - Service Provider Authorisation (ES 4) - HV Live Work Manual - Electricity Network Safety Management System (ENSMS) Manual - Submitting Network Access Requests (NSEC 007 - System Control) - Network Engineering Guideline NEG-SE05 series of documents
Ausgrid Network Standards - Assessment and management of low voltage parallels (NS 136) - Labelling of Mains and Apparatus (NS 158) - Safety Inspection Procedure for Working on Poles (NUS 146) - Safety Requirements for Non-Electrical Work in and around Live Substations (NS 165) - Specification for Laying of Underground Cables up to 22kV (NS 130) - Specification for Network Project Design Plans (NS 104) - Specification for Testing of Underground Cables (NS 161) - Working Near or around Underground Cables (NS 156)
Australian Standards - Conductors—Covered overhead – For working voltages 6.35/11 (12)kV up to and including 19/33 (36)kV (AS/NZS 3675) - Confined spaces (AS 2865) - Cranes, hoists and winches Part 10: Mobile elevating work platforms (AS/NZS 1418.10). - Cranes, hoists and winches - Safe use Part 10: Mobile elevating work platforms (AS 2550.10) - Electrical installations - Construction and demolition sites (AS/NZS 3012:) - Fixed platforms, walkways, stairways and ladders—Design, construction and installation (AS 1657) - Industrial fall-arrest systems and devices - Part 3: Fall-arrest devices (AS/NZS 1891.3) - Industrial fall-arrest systems and devices - Part 4: Selection, use and maintenance (AS/NZS 1891.4) - Overhead line design – Detailed procedures (AS/NZS 7000) - AS/NZS 1768 – Lightning Protection - AS/NZS 60479 – Effects of current on human beings and livestock - AS 2225: Insulating gloves
International Standards - IEC 60903: Insulating Gloves - IEC 61140: Protection against electric shock - IEC 61230: Live working – portable equipment for earthing or earthing and short circuiting - IEC 61243: Live working – voltage detectors

References
Energy Networks Association (ENA) • ENA DOC 001: National Electricity Network Safety Code • ENA DOC 023: Vegetation management • ENA DOC 024: Tools and equipment • ENA NENS 03: safe access to electrical and mechanical devices • ENA NENS 04: safe approach distances to electrical and mechanical devices • ENA NENS 07: Manual Reclose • ENA NENS 09: National guidelines for the selection, use and maintenance of personal protective equipment for electrical hazards
Industry Skills Council • Electricity Supply Industry - Transmission, Distribution and Rail Sector Training Package (Version 2.1) Volume 2—Part 3 - Language, Literacy and Numeracy (EE-OX UET09)
New South Wales • Electricity Supply Act • Electricity Supply (Safety and Network Management) Regulation • NSW Electricity (Consumer Safety) Regulation 2006 • Service and Installation Rules of New South Wales • Work Health and Safety Act 2011 • Work Health and Safety Regulation 2011
NSW Industry Safety Steering Committee (ISSC) • Guide for height safety within the NSW electricity industry (ISSC 34) • Guide for Network Operators to Provide Information to the Construction Industry for Working Near Overhead Power Lines (ISSC 32) • Guide to electrical workers' safety equipment (ISSC 14) • Guide to Electricity Workers' Escape & Rescue Procedures (ISSC 24) • Guide to Managing Vegetation near Power Lines (ISSC 3)
WorkCover • Amenity Tree Industry - Code of Practice • Work near Overhead Power Lines - Code of Practice • Work near underground assets – Guide

20 Index

- Absolute Limit of Approach, 7.3.1
- Access Authorities/Permits, 5
- Access Permit Folder, 5.9.1
- Accredited Service Provider - Training and Competency, 3.1.2
- Apparatus Owned by a Specified Customer, 9.10.3
- Application (of these Rules), 1.1
- Apprentice - Live Low Voltage Work by, 9.5.2
- Authorisations for work, 3.1
- Barrier - Tape barriers, 8.1
- Barrier - Physical, 9.1.6
- Basement Substations, 11.2
- Battery Rooms, Working in, 11.3
- Black and Yellow Rope, 10.6
- Cable Identification and Cutting, 6.2.21, 6.2.22, 9.3, 9.9
- Cage, 8.4.6
- Capacitors, 10.6, 11.5.4
- Classes of Operating Authorities, 3.2.3
- Clearance to Work, 5.1, 5.6
- Clearance to Work Folder, 5.9.5
- Clearances (Safe working distances), 7
- Climbing Poles – Precautions for Climbing and/or Working on Poles, 10.2
- Close Approach Vegetation Control (CAVC), 10.5
- Commissioning, 4.3.1
- Competency Assessment, 3.1
- Conductive Materials – Danger of, 6.1.3, 11.4.1
- Conductive Poles and Structures, 10.2.1
- Confined Spaces, 11.1
- Connectable
 - During Commissioning, 4.3.1
 - Mains Not Connectable, 10.4
 - Equipping Permits (and Becoming Connectable), 5.8.1, 5.8.5
- Connection and disconnection of low voltage mains and apparatus, 9.4.1
- Connection of service and installations, 9.4.2
- Covered Tools, 6.2.16, 9.5.4
- Craning or Operating Plant, 7.5
- Cross Referencing Access Authorities and Permits, 5.2.3
- Current Transformers, 11.5.3
- Customer Equipment – High Voltage Equipment, 11.8
- Danger Tags, 8.4.3, 8.4.4
- De-energised
 - High Voltage Mains and Apparatus, 9.1.3, 9.6
 - Low Voltage Mains and Apparatus, 9.1.1, 9.2
- Detectors - voltage, 6.2.11, 6.2.12
- Distances - see Clearances, 7
- Earthed Situations on Poles, 10.2.1, 9.5.4
- Earthing and Short-circuiting, 9.8.1
- Effectiveness of Insulation, 9.1.2, 9.1.4
- Elevating Work Platforms - Insulation Requirements, 7.5.11
- Emergencies, 2.1
- Emergency Rescue Kits, 6.2.10
- Enclosed City Type Low Voltage Switchboards, 8.3.1
- Enclosure
 - of conductors, 7.8.4
 - taping of, 8.1
- Entering Substations, 3.1.3, 11.2.1
- Equipping Permits, 5.8
- Examining Access Permits, 5.2.4
- Fall-Arrest Equipment, 6.2.23
- Fallen Conductors Handling of, 2.1.6
- Fire doors, 11.5.6
- First Aid Kits, 6.2.9
- Folders - Access Authority/Permit, 5.9
- Folder - Isolation, 5.9.3
- Gas Detection and Monitoring Equipment, 6.2.26
- Generation Plants
 - Isolation of Privately Owned, 12.4
- Gloves - Insulating Gloves and Other Gloves, 6.2.7
- High Voltage Cables, 9.9
- High Voltage Detectors, 6.2.11
- High Voltage Customer Equipment, 11.8.1

High Voltage Equipment owned by Other Organisations, 14

High Voltage Mains and Apparatus, 9.1, 9.6

High Voltage Live Work, 3.1.9, 9.1.5

Identification of cables

- LV, 9.3.1
- HV, 9.9.3
- Sub transmission, 9.9.5
- Equipment, 6.2.21

Induced Voltages, 9.11

Industry Guides, 1.1.5

Insulated Tools - Low Voltage, 6.2.5

Insulating Gloves, 6.2.7

Insulation - Effectiveness of, 9.1.2, 9.1.4

Interconnected Mains and Apparatus, 12

Interlocks, 9.6.4, 11.5.5

Isolation Folder, 5.9.3, 5.9.4

Isolation of High Voltage Mains and Apparatus, 9.6

Labelling Mains and Apparatus, 8.4.1

Ladders, 6.2.24

Leakage Currents on Poles, 10.1.1

Live Exposed Conductors

- Entering Areas where there are, 3.1
- Minimum Safe Working Distances, 7.1
- Work on Live Low Voltage, 9.5

Live Overhead Mains and Apparatus - Erecting Conductors in the vicinity, 10.2

Locking Devices to Secure Isolation, 9.6.4

Low Voltage Detectors, 6.2.12

Low Voltage Shorts, 6.2.18, 9.2.3

Low Voltage Tools, 6.2.16

Low Voltage Mains and Apparatus, 9

Low Voltage Portable Electrical Tools, 6.2.16

Low Voltage Work, 9

Mains and Apparatus

- Left Ready for Emergency Service, 5.2.8
- Not Left Ready for Emergency Service, 5.2.9
- Owned by Others, 14
- Returning to Service, 5.2.12

Materials, 11.4

Minimum Fixed Clearances for High Voltage Work, 7.4.1

Minimum Safe Working Distances, 7.1

Network Access Requests, 4.1

Observer - for live LV work, 9.5.4

Operating Agreement, 5.7.1, 11.8.1, 12, 14

Operating Authorities, 3.2

Operating Equipment - Checking, 6.2.1

Operating Sticks and Rods - High Voltage, 6.2.19

Operating Work - Authorisation for, 3.2

Operation of Switches during an emergency, 2.1.8

Operator Danger Tags, 8.4.3

Other Organisations, 12, 13, 14, 15

Outdoor Switchyards - Safe Work Area, 8.1.7

Overhead Mains

- working on, 10.2
- not connectable to the network, 10.4

Paralleling, 10.8.1

Permits and Folders, 5

Personal Danger Tags, 8.4.4

Personal Protective Equipment (PPE), 6.2

Phasing, 4.3.2, 10.6.2

Pole Platforms, 6.2.25

Plant and Equipment - Clearances and Operating Requirements, 7.5.1

Poles, 10.2

Portable Electrical Tools, 6.2.17

Privately Owned Parallel Generation Plants - Isolation of, 12.4

Proving Low Voltage Mains and Apparatus De-energised, 9.2.2

Proving High Voltage Mains and Apparatus De-energised, 9.7.1

Recipients of Access Permits, 5.1.2, 5.1.4

Reduced Minimum Safe Working Distances, 7.2.1

Regulation - Electricity Supply (Safety and Network Management) 2014, 1.1.2

Removing of Earthing and Short-Circuiting Equipment, 9.8.4

Reporting Dangerous Condition or Emergency Situations, 2.1.1

Reporting Dangerous Work Practices, 6.1.4

Reporting Unusual Conditions in a Substation, 2.1.10

Rescue - Emergency Rescue Kits, 6.2.10

Residual Current Devices, 6.2.17

Responsibilities of Employers and Workers, 1.1.3

Restricted Access Permit for Work, 5.4

Restricted Operating Authority, 3.2.4

Returning Mains and Apparatus to Service, 5.2.11

Risk Assessment, 6.1.2

Safe Working Distances, 7

Safe Working Procedures, 6.1

Safety Equipment, Tools, Clothing and Materials, 6.2

Scaffolding, 7.8

Screens, 6.2.13, 6.2.15

Services, 9.4.2

Short-Circuiting and Earthing, 0

Short-Circuiting Equipment, 6.2.16

Shorts - Low Voltage, 6.2.18, 9.2.3

Special Authorisation to Receive Access Permits, 3.1.7

Specified Customers, 9.10

Stand-by Person, 3.1.3

Storage of Materials, 11.4.2

Street Lighting Equipment - Clearances from Exposed Conductors, 7.9.1

Substation Emergencies, 2.1.9

Substations - Indoor and Underground, 11.2

Substations Owned by Others, 13

Switches Operation of, 2.1.7

System Alteration Order, 4.2

Tags, 8.4

Operators' Danger Tags, 8.4.3

Tape – Yellow, 8.1

Telephone Numbers, Page 2

Test and Ancillary Work, 5.5

Test Voltages, 10.6

Testing with Earth and Short-Circuit Removed, 10.6.3

Tools, 6.2

Tong or Clip-on Ammeters, 10.6

Transferred Earth Potentials, 9.11.5

Transformers - Special Requirements for Disconnected Transformers, 11.5.2

Transgrid, 12, 13, 14

Tree Trimming (vegetation control), 10.5

Unauthorised Access - Precautions Against, 11.5.6

Underground Substations, 11.2

Vegetation management, 10.5

Voltage Transformers, 11.5.1

Warning Do Not Operate (WDNO) Labels, 8.4.2

Warning Tags, 8.4.5

Working Earths, 9.8

Working Earths Form, 5.3.6

Yellow Tape Barriers, 8.1