Network Standard

NETWORK	Document No : NW000-S0062 Amendment No : 3 Approved By : Head of Network Strategy & Future Grid

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NW000-S0062 **NS223 LOW VOLTAGE SHORT CIRCUITING FOR DE-ENERGISED WORK**

ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the Low Voltage Short Circuiting for De-energised Work, and is for reference by field, technical and engineering staff.

Ausgrid maintains a copy of this and other Network Standards together with updates and amendments on www.ausgrid.com.au.

Where this standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document

DISCLAIMER

As Ausgrid's standards are subject to ongoing review, the information contained in this document may be amended by Ausgrid at any time. It is possible that conflict may exist between standard documents. In this event, the most recent standard shall prevail.

This document has been developed using information available from field and other sources and is suitable for most situations encountered in Ausgrid. Particular conditions, projects or localities may require special or different practices. It is the responsibility of the local manager, supervisor, assured quality contractor and the individuals involved to make sure that a safe system of work is employed and that statutory requirements are met.

Ausgrid disclaims any and all liability to any person or persons for any procedure, process or any other thing done or not done, as a result of this Standard.

All design work, and the associated supply of materials and equipment, must be undertaken in accordance with and consideration of relevant legislative and regulatory requirements, latest revision of Ausgrid's Network Standards and specifications and Australian Standards. Designs submitted shall be declared as fit for purpose. Where the designer wishes to include a variation to a network standard or an alternative material or equipment to that currently approved the designer must obtain authorisation from the Network Standard owner before incorporating a variation to a Network Standard in a design.

External designers including those authorised as Accredited Service Providers will seek approval through the approved process as outlined in NUS181 Approval of Materials and Equipment and Network Standard Variations. Seeking approval will ensure Network Standards are appropriately updated and that a consistent interpretation of the legislative framework is employed.

Notes: 1. Compliance with this Network Standard does not automatically satisfy the requirements of a Designer Safety Report. The designer must comply with the provisions of the Workplace Health and Safety Regulation 2011 (NSW - Part 6.2 Duties of designer of structure and person who commissions construction work) which requires the designer to provide a written safety report to the person who commissioned the design. This report must be provided to Ausgrid in all instances, including where the design was commissioned by or on behalf of a person who proposes to connect premises to Ausgrid's network, and will form part of the Designer Safety Report which must also be presented to Ausgrid. Further information is provided in Network Standard (NS) 212 Integrated Support Requirements for Ausgrid Network Assets.

2. Where the procedural requirements of this document conflict with contestable project procedures, the contestable project procedures shall take precedent for the whole project or part thereof which is classified as contestable. Any external contact with Ausgrid for contestable works projects is to be made via the Ausgrid officer responsible for facilitating the contestable project. The Contestable Ausgrid officer will liaise with Ausgrid internal departments and specialists as necessary to fulfil the requirements of this standard. All other technical aspects of this document which are not procedural in nature shall apply to contestable works projects.

INTERPRETATION

In the event that any user of this Standard considers that any of its provisions is uncertain, ambiguous or otherwise in need of interpretation, the user should request Ausgrid to clarify the provision. Ausgrid's interpretation shall then apply as though it was included in the Standard, and is final and binding. No correspondence will be entered into with any person disputing the meaning of the provision published in the Standard or the accuracy of Ausgrid's interpretation.

KEYPOINTS

This standard has a summary of content labelled "KEYPOINTS FOR THIS STANDARD". The inclusion or omission of items in this summary does not signify any specific importance or criticality to the items described. It is meant to simply provide the reader with a quick assessment of some of the major issues addressed by the standard. To fully appreciate the content and the requirements of the standard it must be read in its entirety.

AMENDMENTS TO THIS STANDARD

Where there are changes to this standard from the previously approved version, any previous shading is removed and the newly affected paragraphs are shaded with a grey background. Where the document changes exceed 25% of the document content, any grey background in the document is to be removed and the following words should be shown below the title block on the right hand side of the page in bold and italic, for example, Supersedes – document details (for example, "Supersedes Document Type (Category) Document No. Amendment No.").

KEY POINTS OF THIS STANDARD

Scope and Risks Addressed

This standard outlines the works related to the design, manufacture and implementation of the LV short circuits. This standard is limited to scope identified below and provides controls for associated risks as listed below:

- ☐ the minimum requirements for the purchase of LV short circuits
- ☐ the testing and maintenance required for the LV short circuits
- ☐ the procedure for applying LV short circuits and
- ☐ the form to be completed that lists the location of the LV short circuits.

Where to for more information?
Section 1,2

LV Short Circuit Requirements

This section outlines the requirements for LV short circuits and includes:

- ☐ A capability of handling 48A per phase current associated with shorted output of a maximum of 10kW per phase distributed energy resources.
- ☐ LV short circuits to be supplied as a kit including a carry bag
- ☐ Two versions – an overhead kit and an underground kit
- ☐ Specifications for the OH kit are given in clause 5.2.2
- ☐ Specifications for the UG kit are given in Clause 5.2.3
- ☐ Photographs of the kits and their typical application are provided in Annexure A
- ☐ Each set of short circuits to be labelled with a unique identifier and date of last and next three yearly inspection
- ☐ The design of the LV short circuits is not suitable for use as HV earths or for LV bridging
- ☐ Additional fittings are required to use the underground LV short circuits with pillars and link boxes
- ☐ Additional fittings are required for OH LV ABC mains

Where to for more information?
Section 5

Tools and Forms
Annexure A – Photos, Annexure C – UG fittings, Annexure D – OH LV ABC fittings

Testing and Maintenance Specifications

The testing and maintenance requirements include:

- ☐ Type test in accordance with IEC 61230
- ☐ The OH LV short circuits to have a continuous current rating of 150Amps and the UG LV short circuits a rating of 100 Amps
- ☐ Maintenance and testing regime in accordance with Ausgrid Technical Maintenance Plan
- ☐ LV short circuits must be inspected prior to use for any sign of damage, deterioration or faulty connections
- ☐ A six-monthly inspection is required and labelling applied to the handles as illustrate in Annexure B
- ☐ The three-yearly inspection will include testing by the Workshop Manager – Homebush
- ☐ Inspection records must be kept in accordance with HS008-P0300

Where to for more information?
Section 6

Tools and Forms
Annexure B – Labelling

Procedure for LV Short Circuiting

The application of LV short circuits includes the following steps:

- ☐ Isolation from points of supply
- ☐ Proving de-energised
- ☐ Wearing insulating gloves on both hands and approved eye protection
- ☐ Apply the LV short circuits connecting to the neutral conductor first
- ☐ Record location of permit LV shorts on the Access Permit/Clearance to Work (as applicable)
- ☐ Record location of working LV shorts on the Working Earths/ Low Voltage Shorts Form
- ☐ On completion of work - reversal of the process including disconnecting neutral last and recording shorts removed on the same permit and or Working Earths/Low Voltage Shorts Form.
- ☐ Precautions are listed for the appropriate location and use of LV shorts.
- ☐ Requirements for the number and location of LV shorts is indicated for Bare Overhead conductors, for Aerial Bundled Conductors and for LV Underground Mains
- ☐ LV short circuits that have been exposed to a network fault must be disposed of.
- ☐ Stockcodes supplied

Where to for more information?
Section 7

Tools and Forms
Annexure E - Forms

Network Standard
NS223
Low Voltage Short Circuiting for De-energised Work

Contents

1.0 PURPOSE

The intent of this document is to provide a methodology to make LV mains and apparatus effectively de-energised to allow it to be worked on without using live LV working techniques. The purpose of bonding the LV mains together with LV short circuits is to prevent LV mains and apparatus which are isolated from network sources of supply becoming re-energised from customer service connections that have not been isolated. The LV short circuits (referred to as LV shorts in the ESR) are to provide protection for workers against the potential hazard of inadvertent distributed energy resources back feed on LV mains and apparatus that have been isolated from grid sources of supply. The LV short circuits will create an adequate short circuit that will prevent the distributed energy resources from developing hazardous voltages at the work site.

LV short circuits shall be applied and removed by trained and competent persons.

2.0 SCOPE

This standard outlines the works related to the design, manufacture and implementation of the LV short circuits. The scope includes material that:

- Identifies the likely maximum fault capacity of the distributed energy resources.
- Outlines a specification for approved LV short circuits. This will include the minimum requirements for the purchase of the LV short circuits.
- Specifies the testing and maintenance required for the LV short circuits.
- Specifies the procedure for applying and removing LV short circuiting and recording requirements for the application and removal of the LV short circuits.

Note: The LV short circuits are required to protect against inadvertent distributed energy resources back feed or re-energisation of the LV mains only, they are not protection against re-connection to grid supply. The existing controls for grid isolation points are considered adequate.

3.0 REFERENCES

3.1 General

All work covered in this document shall conform to all relevant Legislation, Standards, Codes of Practice and Network Standards. Current Network Standards are available on Ausgrid's Internet site at www.ausgrid.com.au.

3.2 Ausgrid documents

- Electrical Safety Rules
- ES1 Premises Connection Requirements
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS212 Integrated Support Requirements for Ausgrid Network Assets

3.3 Other standards and documents

- AS/NZS 1125:2001 Conductors in insulated electric cables and flexible cords
- AS 4777.1-2005 Grid connection of energy systems via inverters
- AS/NZS 5000.1:2005 Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 (1.2) kV
- ENA Doc 001-2019 National Electricity Network Safety Code

3.4 Acts and regulations

- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014
- Work Health and Safety Act 2011 and Regulation 2017

4.0 DEFINITIONS AND ABBREVIATIONS

Refer to NS 001

5.0 LOW VOLTAGE SHORT CIRCUIT REQUIREMENTS

5.1 Distributed Energy Resources fault capacity

The intention of the LV short circuits is to protect staff from the energisation of LV mains from distributed energy resources, not grid supply. The maximum fault rating of the distributed energy resources is required to specify the LV short circuit construction and rating. A small scale distributed energy resource connection has a capacity, according to ES 1 Premises Connection Requirements and AS 4777, of a maximum of 10kW per phase. Additionally, as described in ES 1 Premises Connection Requirements, for grid connected distributed energy resource systems greater than 10kW per phase, a generator connection agreement will usually be required. Therefore, the applied limitation for design and use of short circuits will be considered as the maximum generation capacity for a small scale distributed energy resources connection. A typical 10kW generation inverter has a maximum output current rating of 48A. This current value will be considered for each phase when determining the LV short circuit minimum construction and rating.

5.2 Specification for low voltage short circuits

5.2.1 General requirements

The LV short circuits shall be suitable for use within indoor and outdoor locations. The LV short circuits are to be suitably resistant to oils, petrol, acid and UV that are consistent with heavy industry use.

5.2.2 Overhead LV short circuiting equipment

The general construction of the Overhead LV short circuits shall enable an appropriate electrical connection to the Overhead mains. The Overhead LV short circuits kit will include:

- 4 line conductor clamps. Each clamp has a handle with non-conductive grips
- 35mm^2 flexible copper conductor (2 x 1500mm and 1 x 1800mm).

Overhead LV short circuits shall be provided with a suitable carry bag in which the shorts will be stored when not in use.

Note: Refer to paragraphs 5.2.3 – 5.2.4 – 5.2.5, drawing number 192952 and to Annexure A for details and typical arrangements.

5.2.3 Line conductor clamps

The line conductor clamps shall provide a correct attachment to line conductors within the range of 5mm to 19mm in diameter (approximately 16mm^2 to 210mm^2). The clamp is to have a handle with non conductive grips for the application and a hole of approximately 13mm appropriate for the connection of the short circuiting cables utilising M12 bolted lug connections (refer to section 5 for electrical requirements).

5.2.4 Short circuiting cables

The cables shall comply with AS/NZS 5000.1:2005 and AS/NZS 1125:2001.

The short circuiting cables shall be a flexible single core insulated copper conductor. The cross sectional area (CSA) of the conductor is to be 35mm^2.

The insulation is to have a rating of 0.6/1kV, have an orange colour and be resistant to chemical and ultra violet (UV) damage.

The length of the cable for both the outer to the inner clamps shall be 1.5m in length each and between the inner clamps shall be 1.8m in length.

The ends of the cables are to be terminated to the line conductor clamps with hexagonal crimping lugs along with M12 stainless steel bolt and components comprising of flat and spring washers. The crimped connections are to be covered with an insulating mastic lined heat-shrink of suitable length to provide water ingress protection and stress relief at the terminations.

A suitable label shall be placed on each of the short circuiting cables. The label shall display the following bold print:

NOT TO BE USED FOR HV EARTHS OR LV BRIDGING

In addition to the above, each set of short circuits must be labelled with a unique identifier (eg. serial number) and the date of the last and next three yearly inspection (see Annexure B).

5.2.5 Carry case / bag

A suitable carry bag is to be supplied with each set of LV short circuits.

The carry bag is to have a shoulder strap and the colour of the bag shall be orange with the following print boldly placed on the front of the bag:

OVERHEAD LV SHORT CIRCUITS NOT TO BE USED FOR HV EARTHS OR LV BRIDGING

5.2.6 Underground LV short circuiting equipment

The general construction of the LV short circuits shall enable an appropriate electrical connection to the required underground isolation points without causing damage to the network hardware. The underground short circuit equipment will include:

- 16mm^2 flexible copper cables (3 x 600mm and 1 x 1000mm)
- 4 conductor clamps
- Underground LV short circuiting fittings to provide contact with underground isolation points (pillars and links) in the different scenarios.

Underground LV short circuits shall be provided with a suitable carry bag in which the shorts will be stored when not in use.

Note: Refer to paragraphs 5.2.7 – 5.2.8 – 5.2.9 – 5.2.10, drawing number 193009, and to Annexure A for details and typical arrangements.

5.2.7 Conductor clamps

The conductor clamps shall provide a satisfactory electrical and mechanical attachment to a flat metallic surface with thickness range of 4mm to 12mm, and to a cylindrical copper bar of 3/8" (9.5mm) diameter (both inline and transverse connection). The clamp must fit between phase-separation barriers of link boxes.

5.2.8 Short circuiting cables

The cables shall comply with AS/NZS 5000.1:2005 and AS/NZS 1125:2001.

The short circuiting cables shall be a flexible single core insulated copper conductor. The cross sectional area (CSA) of the conductor is to be 16mm^2.

The insulation is to have a rating of 0.6/1kV, have an orange colour and be resistant to chemical and ultra violet (UV) damage.

One end of each cable is to be terminated with a line conductor clamp whilst the other ends are all connected together (reference Annexure A5).

A suitable label shall be placed on each of the short circuiting cables. The label shall display the following bold print:

UNDERGROUND LV SHORT CIRCUITS NOT TO BE USED FOR HV EARTHS OR LV BRIDGING

In addition to the above, each set of short circuits must be labelled with a unique identifier (e.g. serial number) and the date of the last and next three yearly inspection (see Annexure B).

5.2.9 Fittings for connection to pillars and link boxes

Underground Short Circuiting equipment must be used in conjunction with appropriate fittings to enable safe connection to pillars and link boxes. These fittings will consist of but not limited to:

- 3 x Customer Meter/ Switch Board Modular fuse holders with cylindrical copper bar tags 3/8" (9.5mm) diameter (Annexure C3)
- 4 x Heading locking test links with cylindrical copper bar tag of 3/8" (9.5mm) diameter directed inwards (Annexure C4)
- 3 x Knife-blade terminal contact NH-type DIN link connectors each of them equipped with a 3/8" (9.5mm) diameter copper stalk threaded on one end, screwed into the orange blade (Annexure C2)
- 4 x Copper Stalks of 3/8" (9.5mm) diameter, “L” shaped, total length 110mm (20mm bent) to be inserted into LV service termination blocks in Single and Double link pillars (Annexure C6)
- 4 x Copper contacts to provide isolation from the network and load side shorting of underground link boxes (Annexure C1).

Note: The fittings listed above will allow connection to be made to the network isolation points. Variations to these fittings need the approval of the manager Electrical Safety.

5.2.10 Carry Case/Bag

A suitable carry bag is to be supplied with each set of LV short circuits.

The carry bag is to have a shoulder strap and the colour of the bag shall be orange, with the following print boldly placed on the front of the bag:

UNDERGROUND LV SHORT CIRCUITS NOT TO BE USED FOR HV EARTHS OR LV BRIDGING.

The bag must have two separate compartments – one for the underground short circuiting cables and the other for the fittings.

6.0 TESTING AND MAINTENANCE SPECIFICATIONS

6.1 Type testing requirements

The following type tests shall be conducted in accordance with IEC 61230:

- Continuous current testing of 150A per phase to ensure conductors does not exceed thermal ratings in normal working conditions for OH, 35mm^2 shorts.
- Continuous current testing of 100A per phase to ensure conductors does not exceed thermal ratings for UG 16mm^2 shorts

The LV short circuiting equipment used by Ausgrid is shown in the photographs in Annexure A. The LV short circuit bar code and continuous rating label can be seen in Annexure B.

6.2 Maintenance and routine testing requirements

The maintenance and inspection of the LV short circuits shall be in accordance with Ausgrid's Technical Maintenance Plan (TMP).

The LV short circuit inspection labels can be seen in Annexure B.

6.2.1 Before-use inspection

Before each use the LV short circuits must be inspected for any sign of damage, deterioration, or faulty connections. The inspection must check for:

- Signs of damage to the clamps
- Tightness of the connections, and
- That they have been tested within the last 3 years, and
- Damage to the conductor insulation.

Where there is any doubt about the condition of LV short circuits, it shall be reported to the site supervisor. Alternative LV short circuit sets shall be used until the suspect set is either repaired or replaced.

6.2.2 Six-monthly inspection

Every six months and irrespective of any other inspection or test, the LV short circuits must be inspected as set out in 6.2.1 by a competent person. -

If the equipment has any defect it must be withdrawn from service and not used until repaired, retested and tagged.

If the equipment is defect free the appropriate LV short circuit inspection label must be applied.

Labels are available from the Workshop Manager-Homebush.

6.2.3 Three-yearly inspection and test

Every three years and irrespective of any other inspection or test, the LV short circuits must be inspected as set out in 6.2.1.

Additionally, a resistance check will be performed to check for any potential broken conductor strand or corrosion. The test result will be compared to the original resistance value when the LV short was first produced. Remove the heat-shrink and confirm there are no broken strands, visible corrosion or signs of overheating.

Return the LV shorts to the Workshop Manager – Homebush depot to carry out the three yearly inspection and testing.

If the equipment is defect free the appropriate LV short circuit inspection label must be applied

If the equipment has any defect it must be withdrawn from service and not used until repaired, retested and tagged.

6.2.4 Inspection records

Ausgrid's LV short circuits are protection equipment and the inspections must be recorded. For Ausgrid workers, all testing and inspections of LV shorts must be carried out and recorded in accordance with HS008 – P0300: Workplace Testing and Monitoring.

ASP's and contractors must follow their own procedures for testing and recording any inspections or testing of LV shorts used on the Ausgrid LV network

7.0 PROCEDURE FOR LOW VOLTAGE SHORT CIRCUITING

Procedures within this section in relation to working on LV mains and apparatus isolated from grid supplies must be followed.

All workers shall wear PPE to the requirements of the ESR.

The following shall be carried out for all LV works on Ausgrid's mains and apparatus where LV short circuiting is required:

1. Isolate the mains and apparatus from all known network sources of supplies as per ESR.
2. Test and prove the mains and apparatus are de-energised. If the LV mains are still live after grid isolation, the source of supply must be identified and disconnected from the low voltage network and the low voltage network proved to be de-energised before applying the LV short circuits at the work site as required by the NAR. Note: Workers applying LV shorts shall make connection to the neutral conductor first. Visual identification of the neutral conductor is acceptable for the purpose of connecting LV shorts.
3. Document the location of the permit LV short circuits on the Access Permit, CTW, Permit Folder or Operating Agreement as applicable. and any working LV short are recorded on the Working Earths/LV shorts form.

   Alternate terminology is now being used to describe LV shorts are identical in construction irrespective of the different situations LV shorts are applied as per the below definitions. The LV shorts are identical in construction irrespective of the definition used.

Table 1 - Shorts definitions

Shorts Terminology	Description
LV Shorts	this term used to describe the LV shorting equipment applied to de-energised LV mains and equipment 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. LV shorts must only be applied by trained and competent persons.
Permit LV Shorts	this term applies to the LV shorts applied as a part of issuing the Access Permit, CTW or Operating Agreement (as applicable). For planned work, the location of the permit LV shorts will be identified on the NAR. All applied and removed permit LV shorts are recorded by the operator on the Access Permit, CTW Permit Folder or Operating Agreement (as applicable). Permit LV shorts may only be applied under the direction of an appropriately authorised operator.
Working LV Shorts	this term applies for the application of additional LV shorts applied by the workgroup after a permit has been issued and accepted by an authorised recipient. All applied and removed sets of working LV shorts must be recorded by the recipient on the Working Earths/LV shorts form.

Note: Disconnection from the neutral conductor must be made last in every case.

The following precautions must be observed in all cases:

- LV mains and apparatus that have not been isolated from all known sources of supply are to be treated as alive until LV short circuits are applied.
- LV short circuits must be applied as close as practical to the worksite.
- Where LV short circuits are being applied, they must be connected to all de-energised phase conductors, and the neutral.
- Caution shall be taken when re-connecting conductors to ensure that the worker does not create a series path.
- A check must be made to verify the equipment has been inspected and tested in accordance with the requirements of Section 5 (also see Annexure B).
- The before use inspection as per Section 5 (Testing and Maintenance Specifications) has been successfully carried out.

Notes:

1. For bare conductor such as galvanized steel conductor (SC/GZ), aluminium clad steel conductor (SC/AC) or aluminium conductor galvanized steel reinforced (ACSR/GZ), Short Circuits are not a valid option therefore appropriate PPE must be used and the mains treated as alive if all the LV distributors, or sections of these, cannot be isolated.
2. Minimum conductor sizes to apply short circuits are:
    - 17mm^2 CU and 35mm^2 AL for bare conductors
    - single 95ABC
    - 50mm^2 CU or AL for UG cables.

7.1 Low Voltage overhead bare wire mains

A single set of LV short circuits may be used if:

- the LV OH mains are not to be removed or disturbed, and
- A maximum distance of 100m between the LV short circuit and the work site is maintained.

Multiple sets of LV short circuits must be used in all other instances.

If the LV OH mains are to be cut or a section removed, a LV short circuit set must be applied on each side of the work site, or either side of the section to be cut/removed, before the LV mains are cut/removed. In this case the maximum distance of 100m must not be exceeded between two adjacent LV short circuits to create a continuous de-energised work site. Outside of the outer LV short circuits a maximum distance of 100m must not be exceeded between the nearest LV short circuits and the work site. This may result in four separate sets of LV short circuits being required, for example on a street intersection pole.

If LV OH mains are not to be removed or disturbed a maximum distance of 200m must not be exceeded between two adjacent LV short circuits to create a continuous de-energised work site. Outside of the outer LV short circuits a maximum distance of 100m must not be exceeded between the nearest LV short circuits and the work site (see Figure 1 for details).

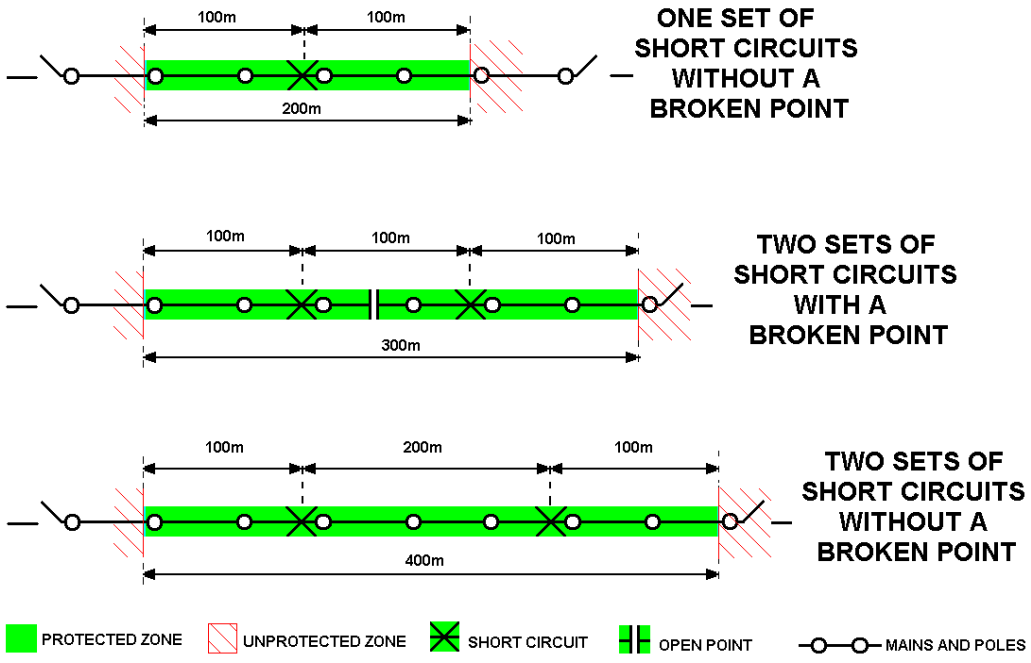


Figure 1 – Protection Zones for Different Bare OH LV Mains Scenarios

7.2 Low Voltage aerial bundled conductor mains

Insulating piercing connectors (IPCs) will be utilised where LV short circuiting is required (a typical IPC can be seen in Annexure D). Once installed, the IPCs are to remain in place after the job's completion. This will enable future LV short circuiting points while preventing the entry of water into the cable.

The IPCs must be installed as follows:

- The IPCs are staggered with a spacing of 400 – 450mm of LV ABC visible between adjacent IPCs and the M12 socket's hole is not pointing upwards.
- With the use of a six sided (Hex) deep well socket spanner – a shifting spanner must not be used.

The IPCs are to have the following specifications:

- Have the ability to securely connect to LV ABCs in the range of 50 – 185mm^2.
- Have an M12 bolted connection.
- Ausgrid's approved IPC is Sicame EPC1-401-TC.

To provide a suitable point of connection for the LV short circuits, the IPCs are to be installed with the inclusion of a 75mm x 12mm stainless steel bolt and lock nut. Upon the removal of the LV short circuits, the stainless steel bolt must be removed and the insulated covers secured onto the IPCs.

A single set of LV short circuits may be used if:

- the LV ABC OH mains are not to be removed or disturbed, and
- A maximum distance of 300m between the LV short circuit and the work site is maintained.

Multiple sets of short circuits must be used in all other instances.

If the LV ABC OH mains are to be cut or a section removed, a LV short circuit set must be applied on each side of the work site, or either side of the section to be cut / removed, before the LV mains are cut / removed. In this case the maximum distance of 300m must not be exceeded between two adjacent LV short circuits to create a continuous de-energised work site. Outside of the outer LV short circuits a maximum distance of 300m must not be exceeded between the nearest LV short

circuits and the work site. This may result in four separate sets of LV short circuits being required, for example on a street intersection pole.

If LV ABC OH mains are not to be removed or disturbed a maximum distance of 600m must not be exceeded between two adjacent LV short circuits to create a continuous de-energised work site. Outside of the outer LV short circuits a maximum distance of 300m must not be exceeded between the nearest LV short circuits and the work site (see Figure 2 for details).

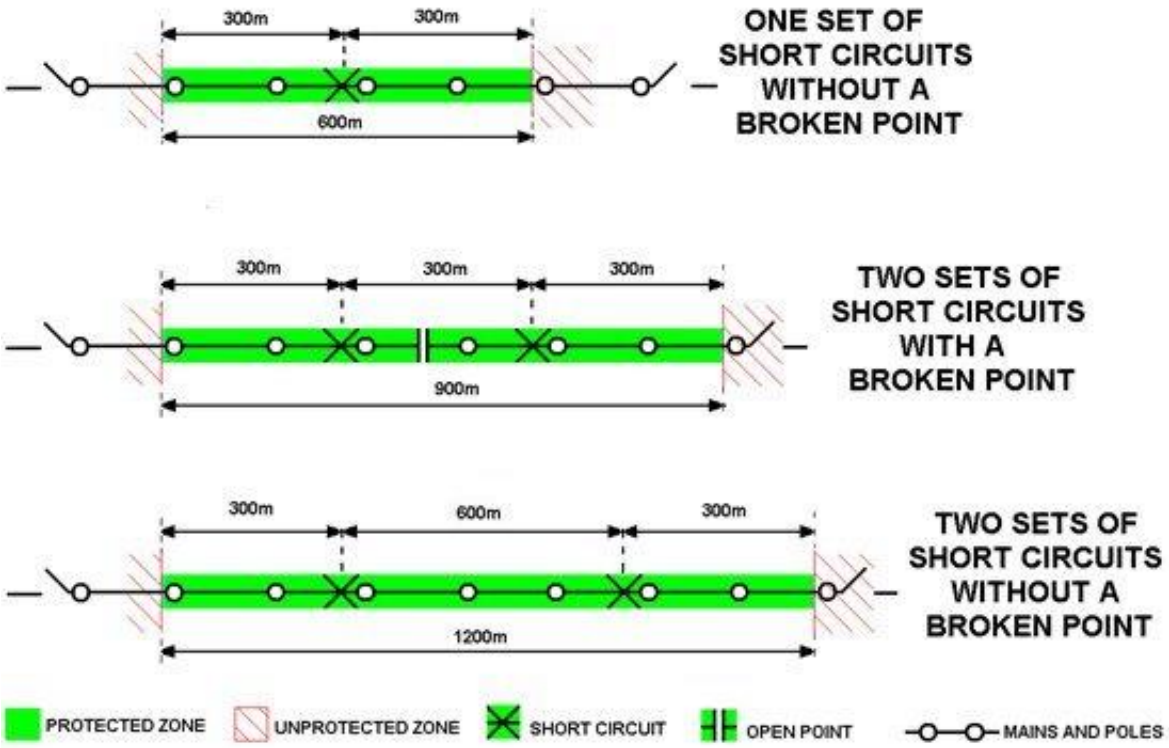


Figure 2 – Protection Zones for Different LV ABC OH Mains Scenarios

7.3 Low Voltage underground mains

A single set of LV short circuits may be used if:

- the LV UG mains are not to be removed or disturbed, and
- A maximum distance of 200m between the LV short circuit and the work site is maintained.

Multiple sets of LV short circuits must be used in all other instances.

If the LV UG mains are to be cut or a section removed, a LV short circuit set must be applied on each side of the work site, or either side of the section to be cut / removed, before the LV mains are cut / removed. In this case the maximum distance of 200m must not be exceeded between two adjacent LV short circuits to create a continuous de-energised work site. Outside of the outer LV short circuits a maximum distance of 200m must not be exceeded between the nearest LV short circuits and the work site. This may result in four separate sets of LV short circuits being required.

If LV UG mains are not to be removed or disturbed a maximum distance of 400m must not be exceeded between two adjacent LV short circuits to create a continuous de-energised work site. Outside of the outer LV short circuits a maximum distance of 200m must not be exceeded between the nearest LV short circuits and the work site (see Figure 3 for details).

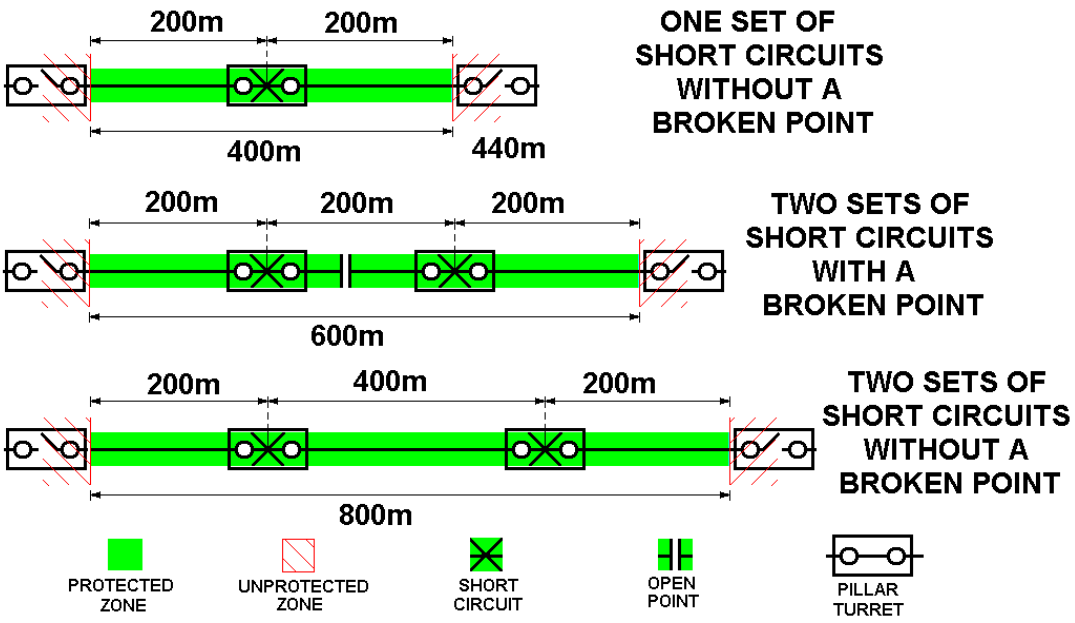


Figure 3 – Protection Zones for Different LV UG Mains Scenarios

If there is no possibility at all of applying permit LV shorts in the 200/400m range, an exception can be made and shorts can be applied on services not smaller then 25mm^2 AL or 16mm^2 CU. In this case the maximum distances cannot exceed 100m and 200m.

7.4 Typical scenarios requiring LV short circuits application

Typical situations requiring installation of LV short circuiting equipment include:

Overhead:

- Where crews are working to replace HV conductors located above LV mains. If the need to isolate the LV mains arises, LV short circuits may be used to prevent distributed energy resources back feeding into the LV mains.

Underground:

- When replacing CONSAC cable. In some circumstances an open point will be created once the cable is cut, therefore two sets of LV shorts will be required. Maximum distance between LV shorts and the work site need to comply with this standard.
- When installing a new pillar and there is a need to cut CONSAC cable to join into the new pillar and there are services with direct connection to CONSAC cable.
- When cutting away a service and it isn't possible to isolate all services.

7.5 Disposal after network fault exposure

In the case of a set of LV short circuits being subject to a network fault current, the set shall be disposed of. None of the components may be reused.

7.6 Stockcodes

Table 2 – Stockcodes

Equipment	Stockcode
35 mm^2 OH Short Circuits with orange bag	182654
Insulating piercing connectors (IPCs)	181331
Plastic cap with lanyard and bolt	182913
16 mm^2 UG Short Circuits with orange bag including UG fittings (stalks, clamps, DIN links)	182929

8.0 RECORDKEEPING

The table below identifies the types of records relating to the process, their storage location and retention period.

Table 3 – Recordkeeping

Type of Record	Storage Location	Retention Period*
Approved copy of the network standard	Document repository Network sub process Standard – Company	Unlimited
Draft Copies of the network standard during amendment/creation	Work Folder for Network Standards (HPRM ref. 2014/21250/172)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	Records Management system Work Folder for Network Standards (HPRM ref. 2014/21250/172)	Unlimited

* The above retention periods are subject to change eg if the records are required for legal matters or legislative changes. Before disposal, retention periods should be checked and authorised by the Records Manager.

9.0 AUTHORITIES AND RESPONSIBILITIES

For this network standard the authorities and responsibilities of Ausgrid employees and managers in relation to content, management and document control of this network standard can be obtained from the Company Procedure (Network) – Production/Review of Engineering Technical Documents within the document repository. The responsibilities of persons for the design or construction work detailed in this network standard are identified throughout this standard in the context of the requirements to which they apply.

10.0 DOCUMENT CONTROL

Content Coordinator : Electrical Safety Manager

Distribution Coordinator : Head of Network Strategy and Future Grid

Annexure A Low voltage short circuits

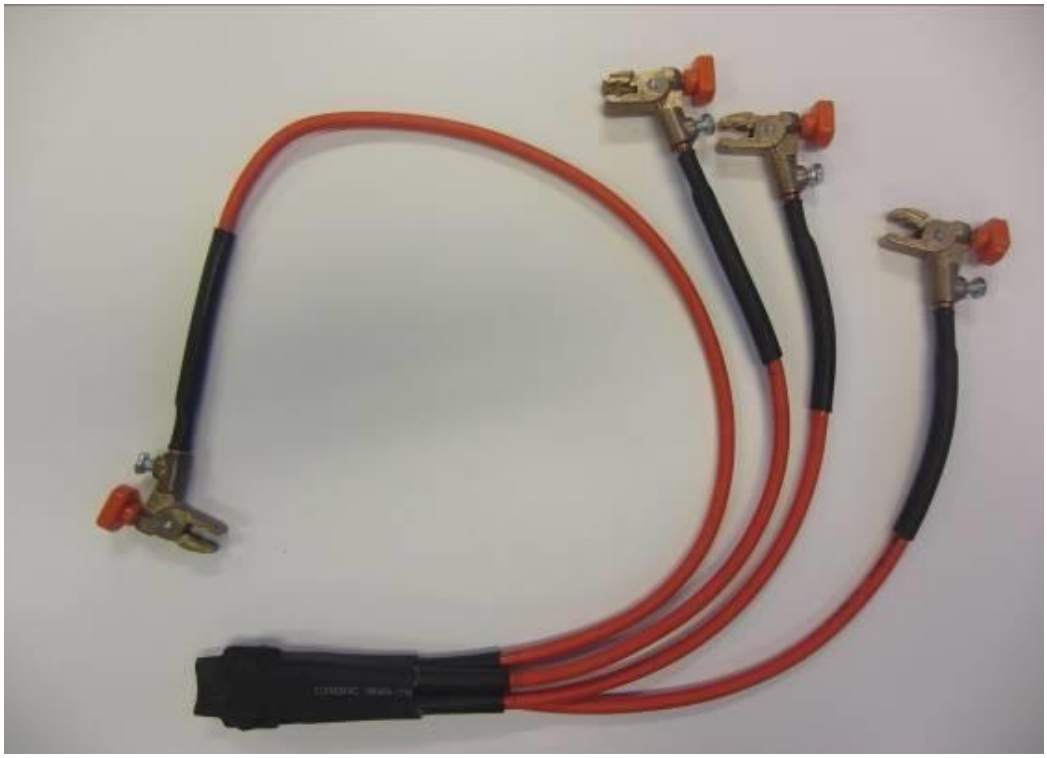
A1 Overhead low voltage short circuit assembly

A2 Overhead carry bag

A3 Overhead conductor clamp

A4 Typical overhead low voltage short circuit installation

A5 Underground low voltage short circuit assembly



A6 Underground carry bag

A7 Underground conductor clamp

A8 Typical underground low voltage short circuit installation – shorts applied by means of copper stalks inserted in the service termination blocks

Annexure B LV short circuits bar codes / tags / labels

B1 LV short circuit inspection labels

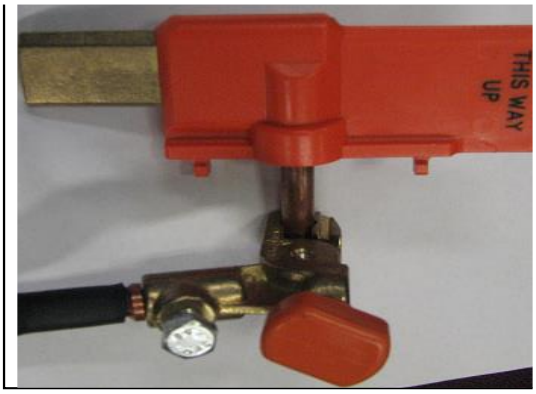
B2 LV short circuit inspection labels

Replacement inspection labels are available from Workshop Manager - Homebush

Annexure C UG LV short circuits fittings

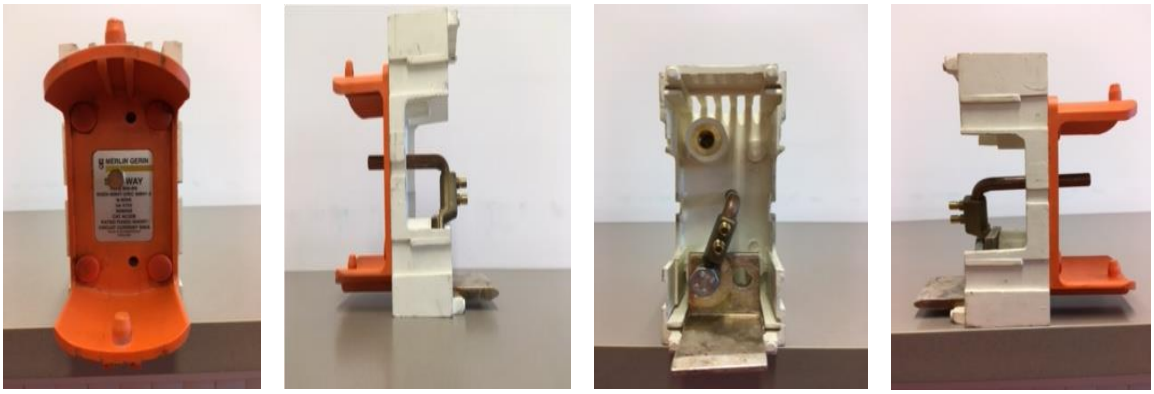
C1 Low voltage link box / pillar arrangements

C2 Commercial & industrial pillar (Jean Muller SL3-3X/ 3AA2 – LTL4A, Size: NH4a, Rated I: 1250A) with NH-type DIN link connectors



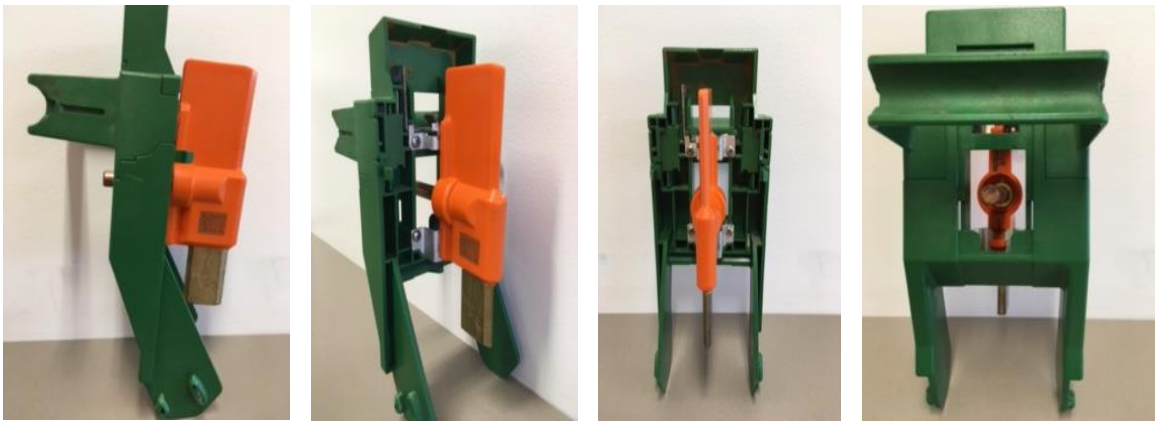
C3 Approved connection adaptors

Suitable for SAIF MKII LV fuse strips



Suitable for Jean Muller LV fuse strips

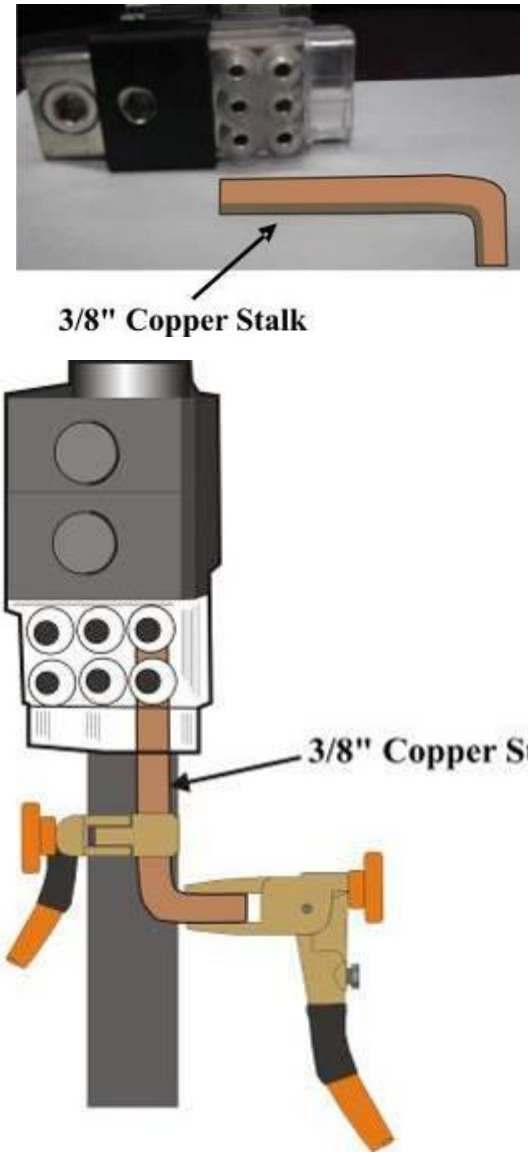
Suitable for Webber LV fuse strips



C4 Customer Meter/ Switch Board Modular fuse holders (Cooper Bussmann HSB30BWI 100A)

C5 Heading locking test links

C6 Copper stalks for LV service termination blocks



Annexure D OH LV ABC Short Circuits fittings

D1 Typical IPC SICAME Australia LV connector product number EPC1-401

Annexure E Forms

E1 Access Permit for Work

Ausgrid

ACCESS PERMIT FOR WORK 12345

Issued in accordance with Network Access Request N^0..... Due for cancellation: Time .....hrs Date .....

1. PURPOSE: This Access Permit allows access to: .....

.....

.....

.....

.....

to carry out the following: .....

2. ISOLATION POINTS: .....

.....

.....

.....

.....

.....

.....

.....

.....

3. ACCESS PERMIT EARTHS and/or PERMIT LV SHORTS:

No	Location of Access Permit Earths/Permit LV Shorts	Re-moved	No	Location of Access Permit Earths/Permit LV Shorts	Re-moved
1			16		
2			17		
3			18		
4			19		
5			20		
6			21		
7			22		
8			23		
9			24		
10			25		
11			26		
12			27		
13			28		
14			29		
15			30		

4. ADDITIONAL CONTROL MEASURES: .....

.....

.....

5. WARNINGS: .....

.....

.....

.....

6. ISSUE: I hereby certify that the above controls have been carried out in line with Ausgrid's Electrical Safety Rules and are within the scope of my operating authority:

This Access Permit is issued to ..... Permit Folder affixed at .....

Permit Receptacle/s affixed at..... Time.....Date.....

Issued by (Signature) .....(Print name) ..... Operating Authority .....

7. ACCEPTANCE BY RECIPIENT: By signing below, I accept this Access Permit and state that I: (print name) .....

(1) fully understand my responsibilities as an access permit recipient; (2) will treat all mains and apparatus other than those covered by this Access Permit as alive; (3) am satisfied that the controls listed in Sections 1-4 of this Access Permit will allow me, and those who sign onto this Access Permit, to complete the work in compliance with the Electrical Safety Rules; (4) acknowledge any warnings listed in Section 5 of this Access Permit; and (5) am responsible for applying , removing, and recording, working earths and/or working LV Shorts.

Recipient Signature ..... Classification ..... Contact Phone Number .....Time..... hrs. Date.....

Issue Date: 2024 A55

E2 Clearance to Work

Ausgrid

CLEARANCE TO WORK

12345

Issued in accordance with Network Access Request N° ..... Due for cancellation: Time ..... hrs Date .....

1. PURPOSE: This Clearance to Work confirms Ausgrid has isolated the following mains and/or apparatus and carried out the control measures listed below for the purpose of the following work: .....

by (company) .....

at (address) .....

near the following mains and/or apparatus: .....

The mains and/or apparatus will remain in this state until this Clearance to Work is surrendered and cancelled.

2. CONTROL MEASURES TAKEN BY AUSGRID:

a) Isolation Points the mains and/or apparatus have been isolated at the following locations: .....

b) Earthing and Short-circuiting equipment have been applied at the following locations: .....

c) Additional Control Measures taken by Ausgrid: .....

3. WARNINGS / LIMITATIONS OF WORK: Additional warnings to the person in charge of work or limitations of the proposed work: .....

4. ISSUE: by Ausgrid - I hereby certify that the above control measures have been carried out in line with Ausgrid's Electrical Safety Rules and this Clearance to Work is now issued to:

Person in charge of the work (Print name) ..... Company .....

Issued by (Print name) ..... (Signature) ..... Time ..... Date .....

Location of Permit Folder for return of surrendered Clearance to Work: .....

Issue Date: 2024 A65

E3 Working Earths/LV Shorts Form

Ausgrid

WORKING EARTHS / LV SHORTS FORM

12345

This form is for recording the application and removal of Working Earths and Working Low Voltage Shorts

Access Permit No.: 2345

LOCATION – Working Earths or LV Shorts	APPLIED BY PRINT NAME & SIGN	DATE	REMOVED BY PRINT NAME & SIGN	DATE
Pole EP861	John Citizen *J Citizen*	*1/8/24*	John Citizen *J Citizen*	*1/8/24*
Pole EP847	John Citizen *J Citizen*	*1/8/24*	John Citizen *J Citizen*	*1/8/24*
Pole EP823	John Citizen *J Citizen*	*1/8/24*	John Citizen *J Citizen*	*1/8/24*

Issue Date: 2024 A26