Network Standard

NETWORK	Document No : NW000-S0068 Amendment No : 2 Approved By : Head of AEP & S Approval Date : 22/05/2018

Minor amendments approved 14/02/2023

NW000-S0068 **NS224 LOW VOLTAGE SUBURBAN COMMERCIAL AND INDUSTRIAL UNDERGROUND DISTRIBUTION UTILISING PILLARS**

ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with low voltage cable jointing 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Where this Standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document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, accredited service provider 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 anything 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 the variation to a Network Standard or alternative material into a design. All designers including external designers authorised as Accredited Service Providers will seek approval through the approved process as outlined in NS181 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 Work Health and Safety Regulation 2017 (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 specifies Ausgrid's application for approval, and construction requirements for low voltage underground suburban commercial and industrial distribution systems utilising pillars. It is limited to scope identified below and provides controls for associated risks as listed below:

- ☐ Low voltage pillars in underground suburban commercial and industrial areas
- ☐ Does not apply to Sydney CBD
- ☐ Restrictions on use within Newcastle CBD

Where to for more information?

Section 1, 2

Design Information

This section summarises the design requirements:

- ☐ Suitability assessment
- ☐ Installation options and minimum external clearances
- ☐ Rating of the pillar components
- ☐ Electrical configuration of the cabinets

Where to for more information?

Sections 5.0, 6.0, 7.0, 8.0

Tools and Forms

None provided

Construction Information

This section summarises the construction requirements:

- ☐ Installation options and minimum external clearances
- ☐ Cable and cable termination requirements
- ☐ Special requirement for 240mm^2 and 300mm^2 copper lugs used for phase cable connections to 400A switchgear modules
- ☐ Torque settings
- ☐ Anti-seize lubricant on all stainless steel fasteners
- ☐ Base unit installation requirements
- ☐ Cabinet installation requirements
- ☐ Conduits
- ☐ Distributor connections
- ☐ Service connections
- ☐ Street lighting
- ☐ Operation of cabinet and base unit
- ☐ Labelling of the equipment
- ☐ Acid sulphate soils

Where to for more information?

Sections 6.0, 10.0, 11.0, 12.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0, 31.0

Tools and Forms

None provided

Maintenance Information

This section summarises the maintenance requirements:

- ☐ Inspection of cabinet and base unit
- ☐ Recoating of cabinet and base unit
- ☐ Thermal inspections

Where to for more information?

Section 27.0

Tools and Forms

None provided

Network Standard
NS224
Low Voltage Suburban Commercial and Industrial Underground Distribution Utilising Pillars

Contents

1.0 PURPOSE

This Network Standard specifies Ausgrid's application for approval, and construction requirements for low voltage underground suburban commercial and industrial distribution systems utilising pillars.

The requirements of this standard must always be adhered to. Any deviations from this standard must be submitted to Ausgrid for approval prior to being implemented.

In general, Ausgrid's current policy provides for the contestability of customer connections, recoverable works and some system augmentations. Work on Ausgrid's supply system can only be performed by appropriately accredited and authorised personnel. Further information on Service Provider Authorisations can be obtained from ES4.

This Network Standard should be read in conjunction with NS130 and NS100.

Construction details for joints, terminations, and underground to overhead (UGOH) connections, which are not covered in this standard, shall be sought from Ausgrid as required.

2.0 SCOPE

2.1 General

Low voltage underground suburban commercial and industrial distribution systems utilising pillars covered by this Network Standard are for use in suburban commercial and industrial areas only. Application of this Network Standard in the Sydney CBD is not permitted.

Low voltage underground distribution systems covered by this Network Standard will not be approved or considered for approval for residential application.

2.2 Use in Newcastle CBD Area

Due to the configuration of the low voltage network (fault levels and upstream fusing) within the Newcastle CBD area, the pillars detailed in this Network Standard are not suitable for use in all locations of the Newcastle CBD. A suitability assessment must be carried out for each proposed location as detailed in Section 5.0.

These pillars must not be used in any of the following situations in the Newcastle CBD area:

- For the replacement of distribution feeder pillars which have more circuits or larger cable sizes than those specified in this Network Standard;
- In locations where the required low voltage load rating exceeds 400Amps;
- Within 10m of 3 x 1500kVA distribution substation or a distribution substation that could reasonably be upgraded to become a 3 x 1500kVA distribution substation, whether connected in a radial or triplex network;
- Where the low voltage network could be configured so that the upstream low voltage fuses are larger than 400Amps.

3.0 RELATED DOCUMENTS

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.

ASPs and other persons external to Ausgrid are responsible for sourcing the manufacturer's instructions and manuals.

3.1 Ausgrid documents

- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- ES4 Accredited Service Provider Authorisation
- NS001 Glossary of Terms
- NS100 Field Recording of Network Assets
- NS100 External Annexure C
- NS104 Specification for Electrical Network Project Design Plans
- NS119 Public Lighting Design and Construction
- NS127 Low Voltage Cable Joints and Terminations
- NS130 Laying Underground Cables up to and Including 11kV
- NS148 Overhead Line Support, Street Light Column, Pit and Pillar Labelling
- NS156 Working Near or Around Underground Cables
- NS161 Specification for Testing of Underground Cables
- NS174 Environmental Procedures
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS181 Approved Material List (AML)
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- Public Electrical Safety Awareness Plan

3.2 Other standards and documents

- AS 1428.1-2021 - Design for access and mobility - General requirements for access - New building work
- AS/NZS 1428.4.1:2009 Design for access and mobility - Means to assist the orientation of people with vision impairment - Tactile ground surface indicators
- AS 2865-2009 - Confined spaces
- ENA Doc 001-2019 National Electricity Network Safety Code
- Service and Installation Rules of New South Wales

3.3 Acts and regulations

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

4.0 DEFINITIONS

Refer to NS001 Glossary of Terms.

5.0 APPLICATION FOR PILLAR SUITABILITY ASSESSMENT

Application for pillar suitability assessment is to be made in writing to the Ausgrid Representative responsible for facilitating the contestable project.

The Ausgrid Representative or Ausgrid Designer shall determine whether or not the fault level/s for the proposed installation location/s exceeds the equipment design parameters. Refer to Section 7.0 for additional information. The Ausgrid Representative or Ausgrid Designer shall consult with the relevant protection section to assess the fault levels.

The Designer shall ensure that the proposed installation locations are suitable for the installation of the pillars detailed in this Network Standard, including the physical installation constraints such as other assets in the ground which may impede installation.

The design must ensure all of the installation requirements in this Network Standard can be met.

6.0 INSTALLATION OPTIONS AND MINIMUM EXTERNAL CLEARANCES

6.1 General

Suburban commercial and industrial pillars have been designed as a modular system. There are eighteen (18) major components in the system. These components are:

- Six (6) x cabinets, each cabinet having a different electrical configuration (configurations A to F inclusive);
- Six (6) x base units, matched to electrical configurations A to F inclusive, suitable for a direct buried installation in a location that will not be subjected to motorised edgers (whipper snippers). Typically the base unit (pillar) will be surrounded by a hard surface or in a garden area;
- Six (6) x base units, matched to electrical configurations A to F inclusive, suitable for a direct buried installation in a location that may be subjected to motorised edgers (whipper snippers). Typically the base unit (pillar) will be surrounded by grass.

Component selection is based on:

- the low voltage network requirements for a given location. Based on these requirements an electrical configuration is selected. This determines the cabinet type from Configuration A – F inclusive. Refer to Section 8.0.
- Base unit selection is determined by whether or not the base unit may be subjected to motorised edgers (whipper snippers).

6.2 Installation

In all installation scenarios a section of the base unit is direct buried, with the cabinet and base unit (pillar) being a free standing structure. Distributor cables are either direct buried or installed in ducts.

6.3 Wall recess installation

The cabinet and base unit combination can be installed in a recess in a wall. To ensure adequate ventilation and sufficient space for installation, the following minimum air clearances must be maintained around the cabinet and the above ground section of the base unit when installed in a recess in a wall:

- Sides – 50mm
- Rear – 25mm
- Top – 100mm
- Front – The front of the cabinet / base unit combination must remain clear to provide safe unrestricted access to the internals of both the cabinet and the base unit.

The front of the pillar (cabinet door handle) must be flush with the opening of the recess. Setting the pillar further back in the recess is not permitted.

6.4 Installation in an open air environment

When the cabinet and base unit combination is installed in an open air environment the following minimum air clearances must be maintained around the outside of the cabinet and base unit:

- Sides – 50mm, however, due to the total weight of the cabinet and electrical hardware, 500mm is required if the cabinet is lifted into place with all of the electrical hardware installed. Removal of electrical hardware from the cabinet prior to installing the cabinet will permit the 50mm dimension to be used.
- Rear – 25mm.
- Top – 100mm (typically completely open).
- Front – The front of the cabinet / base unit combination must remain clear to provide safe unrestricted access to the internals of both the cabinet and the base unit.
- Corner of a Building – 500mm (see Note below), where the corner of the building can be walked around.
- Edge of a Doorway – 500mm (see Note below).
- Edge of a Window Frame – 100mm. Cabinets are not to be installed in front of windows (see Note below).

Note: In some instances due to existing services in the ground etc, the air clearances from the cabinet to the corner of a building, or from the edge of a doorway, or from the edge of a window frame, may not be able to be met. In these instances the Ausgrid Representative may reduce these air clearances after consideration is given to, but not limited to the following:

- Reconfiguration of the design which relocates the cabinet/s to a different location/s eliminating the need to reduce the air clearances;
- Ensuring that the proposed cabinet position will not create a trip hazard to pedestrians;
- Ensuring the Designer consults with the owner of the premises where it is proposed to reduce air clearances to the corner of a building, or the edge of a doorway, or the edge of a window frame.

The Ausgrid Representative shall be mindful of the requirement for air circulation around the cabinet. To ensure air circulation, under no circumstances are the air clearances to be reduced below the wall recess minimum air clearance dimensions detailed in Clause 6.3 above.

6.5 Consideration of visually impaired persons

6.5.1 Location of pillars

Designers shall give consideration to visually impaired persons when determining the location of the cabinet and base unit combination (pillar). Wherever possible, pillars shall be installed adjacent to an existing pillar or within an existing set-back along the frontage.

6.5.2 Contrast against surrounding surfaces

The end of the cabinets (depth) must provide a strong luminance contrast against surrounding surfaces (minimum 30%). This may be achieved through provision of a different end-colour or through provision of a contrasting band of at least 75mm in depth at a height of 900-1000mm from floor level. It is recommended that this also be reflective for night-time detection.

The standard colour of the cabinet and base unit already provides a strong luminance contrast against most surrounding surfaces. However, in cases where there is not a strong luminance contrast against surrounding surfaces (minimum 30%) the above requirement shall be met.

6.5.3 Determining luminance contrast

AS1428.1 Appendix B refers specifically to measurements of luminance contrast.

In addition, the following advice has been provided by Vision Australia:

Appendix E within AS1428.4.1 gives you the precise, but complicated, method of measuring luminance contrasts.

Other pragmatic but less accurate, ways include:

- using a lux meter, or
- matching the colours in question with the colours in the “Dulux Colour Atlas” and comparing their Light Reflectance Value (LRV).

Because these methods are not so precise, a higher figure (contrast) shall be used. So, for example, instead of 30% luminance contrast, try to get 40% luminance contrast.

A colorluminator device to allow an easy and precise method of measurement is available at Pathfinder Systems Australia.

6.5.4 Possible questions and answers

Q1 - If a 30% luminance contrast is not achieved is it correct in saying that the contrasting band need not be reflective?

A - If luminance contrast is not achieved it would be essential that a contrasting, reflective band be placed on the outer edges of the cabinets. Refer to Clause 6.5.2.

Q2 - If the walls of a building are a light colour and the colour of the pillar is dark (to give you the 30% luminance contrast) will the reflective band need to be provided? The pillar will be dark and if the footpath is not well illuminated then it may be of benefit.

A - The concept and provision of a reflective band is particularly important for night time/low light detection. Many people who are blind or have low vision experience additional vision reduction due to ‘night blindness’. This in turn presents further obstacle detection challenges.

7.0 RATINGS

7.1 General

Although some of the components used in the pillars will be labelled with current ratings exceeding the values stated in the following clauses, it should be noted that these components have been thermally de-rated.

7.2 Design parameters

Cables from distribution centres with varying transformer configurations will supply the pillars. Therefore, differing prospective fault levels, and fuse let through peak currents may apply. In all cases 400A high rupturing capacity (HRC) fuses shall be installed, upstream of the pillars, at the respective distribution centre. Fuses exceeding 400A shall not be used.

Typical transformer configurations, prospective fault levels and let through peak current (based on the characteristics of Ausgrid's 400A HRC fuse) are described in detail below.

7.2.1 400A HRC fuse installed upstream of proposed LV switchgear

The 400A fuse cut off characteristics show:

- For 60kA prospective fault level - typical for 3 x 1500kVA distribution centre Maximum let through peak current is 35kA pk.
- For 20kA prospective fault level - typical for 1 x 1000kVA distribution centre Maximum let through peak current is 25kA pk.

The total I^2t for this fuse is 1.2 x 10^6 amp squared seconds.

7.2.2 Pillar performance values

The pillars have been designed to the following performance values:

- Maximum let through peak current of 35kA peak; and
- minimum required rated short time withstand current of 4.5kA for one (1) second.

7.3 Busbars

Busbars have a 400A continuous rating.

Note: Summated currents on the busbar/s exceeding either the 400A current rating or the design parameters stated above is not permissible.

7.4 400A distributor links (distributor switchgear modules)

Distributor switchgear modules have a 400A continuous rating. These switchgear modules are load make and load break capable and house three (3) individually operated (single pole) links.

7.5 Services

100A, 200A and greater than 200A (>200A) service connectivity is possible dependent upon the selected electrical configuration (refer to Cabinet Electrical Configurations in Section 8.0).

100A and 200A services terminate at the service terminal blocks and neutral bar. 16mm^2 to 70mm^2 circular stranded copper conductors can be accommodated.

>200A services connect directly to the phase busbars and neutral bar. These connections are lugged and bolted, 185mm^2 circular stranded copper conductor, XLPE / PVC (double insulated).

7.6 Special small services

Special small service connections are typically rated up to a maximum of 10 Amps single phase. Refer to Service and Installation Rules of New South Wales for special small services requirements.

7.7 Fused street lighting circuits

Street lighting switchgear modules are load make and load break capable. These switchgear modules house three (3) individually operated (single pole) fuse links. Given the fuse links can be operated independently, the switchgear module can be used for either (3) x single phase street light circuits or (1) x three phase street light circuit.

The following fuse current ratings are available:

- 10A
- 32A
- 50A
- 63A

Fuse selection is to be determined giving consideration to the cross-sectional area of the conductor used for the street lighting circuit/s.

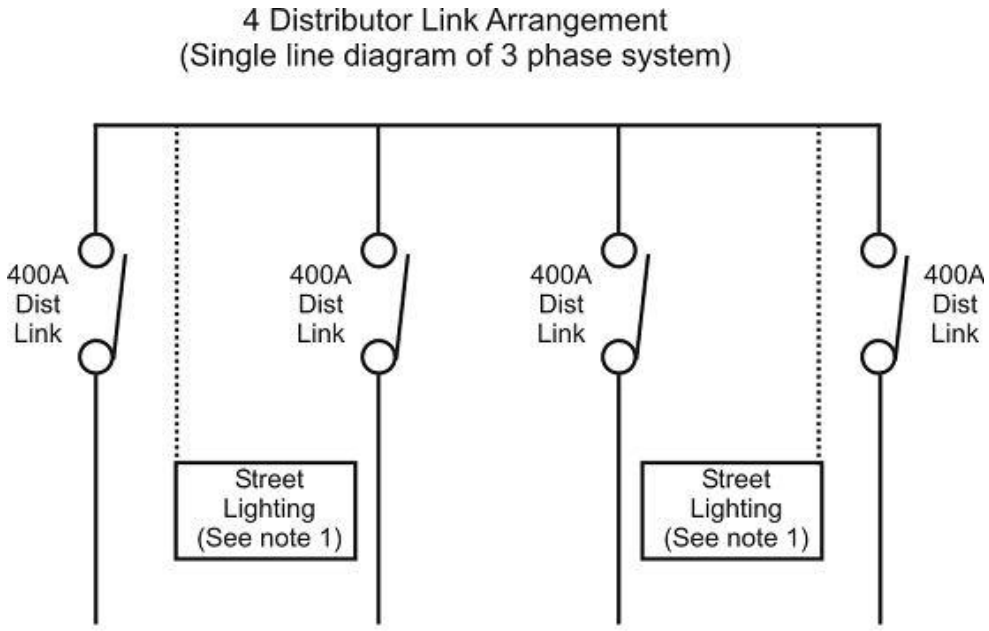
8.0 CABINETS ELECTRICAL CONFIGURATIONS

8.1 General

Six different electrical configurations are available. These configurations are referred to as Configurations A to F inclusive.

For Configurations A to D inclusive, it is possible to isolate sections of the low voltage distributor without interruption of supply to customers. Due to the electrical configuration of Configurations E and F it may not be possible to isolate sections of distributor cables without interruption of supply to customers. Continuity of supply to customers shall be considered by Designers when selecting the appropriate electrical configuration.

8.2 Configuration A – 4 Distributor Link Arrangement



Note 1:
(1) x street lighting circuit, 2.5mm² to 16mm² stranded copper cables
Street lighting circuits may be single or three phase.
Single phase street lighting circuits - 10 or 50 amperes fused.
Three phase street lighting circuits - 32, 50 or 63 amperes fused.
The installation of street lighting circuits will be on an as required basis using an optional kit.

Figure 1 - Single line circuit diagram – Configuration A

Figure 2 - 4 distributor link arrangement – Configuration A

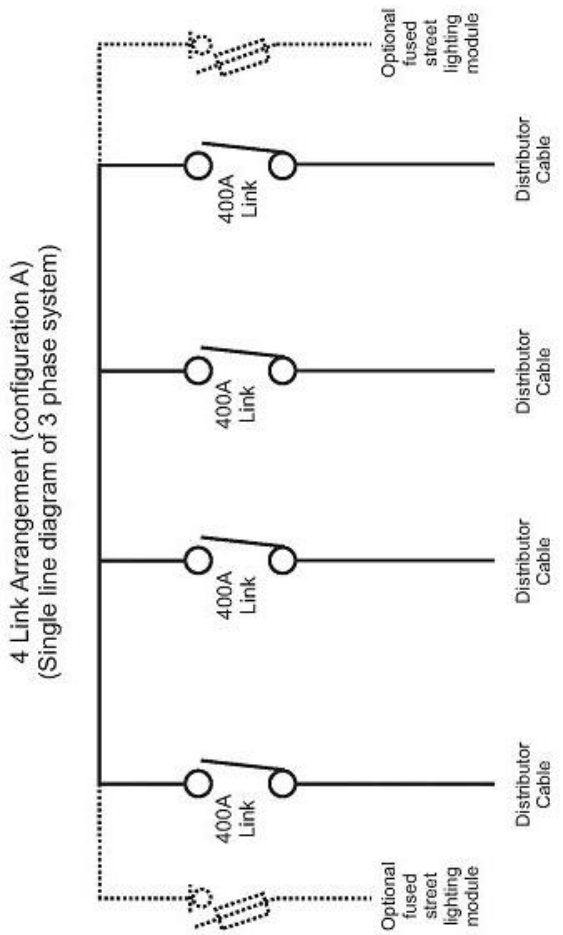
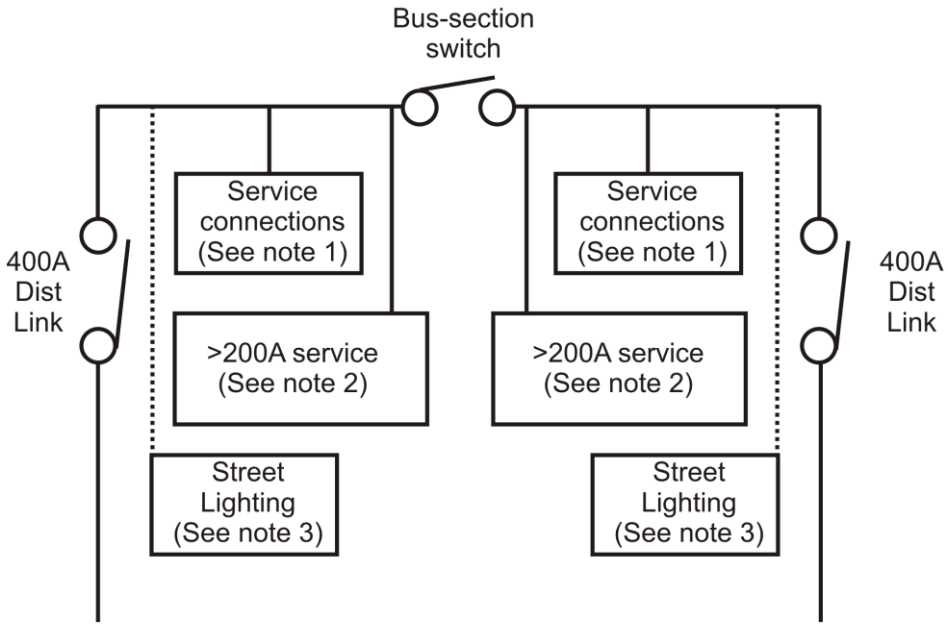


Figure 3 - Circuit diagram shown on inside of cabinet door – Configuration A

8.3 Configuration B - Bus-section plus 2 Distributor Link Arrangement

Bus-section plus 2 Distributor Link Arrangement
(Single line diagram of 3 phase system)



Note 1:
(4) x 16mm^2 to 70mm^2 stranded copper cables (services) and
(1) x 6mm^2 to 16mm^2 stranded copper cables (special small services)
Service combinations:
(4) x 100A + special small service or
(1) X 200A + (2) x 100A + special small service or
(2) x 200A + special small service.
Special Small Services (SSS):
SSS typically are single phase. (3) x separate neutral connections for SSS are provided.

Note 2:
(1) x 185mm^2 stranded copper conductor for services greater than 200A up to an including 400A.

Note 3:
(1) x street lighting circuit, 2.5mm^2 to 16mm^2 stranded copper cables
Street lighting circuits may be single or three phase.
Single phase street lighting circuits - 10 or 50 amperes fused.
Three phase street lighting circuits - 32, 50 or 63 amperes fused.
The installation of street lighting circuits will be on an as required basis using an optional kit.

Figure 4 - Single line circuit diagram – Configuration B

Figure 5 - Bus Section and 2 distributor link arrangement – Configuration B

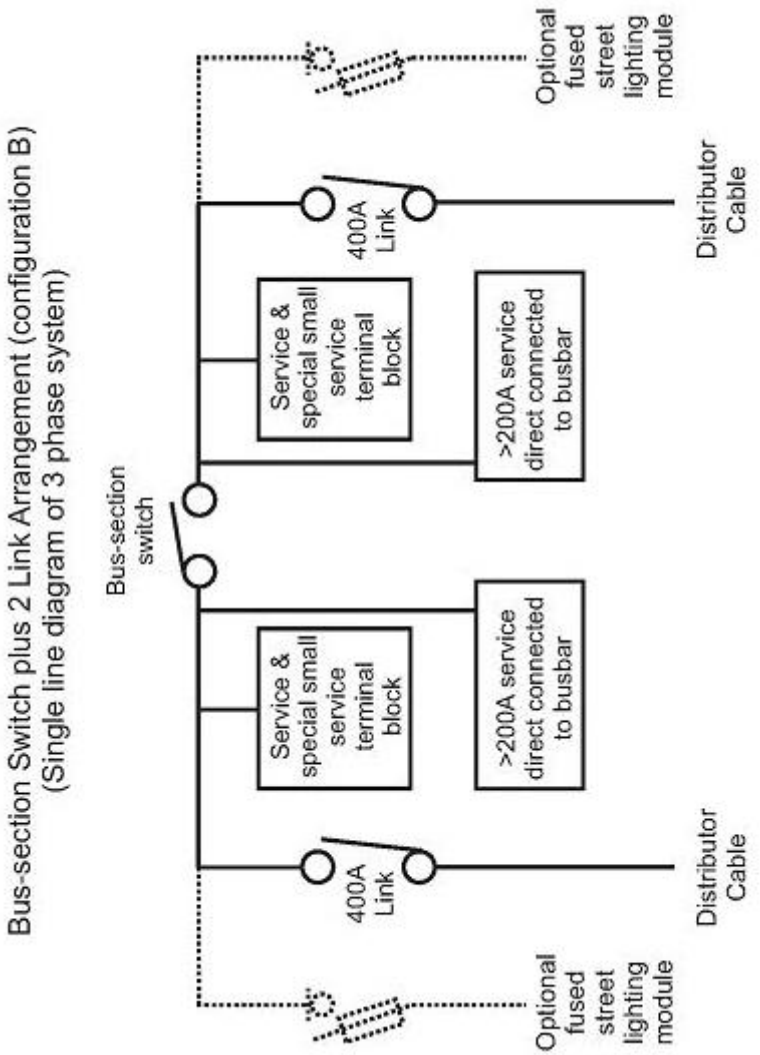
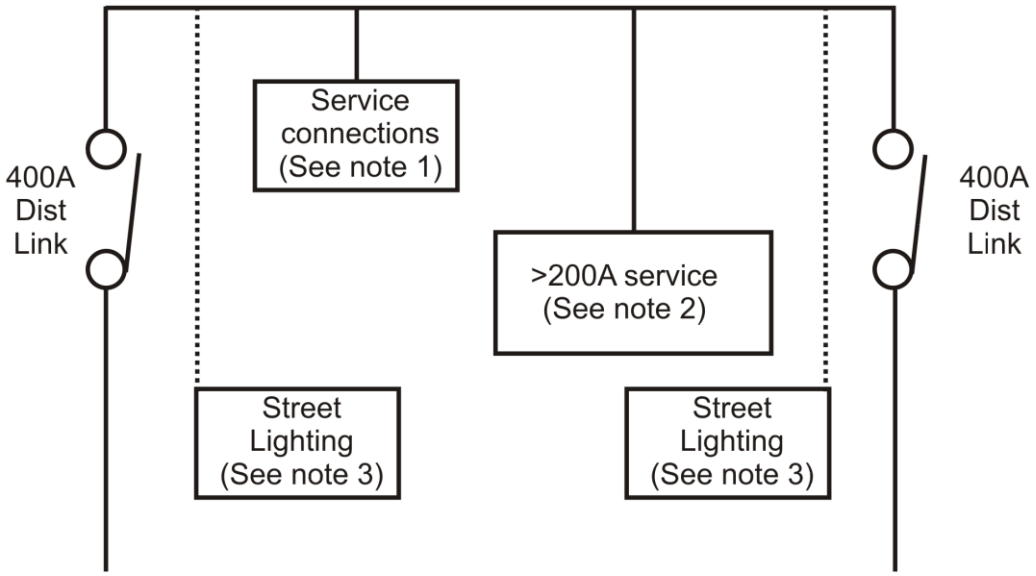


Figure 6 - Circuit diagram shown on inside of cabinet door – Configuration B

8.4 Configuration C – 2 Distributor Link Arrangement

2 Distributor Link Arrangement
(Single line diagram of 3 phase system)



Note 1:
(6) x 16mm^2 to 70mm^2 stranded copper cables (services) and
(1) x 6mm^2 to 16mm^2 stranded copper cables (special small services)
Service combinations:
(6) x 100A + special small service or
(1) X 200A + (4) x 100A + special small service or
(2) x 200A + (2) x 100A + special small service.
Special Small Services (SSS):
SSS typically are single phase. (3) x separate neutral connections for SSS are provided.

Note 2:
(1) x 185mm^2 stranded copper conductor for services greater than 200A up to an including 400A.

Note 3:
(1) x street lighting circuit, 2.5mm^2 to 16mm^2 stranded copper cables
Street lighting circuits may be single or three phase.
Single phase street lighting circuits - 10 or 50 amperes fused.
Three phase street lighting circuits - 32, 50 or 63 amperes fused.
The installation of street lighting circuits will be on an as required basis using an optional kit.

Figure 7 - Single line circuit diagram – Configuration C

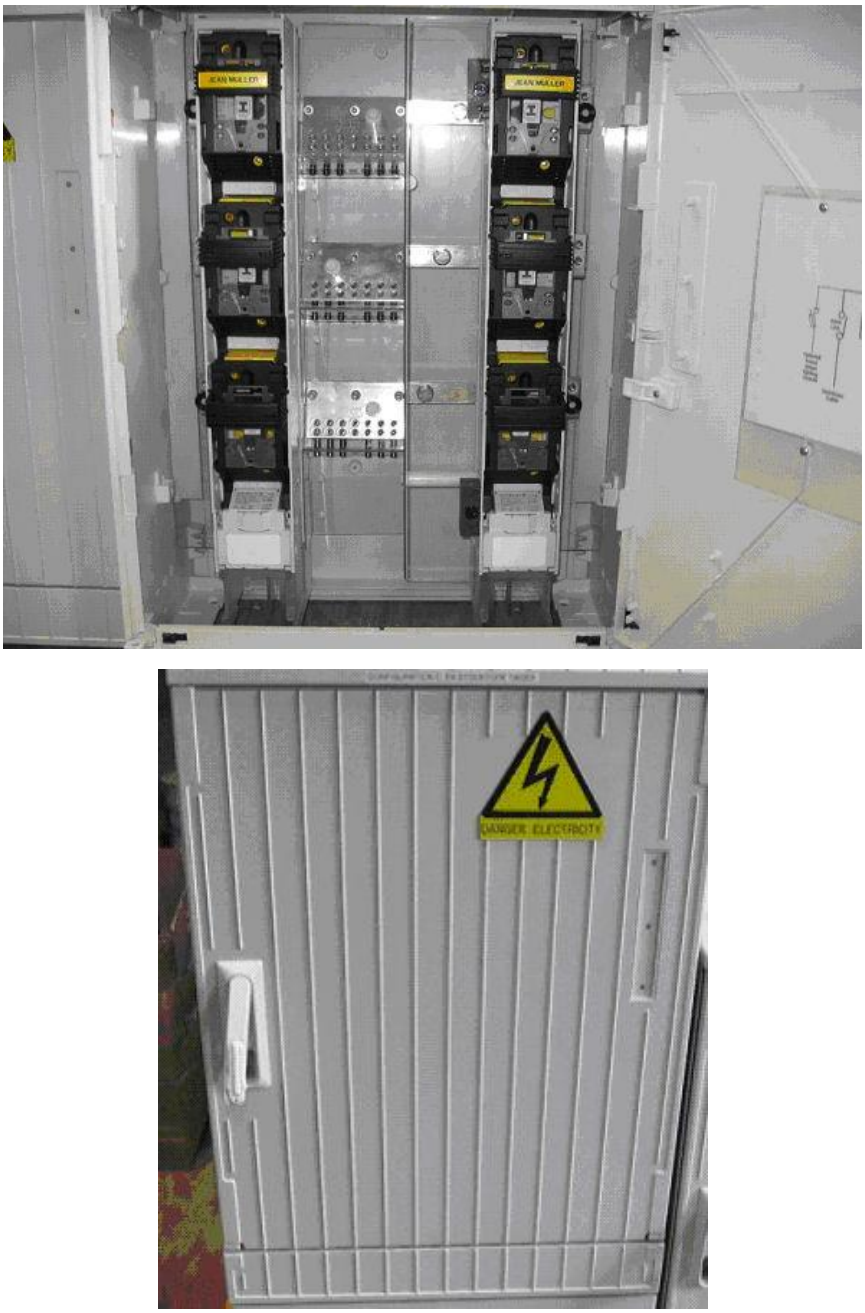


Figure 8 - 2 distributor link arrangement – Configuration C

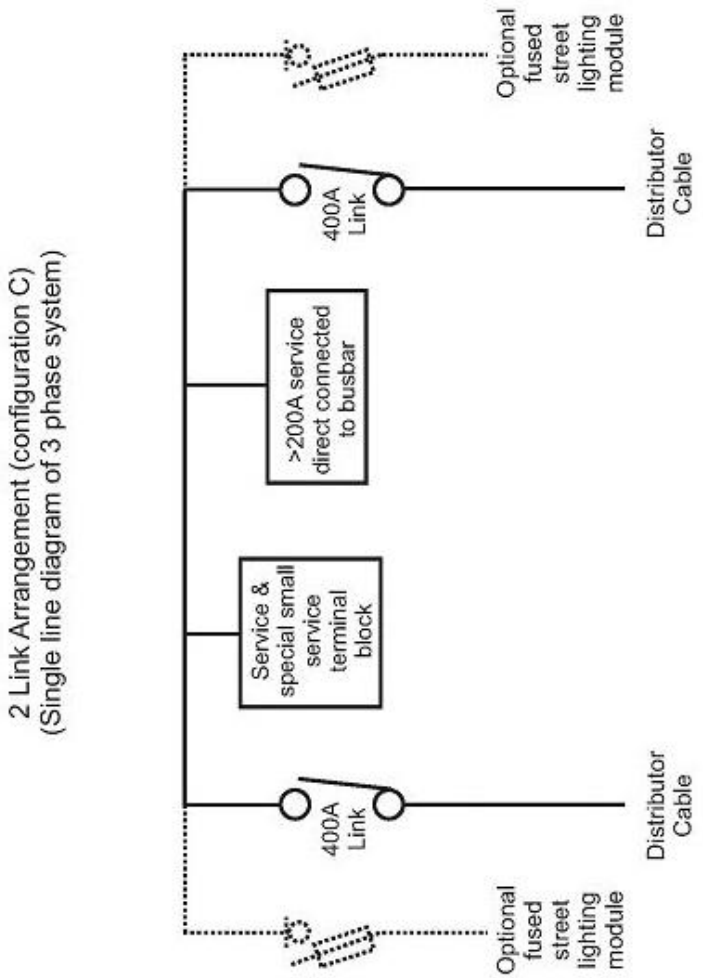
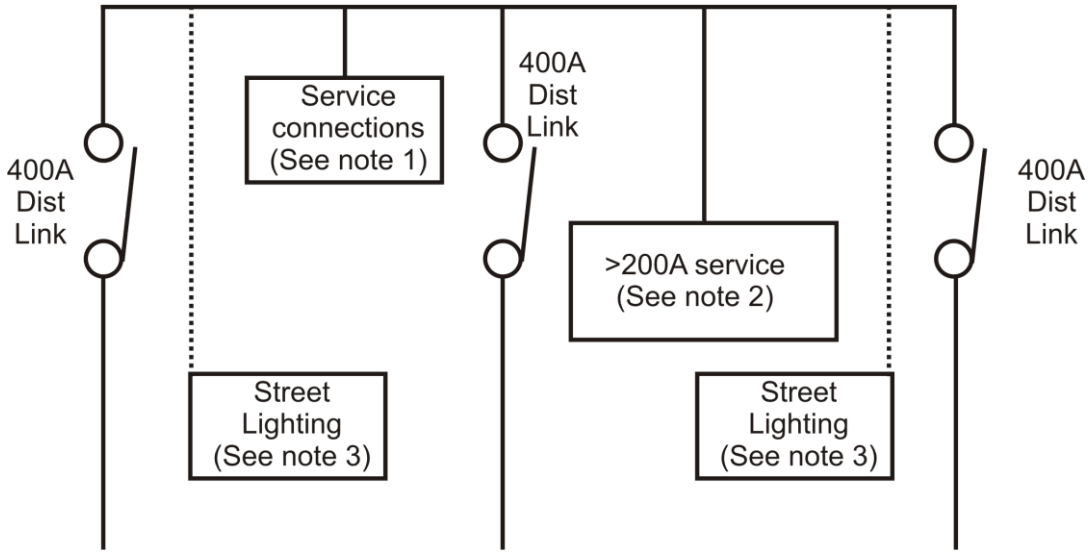


Figure 9 - Circuit diagram shown on inside of cabinet door – Configuration C

8.5 Configuration D – 3 Distributor Link Arrangement

3 Distributor Link Arrangement
(Single line diagram of 3 phase system)



Note 1:
(6) x 16mm^2 to 70mm^2 stranded copper cables (services) and
(1) x 6mm^2 to 16mm^2 stranded copper cables (special small services)
Service combinations:
(6) x 100A + special small service or
(1) X 200A + (4) x 100A + special small service or
(2) x 200A + (2) x 100A + special small service.
Special Small Services (SSS):
SSS typically are single phase. (3) x separate neutral connections for SSS are provided.

Note 2:
(1) x 185mm^2 stranded copper conductor for services greater than 200A up to an including 400A.

Note 3:
(1) x street lighting circuit, 2.5mm^2 to 16mm^2 stranded copper cables
Street lighting circuits may be single or three phase.
Single phase street lighting circuits - 10 or 50 amperes fused.
Three phase street lighting circuits - 32, 50 or 63 amperes fused.
The installation of street lighting circuits will be on an as required basis using an optional kit.

Figure 10 - Single line circuit diagram – Configuration D

Figure 11 - 3 distributor link arrangement – Configuration D

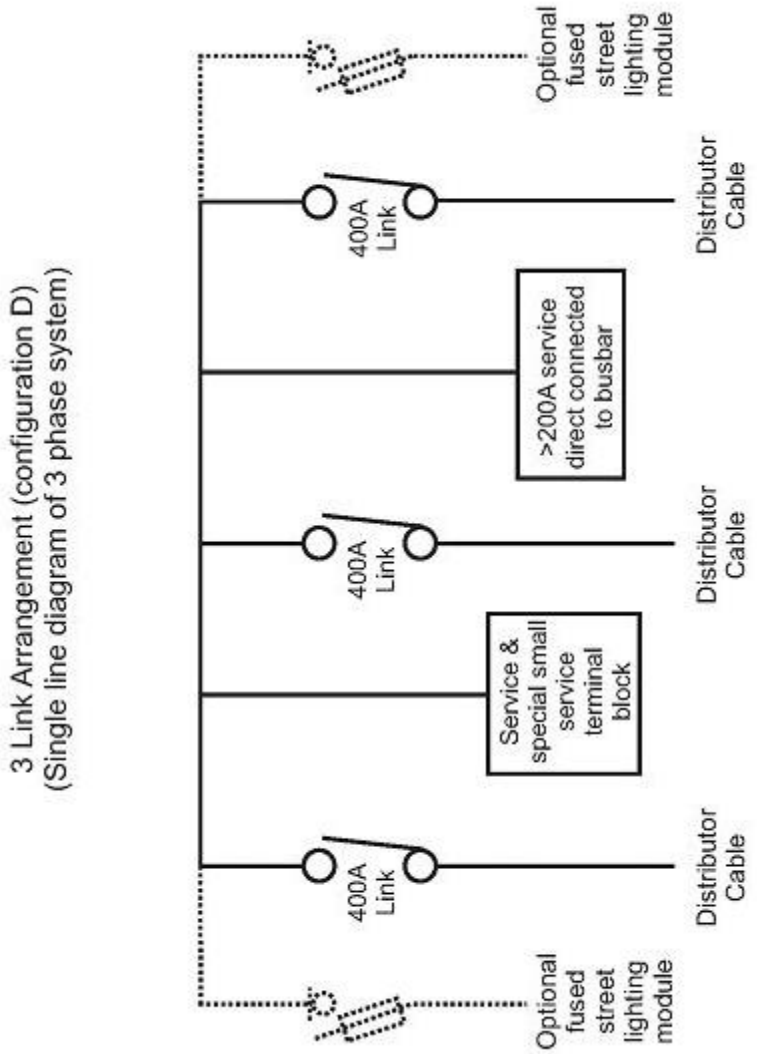
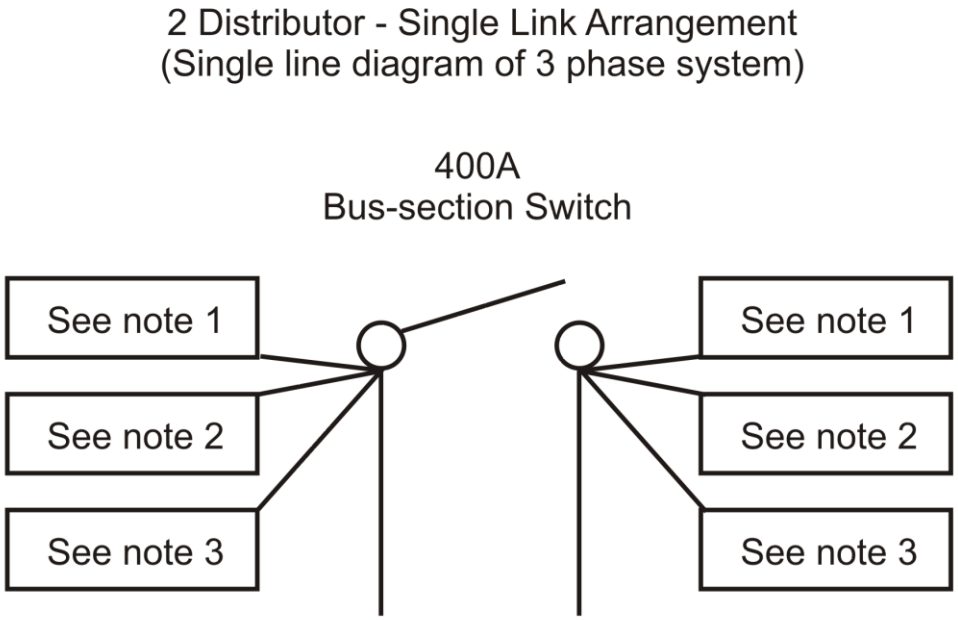


Figure 12 - Circuit diagram shown on inside of cabinet door – Configuration D

8.6 Configuration E – 2 Distributor – Single Link Arrangement



Note 1:
(6) x 16mm^2 to 70mm^2 stranded copper cables (services) and
(1) x 6mm^2 to 16mm^2 stranded copper cables (special small services)
Service combinations:
(6) x 100A + special small service or
(1) X 200A + (4) x 100A + special small service or
(2) x 200A + (2) x 100A + special small service.
Special Small Services (SSS):
SSS typically are single phase. (3) x separate neutral connections for SSS are provided.

Note 2:
(1) x 185mm^2 stranded copper conductor for services greater than 200A up to an including 400A.

Note 3:
(1) x street lighting circuit, 2.5mm^2 to 16mm^2 stranded copper cables
Street lighting circuits may be single or three phase.
Single phase street lighting circuits - 10 or 50 amperes fused.
Three phase street lighting circuits - 32, 50 or 63 amperes fused.
The installation of street lighting circuits will be on an as required basis using an optional kit.

Figure 13 - Single line circuit diagram – Configuration E

Figure 14 - 2 distributor single link arrangement – Configuration E

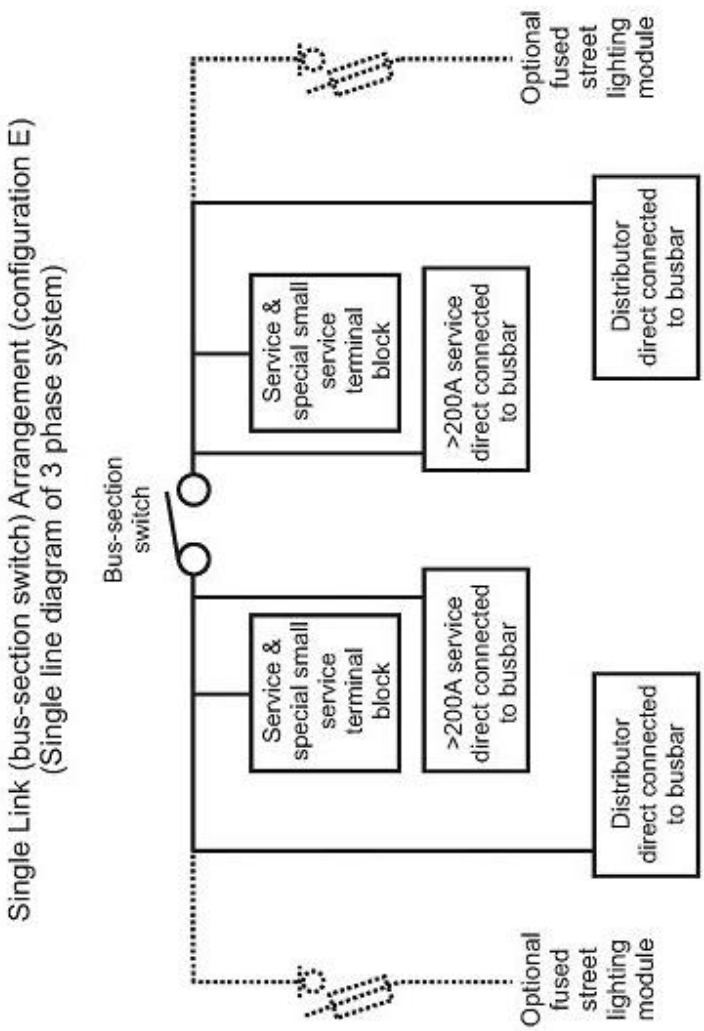
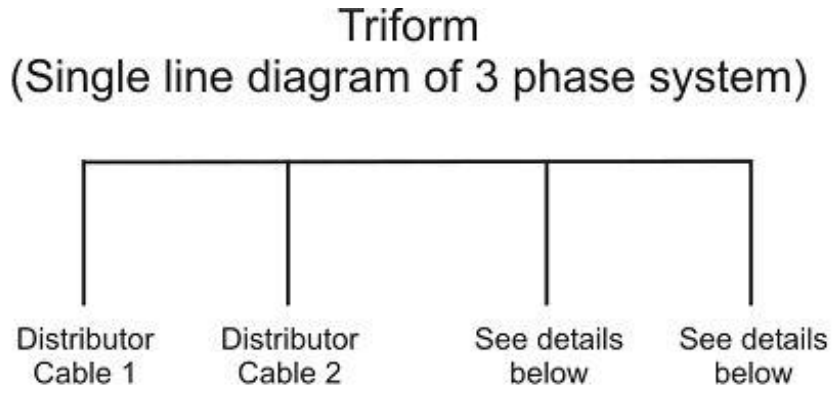


Figure 15 - Circuit diagram shown on inside of cabinet door – Configuration E

8.7 Configuration F – 3-way Solid Pillars - Triform



3 way Solid Pillars (also known as Triforms) utilise bolted connections. Unlike Link Pillars, Solid Pillars do not allow for electrical isolation of the terminated distributor cables except by removal of the connecting bolts.

Triform Solid Pillars allow for the following combination of cable terminations:

Either Three distributor cables connected to the busbars, +
4 x 100 Amp 3-phase services connected to the service terminal blocks, +
1 x 3 phase street light service (optional street lighting kit required)

or Two distributor cables connected to the busbars, +
1 x 400 Amp (>200A) service connected to the busbars, +
1 x 3 phase street light service (optional street lighting kit required)

or Two distributor cables connected to the busbars, +
2 x 200 Amp services connected to the service terminal blocks, +
1 x 3 phase street light service (optional street lighting kit required)

or Two distributor cables connected to the busbars, +
1 x 200 Amp service connected to the service terminal blocks, +
2 x 100 Amp services connected to the service terminal blocks, +
1 x 3 phase street light service (optional street lighting kit required)

Three phase street lighting circuits - 32, 50 or 63 amperes fused.
The installation of street lighting circuits will be on an as required basis using an optional kit.

Figure 16 - Single line circuit diagram – Configuration F

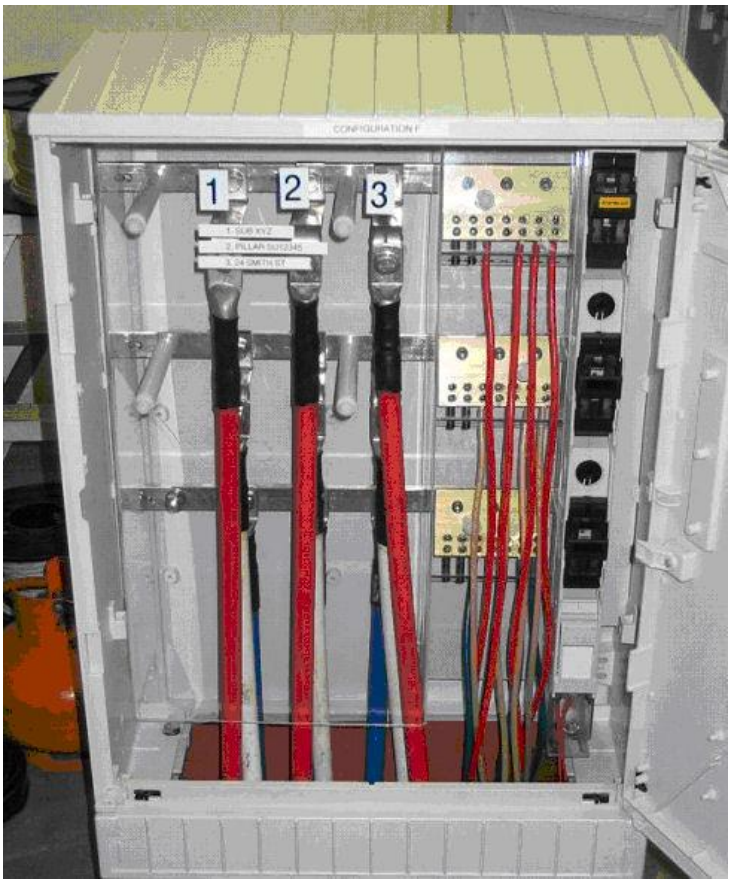


Figure 17 - 3-way Solid Pillar Triform – Configuration F

(with optional street lighting module installed on right hand side)

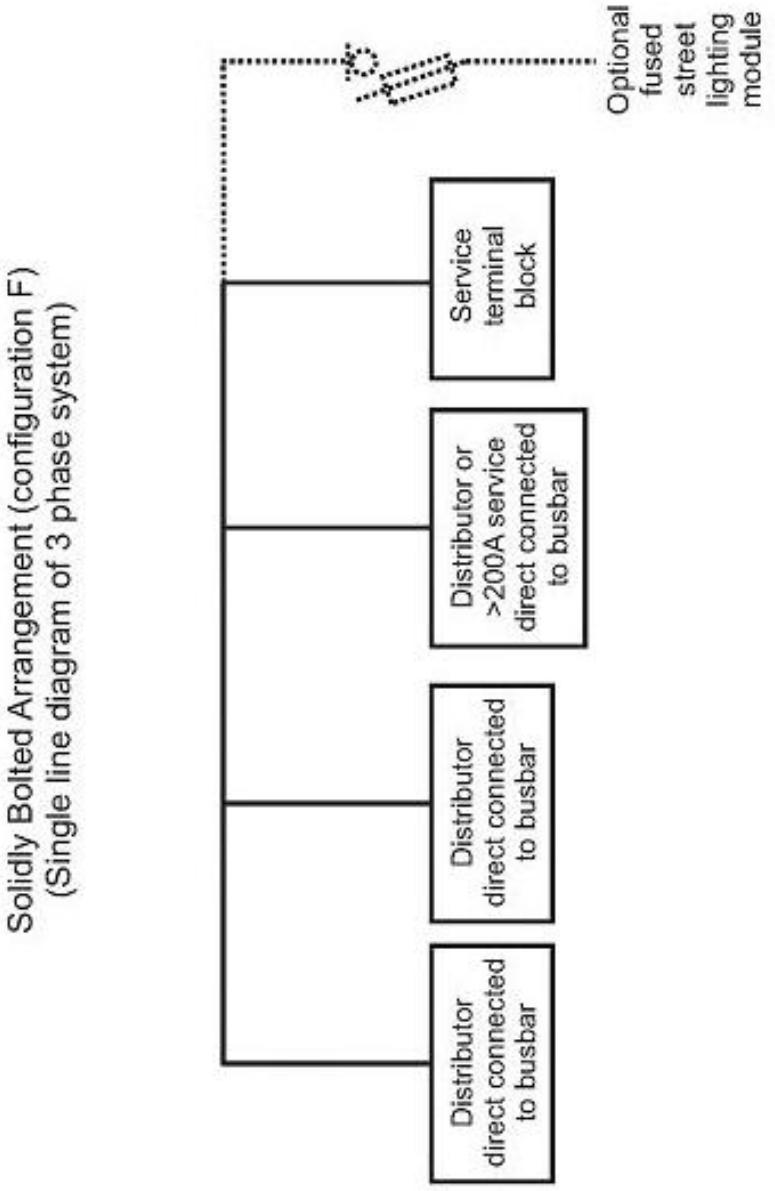


Figure 18 - Circuit diagram shown on inside of cabinet door – Configuration F

9.0 BASE UNITS

9.1 General

Base units provide an interface for the cabinets to mount onto. The cabinets are fastened to the base units in each of the four corners of the cabinet.

9.2 Neutral bar

The base units are supplied with the neutral bar fastened to the inside of the base unit. The neutral bars in the base units are matched to a specific electrical configuration, i.e.: the holes and hole sizes in the neutral bar have been matched to suit a specific electrical configuration. Although the physical dimensions of some the base units are the same, substituting the base unit with the base unit intended for a different electrical configuration must be avoided as the neutral bars are different.

The neutral bar is covered by an insulating mat. The photo below shows a blue insulating mat covering the neutral bar.

Figure 19 - Insulating mat covering the neutral bar

10.0 PHYSICAL DIMENSIONS

10.1 Direct buried base units

Table 1 Dimensions – direct buried base units

Configuration Type	Dimensions				
	Width (mm) "A"	Depth (mm)	Height (mm) * (see note)		
			* Total	Buried	* Above Ground
Configuration A	585	310	872	685	187
Configuration B	1110	310	872	685	187
Configuration C	585	310	872	685	187
Configuration D	780	310	872	685	187
Configuration E	780	310	872	685	187
Configuration F	585	310	872	685	187

Note: ***** - height measurement is to where the cabinet will interface with the base unit, i.e.: excluding the top 30mm lip of the base unit. Dimensions exclude the height of the base grid, pre-cast concrete footing and sand/cement bedding.

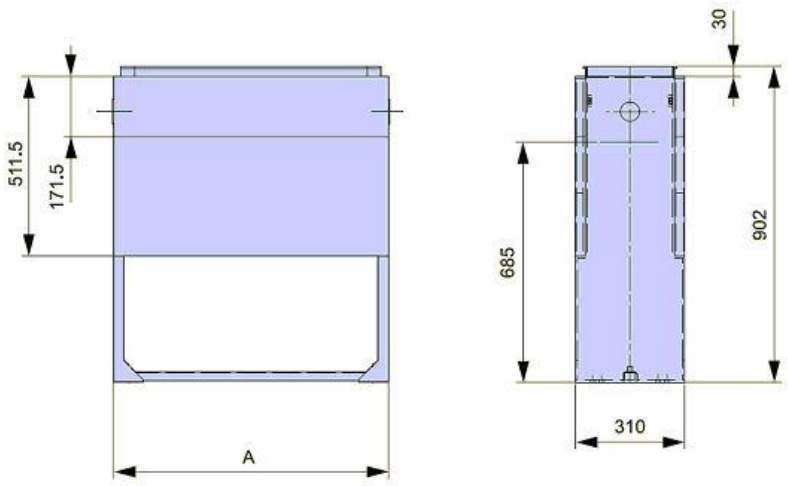


Figure 20 - Dimension chart

Graphic for illustration purposes only. Dependent upon dimension "A" the base unit may be narrower or wider than it is high. (not to scale).

10.2 Cabinets

Table 2 Dimensions - Cabinets

Configuration Type	Dimensions		
	Width (mm) "A"	Depth(mm) / with lock system	Height (mm)
Configuration A	596	322 / 343	862
Configuration B	1121	322 / 343	862
Configuration C	596	322 / 343	862
Configuration D	791	322 / 343	862
Configuration E	791	322 / 343	862
Configuration F	596	322 / 343	862

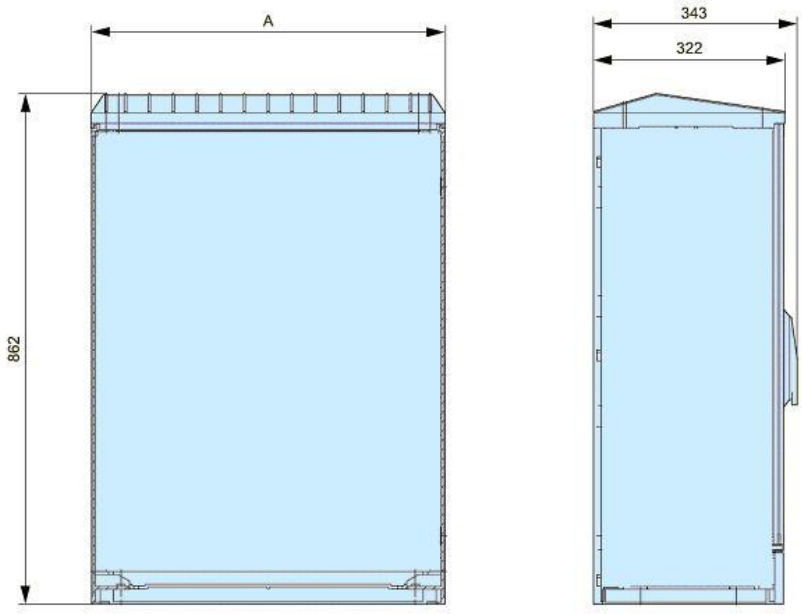


Figure 21 - Dimension chart

Graphic for illustration purposes only. Dependent upon dimension "A" the cabinet may be narrower or wider than it is high. (not to scale)

11.0 CABLES

11.1 General requirements

The following requirements must be satisfied during the construction process:

- The cables must not be bent tighter than the manufacturer's specified minimum internal bending radii during installation, during the termination process or after they have been set in position.
- Cable terminations shall be constructed in accordance with the requirements of this Network Standard.
- Cable termination components and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the termination process.
- All components involved in the termination (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned prior to the application of such sealing agents.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged due to overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.

11.2 Cable types and sizes

11.2.1 Distributor cables (XLPE/PVC)

Note: If 240mm^2, 90 degree sector shaped, stranded, copper conductor or 300mm^2, circular stranded, copper conductor is used a special lug must be used for the phase cable connections to the switchgear module. Refer to Section 12.0 for detailed information.

- 185mm^2, circular, stranded, copper conductor, single core;
- 300mm^2 , circular stranded, copper conductor, single core;
- 240mm^2, 90 degree sector shaped, solid, aluminium conductor, multicore;
- 240mm^2, 90 degree sector shaped, stranded, copper conductor, multicore; and
- 300mm^2, 90 degree sector shaped, solid, aluminium conductor, multicore.

Where distributor cables are exposed to ultra violet (UV) e.g.: an underground to overhead connection (UGOH), the outermost layer of insulation shall be black.

11.2.2 Service cables (XLPE/PVC)

All underground service cables are three phase, except for builders' services.

- 100A service - 16mm^2 or 25mm^2, circular, stranded, copper conductor;
- 200A service - 50mm^2 to 70mm^2, circular, stranded, copper conductor; and
- >200A service - 185mm^2, circular, stranded, copper conductor, single core.

The 50mm^2 cable may also be used for a 100 Amp service to satisfy voltage drop requirements.

The table below specifies the stockcode numbers of service cables that may be used for various service ratings. Any intermediate service ratings (based on the assessed demand of the installation) must use the next largest service rating/cable available.

Table 3 Service cable stockcodes

Service Capacity Amps	Conductor CSA mm^2 (No. of cores)	Stockcode Number
100	16 (4 core)	148668
200	50 (4 core)	149112
>200	185 (single core)	151183 or 61432 see note

Note: Stockcode 151183 (4 X 185mm^2 copper coloured singles, not laid up) for use where cables will not be exposed to UV.

Where service cables will be exposed to ultra violet (UV), 415 185 CU1 XQ Z (black sheath), Stockcode 61432 shall be used.

11.2.3 Street lighting cables

Refer to NS119.

Single Phase:

- 16mm^2, circular, stranded, copper conductor, twin.

Three Phase:

- 16mm^2, circular, stranded, copper conductor, multicore.

11.2.4 Special small service cables

Single Phase:

- From 6mm^2 to 16mm^2, circular, stranded, copper conductor, single core.

12.0 LUGS

12.1 Special requirements for 240mm^2 and 300mm^2 copper lugs

If 240mm^2 or 300mm^2, copper cables are used a special lug must be used for the phase cable connections to the 400A switchgear module. The purpose of the special lug is to ensure the tab of the lug will sit flat on the switchgear connection palm. The tab length of this lug has been slightly reduced to prevent the tab of the lug riding up on the dome head screw located on the upper edge of the switchgear connection palm. Refer to Section 28.0 “Stockcodes” for lug details.

Figure 22

13.0 LOCK AND KEYING

13.1 Lock

Cabinets purchase from Ausgrid's store are supplied with the X27 lock assembly installed in the cabinet door. For cabinets purchase from other retailers, an X27 lock assembly needs to be purchased separately from Ausgrid on Stockcode 182232 and fitted to the cabinet door.

In the event the lock needs to be replaced:

- For new works, the lock shall be returned to the supplier of the lock and the pillars must not be energised until a replacement lock has been installed.
- For existing pillars, contact the Ausgrid Representative responsible for the project. The Ausgrid Representative will then contact Ausgrid's security operations for a replacement lock.

Note: Prior to commissioning the pillar, it must be confirmed by the person installing the pillar that each lock is correctly installed and fully engaged i.e. locking tab at 90 degrees to the lock barrel, when the lock is in the locked position.

13.2 Keying

The X27 lock is keyed to permit opening by an "AB002" key. An "A000" key will also open the lock.

14.0 TORQUE SETTINGS

Torque settings are provided below.

Note: # - denotes installed in factory by supplier.

Table 4 Fastener torque settings

Location of Fastener	Fastener Size	Torque (Nm)
Neutral bar – bolts for cable terminations	M8	15-20
	M12	30-35
400A Switchgear module – phase connection palm bolts /nuts for cable terminations	M12	30-35
# 400A Switchgear module – bolts securing switchgear module to busbars	M12	35-40
Fastener on phase busbars for the connection of >200A services	M12	35-40
Street Lighting Switchgear module – phase connection palm bolts for cable terminations	M8	10
Street Lighting Switchgear module – bolts securing switchgear module to mounting tag on busbars	M8	9
# Tag used to mount street lighting switchgear module – tag to busbar fastener	M8	20-25
Cabinet to base unit fastening bolts / nuts	M12	30-35
# Bolts used to mount phase busbars to the cabinet	M8	9
# Bolts used to mount the neutral busbar to the base unit	M8	9
# “Z” tag to phase busbar connections - used in Configurations E & F for Distributor and >200A service connections	M12	35-40
Cable termination to “Z” tag on phase busbars - used in Configurations E & F for Distributor and >200A service connections	M12	30-35
# Hexagonal socket head screws securing service terminal blocks to phase busbars	M8	20

15.0 ANTI-SEIZE LUBRICANT

15.1 Galling of threads on stainless steel fasteners

Stainless steel fasteners that have been installed at the time of product assembly (in the factory) will already have an anti-seize lubricant applied to the threads.

For stainless steel fasteners that have not already had anti-seize lubricant applied, before installation of any stainless steel bolt/set-screw the thread shall be lubricated with specially formulated anti-seize grease incorporating nickel is available on stockcode 177212. Equivalent anti-seize grease containing nickel may be used but must be submitted to Ausgrid for approval first. Care shall be exercised to prevent anti-seize contaminating the interface of electrical contact surfaces. Any excess anti-seize lubricant shall be removed, using a clean dry cloth, after the fastener has been installed.

15.2 Removal of anti-seize lubricant from electrical contact interfaces

Where stainless steel fasteners have been installed at the time of product assembly (in the factory) with anti-seize lubricant already applied to the threads, anti-seize lubricant may contaminate the electrical contact interface when the fastener is removed. It is essential that the anti-seize lubricant is removed from electrical contact interfaces using a clean dry cloth, prior to making any electrical connections.

16.0 INSTALLATION – GENERAL

16.1 Use of naked flame

Due to the electrical hazard naked flame is not to be used near energised apparatus. Where heatshrink tubing is needed to be installed, the work shall be conducted away from energised apparatus. All apparatus shall be protected from heat damage.

De-energised apparatus shall also be protected from heat damage.

17.0 INSTALLATION OF BASE UNITS

17.1 Direct buried base unit

17.1.1 Removal of cover

Refer to Clause 25.2.1.

17.1.2 Double insulation

Any section of the cable/s that will be buried shall be double insulated.

Where multi-core distributor cables are installed the outer jacket of the cable shall be removed below ground level and a mastic lined four (4) way heatshrink glove and mastic lined heatshrink tubing shall be installed, to allow the individual cores of the cable to be separated.

Double insulation on cables must be maintained for as far as practicable. Where direct buried base units are installed the minimum requirement is for the double insulation to extend 25mm above the sand/cement mix in the bottom of the direct buried base unit. Also refer to Clauses 21.2.1, 21.2.2, 22.2 and 23.2.2.

17.1.3 Base grid

Direct buried base units sit on top of a base grid. The base grid is made up of a number of grid units each measuring 460mm wide by 360mm deep. The sections of the base grid lock together when assembled. The base grid provides a surface for the direct buried base unit to sit on and improves the stability of the base unit. The base grid will be supplied with the base unit. An assembly diagram will be included with the kit.

An example of a direct buried Base Unit mounted on the Base Grid is shown below.

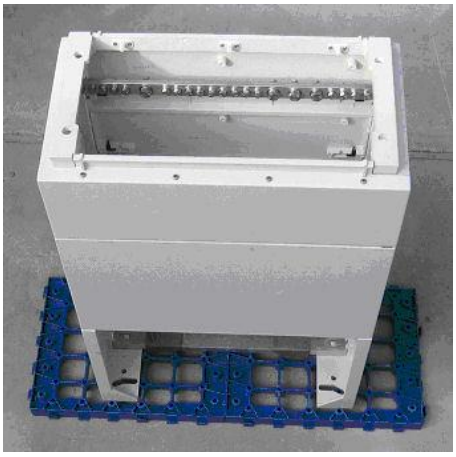


Figure 23

17.1.4 Base grid dimensions

Table 5 Base grid dimensions

Configuration Type	Dimensions (mm)		
	Width	Depth	Height
Configuration A	920	360	40
Configuration B	1380	360	40
Configuration C	920	360	40
Configuration D	920	360	40
Configuration E	920	360	40
Configuration F	920	360	40

17.1.5 Footing for direct buried base units

Where pillars are to be direct buried, the base grid shall be seated on a precast concrete footing. The footing shall be 70mm thick and shall have SL81 mesh centrally placed and constructed using 32MPa concrete. The base dimensions shall match those of the base grid shown in Clause 17.1.4. The footing for Configuration B can be constructed in two sections dividing the width by 2, i.e. if width is 1380mm then the footing can be constructed from 2 x 690mm wide panels.

During the design phase if the site is identified as having acid sulphate soil, the precast concrete footing shall be 100mm thick mass concrete with no reinforcement. Also refer to Section 31.0.

If installers / contractors can smell the presence of sulphur dioxide "i.e. rotten egg smell" at the base of the excavation then the precast concrete footing shall be 100mm thick mass concrete with no reinforcement. Also refer to Section 31.0.

Footings shall be placed on even level compacted 50mm thick min (14:1) sand / cement mix bedding.

17.1.6 Orientation

The removable panel at the top of base unit shall be located on the same side as the door/s of the cabinet. The removable front panel is on the opposite side of the base unit to the neutral bar; i.e. the neutral bar is located to the rear of the cabinet.

The base unit shall be installed plumb.

17.1.7 Bury depth

The direct buried base unit has a bury depth marking on the side of the base unit. The base unit shall be buried to this depth marking. Where the ground is sloping from one side of the cabinet to the other, the base unit shall be buried to a depth so the ground level on the upper side of the slope meets with the bury depth marking on the side of the base unit.

Note: The interface between the upper and lower front plates is above ground line.

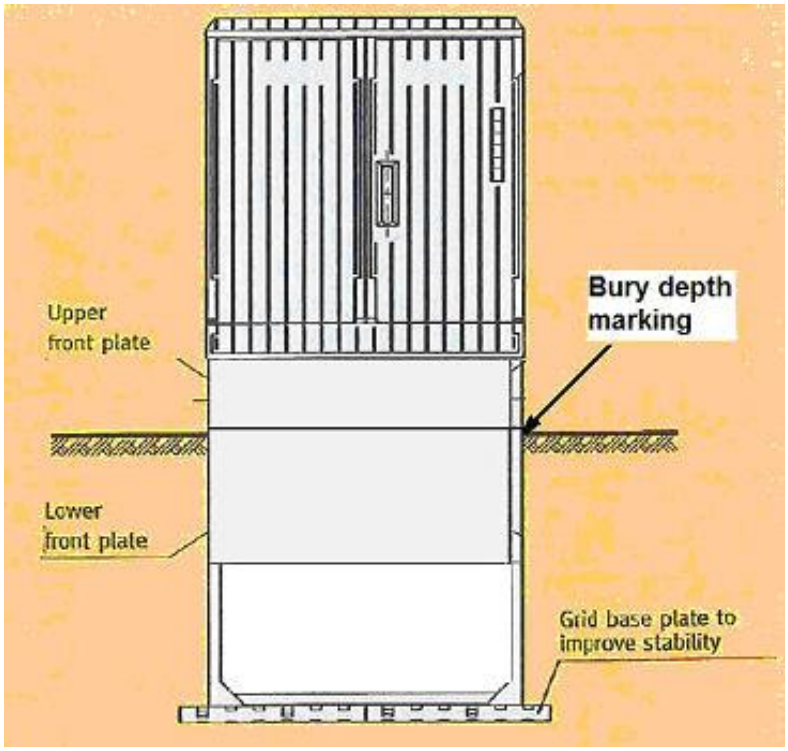


Figure 24 - Installation arrangement – Base Units

Precast concrete footing and sand/cement mix bedding not shown

17.1.8 Support bar installation prior to backfilling

Direct buried base units used with electrical configurations B, D & E have a support bar/s that must be installed prior to backfilling in and around the base unit. This support bar is required to prevent the base unit distorting when backfilling. Backfilling both in and around the base unit must be carried out in stages to equalise the forces that the backfill material will exert on the base unit.

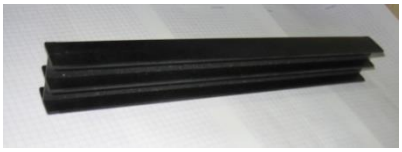


Figure 25 - Base Unit support bar on its side

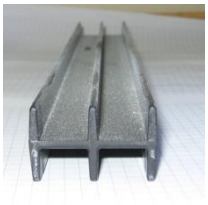


Figure 26 - Base Unit support bar end view

Figure 27 - Base Unit support bar installed in position.
(Viewed looking down into the direct buried base unit.)

Table 6 Support bar requirements

Cabinet Configurations	Support Bar for Direct Buried Base Unit
Configuration A	NO
Configuration B	YES (x2)
Configuration C	NO
Configuration D	YES (x1)
Configuration E	YES (x1)
Configuration F	NO

17.1.9 Backfill material

The inside of the direct buried base unit shall be backfilled with standard bedding material as specified in NS130 to 40mm below ground level. The remaining 40mm up to ground level shall be backfilled with a (20:1) sand/cement mix.

The backfill material used around the base unit shall also be standard bedding material as specified in NS130.

17.1.10 Motorised edger (whipper snipper) protection

Where direct buried base units are installed in areas that may be subject to damage from motorised edgers (whipper snippers) a direct buried base unit incorporating whipper snipper protection shall be installed. Refer to Section 28.0 for stockcodes.

18.0 INSTALLATION OF CABINETS

18.1 Installation of a cabinet in wall recess

Given the limited clearances at the top and the sides of the cabinet, installation of the cabinet with all of the electrical hardware installed presents a manual handling issue. To eliminate this issue the electrical hardware must be removed from the cabinet prior to installing the cabinet on the base unit. In addition the door/s shall also be removed. The cabinet can then be installed onto the base unit and the electrical hardware reinstalled in the cabinet with the cabinet in situ. Refer to Section 14.0 for torque settings.

18.2 Fitting the cabinet to the base unit

Ensure the base unit is stable and level prior to the installation of the cabinet. The cabinet sits around the uppermost lip of the base unit. When the cabinet is installed on the base unit it is important that the front removable panel at the bottom of the cabinet is in place to prevent the cabinet twisting.

18.3 Fastening the cabinet to the base unit

Prior to tightening the cabinet to the base unit, ensure the doors open and close properly and the cabinet is sitting squarely on the base unit. The cabinet is fastened to the base unit in each of the four corners of the cabinet. The fasteners are supplied with the base unit. Refer to Section 14.0 for torque settings. Also refer to Section 15.0 for anti-seize lubricant for stainless steel fasteners.

19.0 CONDUITS

19.1 General

Conduit installation and conduit type shall be in accordance with NS130.

If exposed to ultra violet radiation (UV), conduit shall be protected from UV.

Above ground sections of conduit shall be protected from mechanical damage.

19.2 Conduits for distributor cables

Conduits for distributor cables shall be 125mm.

19.3 Conduits for service cables

Table 7 Conduit sizes for service cables

Service Current Rating	Conduit Size (min) mm
100A	40 UPVC 80 UPVC if 50mm^2 Cu is used to overcome voltage drop
200A	80 UPVC
>200A	125 UPVC

19.4 Conduits for street light circuits

Conduits for street lighting circuits shall be in accordance with NS130.

19.5 Conduits for special small services (SSS)

Refer to Service and Installation Rules of New South Wales for special small services requirements.

19.6 Continuity of conduits

Both distributor and service conduits shall be continuous from the point of origin to the point of termination.

19.7 Conduits in direct buried base units

Conduits are not to be installed into direct buried base units, with the exception of conduit stubs for future service cables. Where conduit stubs are installed, the stub shall extend a distance of 50mm above the sand/cement mix applied in accordance with Clause 17.1.9.

19.8 Sealing of conduits

19.8.1 Sealing methods

Table 8 Conduit sealing methods

Conduit size and application	Sealing Method			
	End of conduit above ground		End of conduit direct buried	
	Conduit Empty	Conduit with Cable Installed	Conduit Empty	Conduit with Cable Installed
40mm service conduit	PVC cap Clipsal Part No. 262/40EO (buy in)	Not required	PVC cap Clipsal Part No. 262/40EO (buy in)	Sealing putty Stockcode No. 75481 (petro mastic compound)
50mm service or street lighting conduit	PVC cap stockcode 179754	Not required	PVC cap stockcode 179754	Sealing putty Stockcode No. 75481 (petro mastic compound)
80mm service conduit	PVC cap Clipsal Part No. 262P80 (buy in)	Not required	PVC cap Clipsal Part No. 262P80 (buy in)	Sealing putty Stockcode No. 75481 (petro mastic compound)
125mm >200A Service or 185Cu1 Distributor conduit or 300Cu1 Distributor conduit	TE Connectivity – conduit plug Part number RBDP-BLA-50D535U, (buy in). See Clause 19.8.3.	Not required	TE Connectivity – conduit plug Part number RBDP-BLA-50D535U, (buy in). See Clause 19.8.3. If other end of conduit is also direct buried, end cap seal, stockcode number 77750 may be used.	TE Connectivity Rayflate RDSS-150 with RDSS-CLIP-150, (buy in). See Clause 19.8.2 OR sealing putty Stockcode No. 75481 (petro mastic compound)
125mm 240Cu4 Distributor conduit or 240Al4 Distributor conduit or 300Al4 Distributor conduit	Not applicable (N.A.)	Not applicable (N.A.)	TE Connectivity – conduit plug Part number RBDP-BLA-50D535U, (buy in). See Clause 19.8.3. If other end of conduit is also direct buried, end cap seal, stockcode number 77750 may be used.	Sealing putty Stockcode No. 75481 (petro mastic compound)

Note: Also refer to the relevant Substation Network Standard for both water sealing and fire stopping requirements for conduits if the other end of a distributor conduit terminates in a Substation.

19.8.2 TE Connectivity rayflate RDSS duct seals

The RDSS-150 inflatable duct seal is used in conjunction with a RDSS-Clip-150. The RDSS-Clip-150 provides the seal between the cables and the RDSS-150 inflatable duct seal provides the seal around the cables and a seal at the conduit interface.

These products are suitable for use with (4) x 185mm^2 Cu1 XQ Z or (4) x 300mm^2 Cu1 XQ Z cables in 125mm conduit.

Additional tooling and CO_2 cartridges are required to inflate the RDSS-150.

Note: The inflatable duct seal shall be installed in the main bore of the conduit, not the bellmouth. Installers shall be trained in the installation of these products.

Figure 28 - Tyco RDSS-150 inflatable duct seal

Figure 29 - Tyco RDSS-Clip-150

19.8.3 TE Connectivity conduit plugs

Conduit plugs are a buy in item from TE Connectivity.

Table 9 TE Connectivity plug details

Application	Part Number	Plug Diameter	Conduit Inside Diameter	
		Inch	Inch	mm
125mm main bore of conduit	RBDP-BLA-50D535U	5.00	5.00 - 5.35	127 - 135.9

Figure 30 - TE Connectivity conduit plug

19.9 Conduit spacing

The electrical layout design shall specify conduit size, type, layout, spacing and depth of cover. Consideration to rating requirements and conduit sizes shall be given when determining conduit spacing.

19.10 Mechanical protection

All conduits shall be mechanically protected in accordance with the requirements of NS130.

20.0 CABLE TERMINATIONS WHERE DIRECT BURIED BASE UNITS ARE USED

20.1 Partial backfilling prior to terminating cables

For installations where direct buried base units are used, all cables shall be set into their final positions and partially backfilled prior to carrying out any cable terminations. The purpose of this requirement is to:

- ensure cables are in their final resting positions, preventing strain on cable terminations, and
- stabilise the base unit.

21.0 CABLE TERMINATIONS – COMMON REQUIREMENTS

21.1 Phase identification

The individual phase and neutral conductors of all cables shall have colour coded identification. The phases and neutral (A, B, C and N) identifying colours shall be red, white, blue and black respectively. For cables where the colour of the insulation does not correctly identify the cable, coloured heatshrink tubing or coloured PVC tape shall be installed to correctly identify the cable.

21.2 Heatshrink on lug barrels

21.2.1 Single insulated cables

Single insulated cables 16mm^2 and larger that are lugged shall have flame retarded medium wall mastic lined heatshrink insulating tubing installed over the barrel of the lug and 30mm onto the insulation, as depicted in the graphic below.

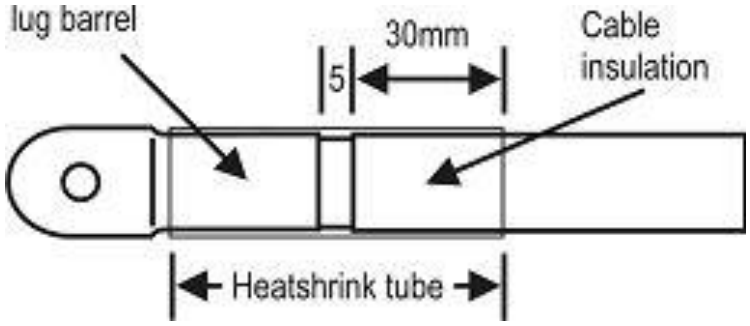


Figure 31 - Heatshrink on lug barrels

21.2.2 Double insulated single core cables

Double insulated single core cables 16mm^2 and larger that are lugged shall have flame retarded medium wall mastic lined heatshrink insulating tubing installed as depicted in the graphic below. The outer layer of insulation shall be stepped as depicted.

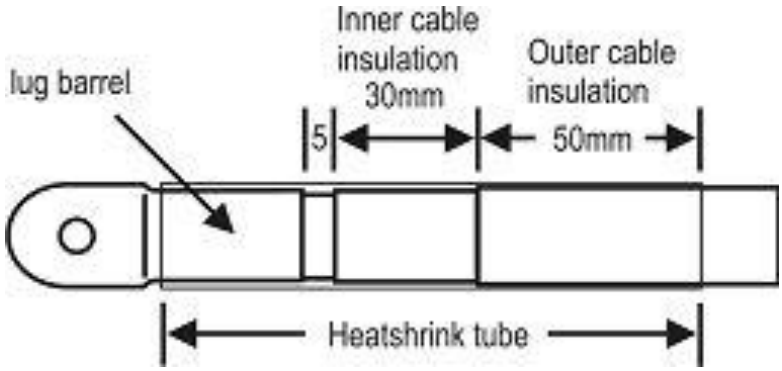


Figure 32 - Heatshrink on double insulated single core cables

22.0 DISTRIBUTOR CONNECTIONS

22.1 Neutral connection

The neutral connection for a distributor shall be located directly below the phase conductors for the given distributor cable. The neutral bar for each electrical configuration has been designed so there is a corresponding neutral connection for each distributor connection.

The requirements of Ausgrid's Electrical Safety Rules regarding the connection and disconnection of neutral conductors shall be met.

22.2 Distributor connections to phase busbars

Dependent upon the electrical configuration/s selected for a given installation distributor cables may be directly connected to neutral and phase busbars. Where distributor cables are connected directly to phase busbars, connecting and disconnecting such connections shall be made with both the distributor cables and phase busbars de-energised. Isolation and proving de-energised shall be carried out in accordance with Ausgrid's Electrical Safety Rules.

Where the phase conductor of a distributor cable passes a phase busbar of a different phase, double insulation shall be maintained. The area of double insulation shall extend a minimum of 25mm above and 25mm below the busbar which the cable is passing.

If the cables are single insulated, install mastic lined medium walled heatshrink tubing over the cables, starting 25mm above the busbar and finishing 25mm below the busbar. Red phase cable shall have additional insulation installed where the cable passes both white and blue phase busbars. White phase cable shall have additional insulation installed where the cable passes blue phase busbar.

In addition, distributor cables shall be set in position to ensure the double insulation is not in direct contact with busbar/s.

22.3 Distributor switchgear modules – cable connection and disconnection

Where distributor cables will be, or are connected to a distributor switchgear module it is possible to connect and disconnect the cables to, or from the cable termination palms of the distributor switchgear module with the phase busbars energised, however, all of the following conditions shall be met:

- all live conductors shall be screened;
- all three (3) links in the distributor switchgear module to which the cables are to be connected or disconnected shall be opened and removed (or parked in the open position);

- the switchgear terminals shall be proven de-energised;
- the cables to be connected or disconnected shall be de-energised;
- the cables to be connected or disconnected shall be proven de-energised; and
- the requirements of Ausgrid's Electrical Safety Rules.

It is not permissible to connect distributor cables to switchgear modules when the cables or the switchgear cable termination palms or the cables and the switchgear cable termination palms are energised.

It is not permissible to disconnect distributor cables from switchgear modules when energised.

22.4 Phase colours – distributor switchgear module terminals

The busbars in the cabinet are labelled L1, L2 and L3.

L1 = red phase top busbar

L2 = white phase centre busbar

L3 = blue phase bottom busbar

The distributor switchgear module terminals and the corresponding phase colours and busbar identification are depicted below.

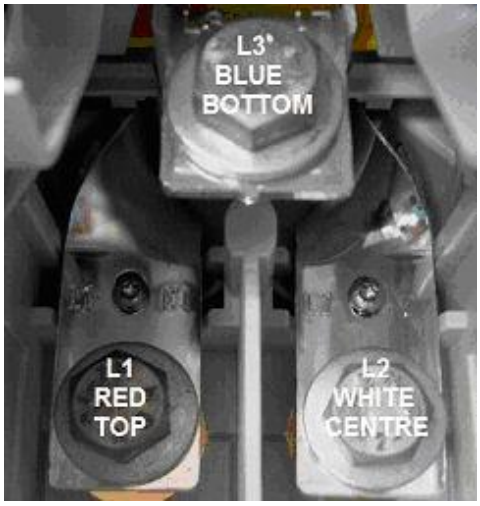


Figure 33 - Phase colours for distributor terminals

Graphic for illustration purposes only.

Stainless steel flat and spring washers are not shown.

22.5 Phase barrier – distributor switchgear module

Distributor switchgear modules have additional insulation installed between the two cable termination palms at the rear of the switchgear module. As part of the installation process a check shall be conducted to ensure this additional insulation is securely installed.

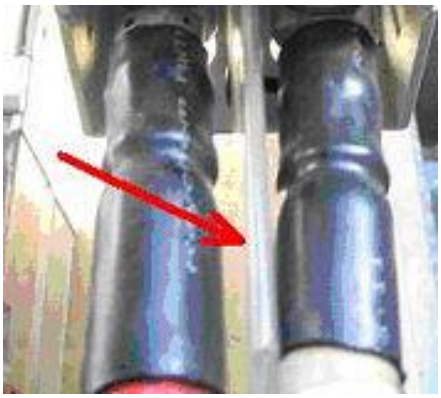


Figure 34 - Phase Barrier viewed from the front of the Distributor Switchgear Module

(see red arrow)

Figure 35 - Phase Barrier viewed from the side of the Distributor Switchgear Module

(red arrow highlights the fixing pin)

22.6 Lug orientation

All cable lugs shall be orientated so the barrel of the lug is forward of the switchgear palm as depicted below.

Phase barrier and L3 cable lug are not installed for clarity.

Figure 36

Figure 37

Graphic for illustration purposes only. Threaded studs are depicted, however, Switchgear will be supplied with bolts instead of studs.

22.7 Energising or de-energising low voltage mains and apparatus

The requirements of Ausgrid's Electrical Safety Rules for "energising or de-energising low voltage mains and apparatus" shall be met.

22.8 Labelling

22.8.1 Labelling of distributor cables

Each of the phase conductors and the neutral conductor for each distributor shall be labelled using a zip tie label as depicted below. Using an indelible pen (Permanent marker Artline 700 - black) the labels shall identify the distributor cable destination.

All labels shall be installed in a position that is easily visible under normal operating conditions.

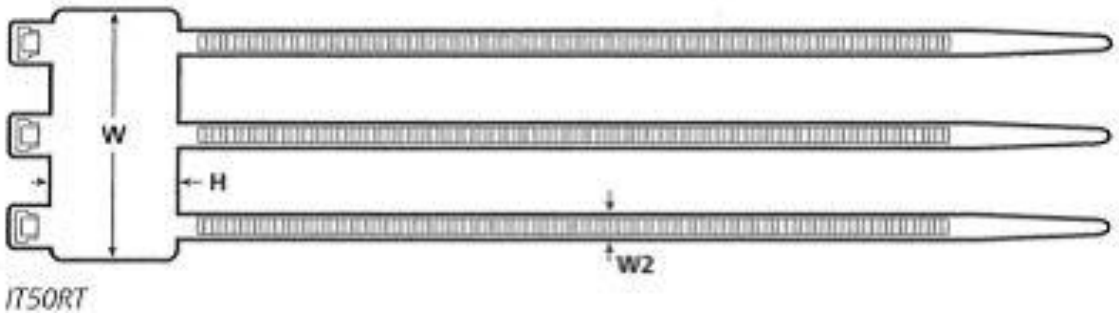


Figure 38 - HellermannTyton identification tie (Part No. IT50RT). Ausgrid Stockcode number 180051

22.8.2 Labelling of switchgear modules

Switchgear modules shall be labelled to identify the destination of the distributor cable connected to the respective switchgear module.

There is an additional labelling requirement for the Hunter Region, whereby each switchgear module is labelled with the link number. The link numbers are shown on the design plan.

At the lower end of the switchgear module is provision for destination labelling and link number labelling (Hunter Region only). The destination labelling provision consists of a white plastic insert.

Labelling shall be laminated adhesive backed tape labels (Brother laminated 12mm Black on White tape Part No. TZ-231/TZe-231) affixed to the white plastic insert.

Figure 39

22.8.3 Labelling of distributor cables direct connected to busbars

Where a distributor cable is directly connected to phase busbars, a laminated adhesive backed tape label (Brother laminated 12mm Black on White tape Part No. TZ-231/TZe231) label, identifying the destination of the distributor, shall be affixed to the polycarbonate cover immediately in front of the respective distributor phase cable terminations.

22.8.4 Distributor switchgear modules without cables terminated

To prevent cable termination palms without cables connected being energised, distributor switchgear modules without cables terminated shall have the links removed from the link handles. Each link shall be placed and sealed in a “zip lock” plastic bag. The zip lock plastic bag shall then be cable tied (nylon zip tie) to the outside of the link handle that it was removed from. These switchgear modules shall be labelled “W.D.N.O”.

23.0 SERVICE CONNECTIONS

23.1 Service terminal blocks – 100A, 200A and special small services (SSS)

23.1.1 General

100A, 200A and special small services connect to the phase terminal block/s and the neutral bar.

23.1.2 Neutral connection

The neutral connection for 100A, 200A and special small services shall be located directly below the phase conductors for the given service cable. The neutral bar for each electrical configuration has been designed so there is a corresponding neutral connection for each service connection.

A separate bolted connection for each neutral connection shall be used.

As special small services may be single phase, provision has been made in the neutral bar to cater for the possibility of three (3) x single phase special small services. i.e. (3) x separate neutral connections.

The requirements of Ausgrid’s Electrical Safety Rules regarding the connection and disconnection of neutral conductors shall be met.

23.1.3 Special small services

Due to the smaller conductor size of special small services, from 6mm^2 to 16mm^2 circular stranded copper conductors, smaller bore diameter tunnels in the service terminal block are provided. These dedicated tunnels are labelled “SSS ONLY”. The purpose of these smaller bore dedicated tunnels is to ensure the strands of the smaller conductor sizes are clamped sufficiently and do not stray up the sides of the grub screw.

Active connections for special small services shall be connected using the tunnel marked “SSS ONLY” in the active terminal blocks.

Figure 40 - Active terminal block (removed from cabinet, no grub screws installed) depicting “SSS ONLY” marking.

23.1.4 Insulated rods in active service terminal blocks

Active service terminal blocks are supplied with insulated rods installed in the 100A and 200A tunnels of the terminal blocks. The purpose of these insulated rods is to maintain the IP rating. Any 100A and 200A tunnels in active terminal blocks that do not have a cable terminated in the tunnel must have an insulated rod installed.

23.1.5 Connecting and disconnecting 100A, 200A and special small services

A polycarbonate cover is installed over the active terminal blocks. Using approved procedures for working energised, 100A, 200A and special small services can be disconnected and reconnected whilst the terminal blocks are energised. Services and special small services shall only be disconnected or connected under “no load” conditions.

Care needs to be exercised when undoing grub screws, to ensure the grub screws do not fall out if unscrewed too far.

When connecting active conductors in terminal blocks, tighten the uppermost grub screw first and conduct a pull test to ensure the uppermost grub screw is in contact with the conductor. Once satisfied the uppermost grub screw holds the conductor captive, tighten the lower grub screw. Tooling is available, refer to Clause 23.1.10.

The requirements of Ausgrid’s Electrical Safety Rules shall be met.

23.1.6 Zip tying of service cables

A service cable (including special small services) shall have its active conductors zip tied together at 100mm centres, starting where red phase conductor meets white phase conductor (below white phase terminal block). The zip ties shall continue to the point where the outer sheath of the service cable has been removed.

Special small services with conductors smaller than 16mm^2 shall be zipped tied to an adjacent 100A or 200A service. In the event there are not any 100A or 200A services, special small services with conductors smaller than 16mm^2 shall have phase conductors supported using zip ties installed through the holes in the polycarbonate cover. The holes referred to are the holes directly in front of the active terminal block grub screws.

23.1.7 Additional cable length for the re-terminating of service cables

Additional cable length shall be left inside the cabinet to allow for the re-terminating of service cables. This can be achieved by creating an “S” shape in the service cables in the base unit area. Ensure access to neutral fasteners is not obstructed.

23.1.8 Labelling of 100A and 200A service cables

Each of the phase conductors (adjacent to the service terminal block) and the neutral conductor (adjacent to the neutral bar) for each service cable shall be labelled using a zip tie label as depicted below. Using an indelible pen (Permanent marker Artline 700 - black) write on the zip tie label to uniquely identify the premises the service is connected to. This is achieved by a street number and street name or a lot number. Company names must not be used.

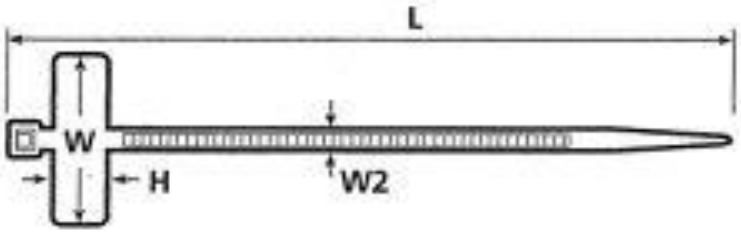


Figure 41 - Hellermann Tyton identification tie (Part No. IT18R). Ausgrid Stockcode number 180034

23.1.9 Labelling of special small services

The phase conductor/s (adjacent to the service terminal block) and the neutral conductor (adjacent to the neutral bar) for each special small service cable shall be labelled using a zip tie label as depicted below. Using an indelible pen (Permanent marker Artline 700 - black) write on the zip tie label to uniquely identify the item the special small service is connected to.

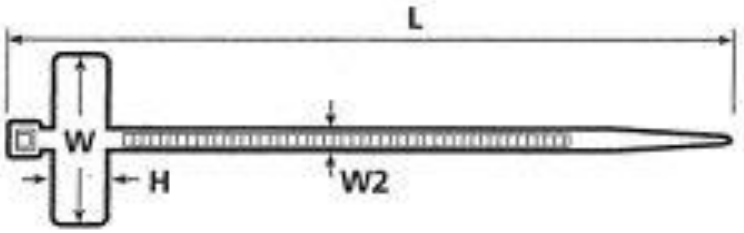


Figure 42 - Hellermann Tyton identification tie (Part No. IT18R). Ausgrid Stockcode number 180034

23.1.10 Tee bar tool

A “covered” tee bar tool to suit the hexagonal socket head grub screws in the service terminal block is available, Ausgrid stockcode number 180287 or direct from Hylec Energy Solutions Pty Ltd.

Figure 43 - Tee bar tool

23.2 >200A Services – direct connected to busbars

23.2.1 Neutral connection >200A services

The neutral connection for a greater than 200A service (>200A) shall be located directly below the phase conductors for the given service cable. The neutral bar for each electrical configuration has been designed so there is a corresponding neutral connection for each >200A service connection.

The requirements of Ausgrid’s Electrical Safety Rules regarding the connection and disconnection of neutral conductors shall be met.

23.2.2 Double insulation >200A services

Where the phase conductors of a >200A service passes a phase busbar of a different phase, double insulation shall be maintained. The area of double insulation shall extend a minimum of 25mm above and 25mm below the busbar which the cable is passing.

If the cables are single insulated, install mastic lined medium walled heatshrink tubing over the cables, starting 25mm above the busbar and finishing 25mm below the busbar. Red phase cable shall have additional insulation installed where the cable passes both white and blue phase busbars. White phase cable shall have additional insulation installed where the cable passes blue phase busbar.

In addition, >200A service cables shall be set in position to ensure the double insulation is not in direct contact with busbar/s.

23.2.3 Connecting and disconnecting >200A services

Dependent upon the electrical configuration/s selected for a given installation certain configurations cater for >200A services directly connected to neutral and phase busbars.

The requirements of Ausgrid's Electrical Safety Rules regarding the connection and disconnection of services shall be met.

23.2.4 Labelling of cables >200A services

Each of the phase conductors and the neutral conductor for each >200A service shall be labelled using a zip tie label as depicted below. Using an indelible pen (Permanent marker Artline 700-black) the labels shall uniquely identify the premises the service is connected to. This is achieved by a street number and street name or a lot number. Company names must not be used.

All labels shall be installed in a position that is easily visible under normal operating conditions.

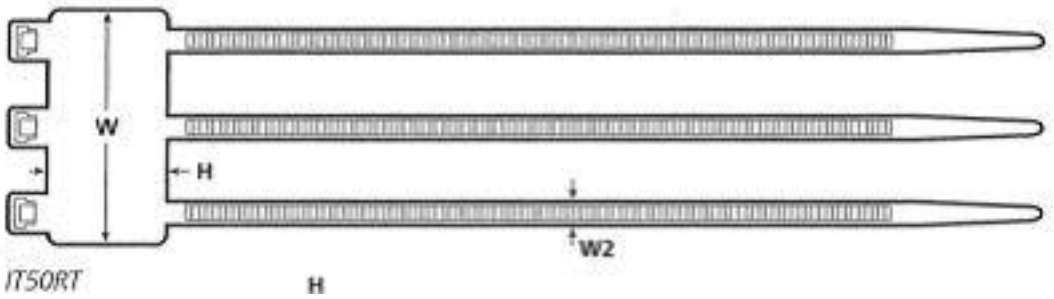


Figure 44 - HellermannTyton identification tie (Part No. IT50RT). Ausgrid Stockcode number 180051

In addition, a laminated adhesive backed tape label (Brother laminated 12mm Black on White tape Part No. TZ-231/TZe-231) label, identifying the destination of the >200A service, shall be affixed to the polycarbonate cover immediately in front of the respective >200A service phase cable terminations.

24.0 STREET LIGHTING

24.1 Installation of street lighting switchgear module

Street lighting modules shall be installed with the cabinet busbars de-energised.

For the torque settings for the street lighting switchgear module to busbar fasteners refer to Section 14.0.

As the street lighting modules are an optional component, polycarbonate covers are installed over the position/s that the street lighting switchgear module can be installed. The polycarbonate cover is removed by either turning the black discs counter clockwise until removed (Figures 45 and 46 below) or turning the back captive screws one quarter of a turn counter clockwise. The polycarbonate cover is no longer required when a street lighting switchgear module is installed.

Some configurations will have a rectangular black moulded plastic component held in place with a captive screw. This rectangular black moulded plastic component pushes into the side of the street lighting switchgear module as depicted below in Figure 47

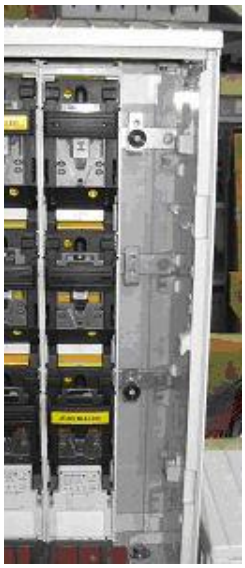


Figure 45 - Polycarbonate cover installed

Figure 46 - Polycarbonate cover removed

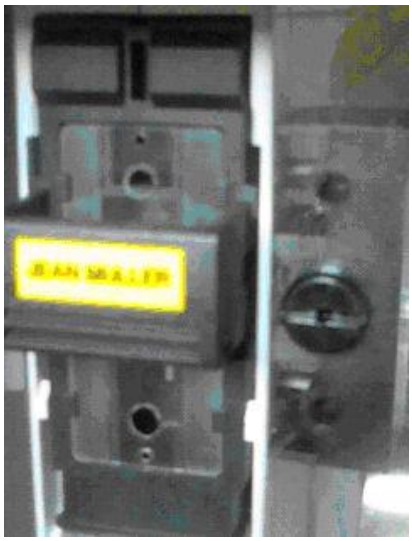


Figure 47 - Moulded plastic component in the side of the switchgear module

Installation Steps

1. De-energise busbars and prove de-energised.
2. Remove polycarbonate cover.
3. Remove SL module from the box (see Figure 48).

Figure 48 - SL module

4. Using a screwdriver turn the black holding screws counter clockwise ¼ of a turn (see Figure 49).

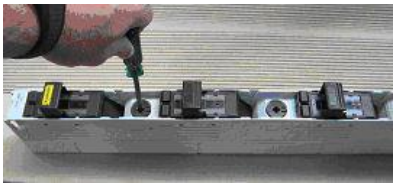


Figure 49

5. Remove the front cover (see Figure 50).

Figure 50

6. Using the supplied hardware (see Figure 50) bolt the module to the three busbars as shown in Figure 51.

Figure 51

7. When all three bolts have been tightened (step 6) refit the front cover and turn the black holding screws clockwise ¼ of a turn to secure cover onto the base (see Figure 52).

Figure 52

24.2 Connecting and disconnecting street lighting circuits

24.2.1 Torque settings

For the torque settings for the active cable terminals on the street lighting switchgear module and the fasteners on the neutral bar, refer to Section 14.0.

24.2.2 Phase colours – street lighting switchgear module terminals

The busbars in the cabinet are labelled L1, L2 and L3.

L1 = red phase top busbar

L2 = white phase centre busbar

L3 = blue phase bottom busbar

The street lighting switchgear module terminals and the corresponding phase colours and busbar identification are depicted below.

Figure 53

24.2.3 Neutral connection

The neutral connection/s for street lighting circuit/s shall be located directly below the respective street lighting switchgear module. As street lighting circuits may be three phase or single phase, provision has been made in the neutral bar to cater for the possibility of three (3) x single phase street lighting circuits, i.e. (3) x separate neutral connections. A separate bolted connection for each neutral connection shall be used.

The requirements of Ausgrid's Electrical Safety Rules regarding the connection and disconnection of neutral conductors shall be met.

24.3 Labelling

Street lighting switchgear modules shall be labelled to identify the destination of the street lighting circuit/s. Where the street lighting switchgear module is used for single phase circuit/s, to identify which fuse relates to which circuit or street light, the individual circuits or street light shall be associated with the phase colour of the busbar the respective fuse connects to; i.e. red, white, or blue and the circuit description or asset number, e.g. Red – TO SL ZZ23456, White – TO SL ZZ23457, Blue – TO SL ZZ23458.

At the lower end of the street lighting switchgear module is provision for destination labelling. The labelling provision consists of a white plastic insert. The label shall be laminated adhesive backed tape labels (Brother laminated 12mm Black on White tape Part No. TZ-231/TZe-231) affixed to the white plastic insert. Due to space limitations label/s may need to be installed vertically.

Figure 54

24.4 Provision for earth connection –Hunter Region

In accordance with the relevant sections of NS119, legacy single insulated and earthed luminaires and standards exist in the Hunter Region.

In these situations, the neutral bar only has provision for the termination of one earthing conductor below the street lighting switchgear module. A single earthing termination on the neutral bar will cater for (1) x three (3) phase circuit or (1) x lighting standard. Where (2) x light standards (separately fused) are required to be connected, additional provision for the termination of earthing conductors is required. This is achieved by terminating an insulated (green/yellow) 16mm^2 cable at the neutral bar and terminating the other end of the 16mm^2 cable into an insulated terminal block, Ausgrid stockcode number 177501. The addition of the terminal block will allow (2) x 2.5mm^2 earthing conductors to be terminated. The terminal block and associated cables shall be supported by black nylon zip ties. Earthing conductors shall be terminated in the link under two (2) screws.

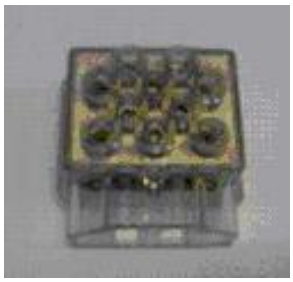


Figure 55

24.5 Street lighting switchgear modules without cables terminated

To prevent cable termination palms without cables connected being energised, street lighting switchgear modules without cables terminated shall not have a fuse/s installed.

E.g.: Where a street lighting switchgear module has one single phase circuit connected, only one fuse shall be installed for that particular circuit. The other two link (fuse) handles are to remain empty.

24.6 Street lighting switchgear module - terminal cover

The clear cover that fits over the active terminals at the bottom of the street lighting switchgear module has been modified, extending the depth of the cover, to ensure all terminals are covered. As part of the installation process a check shall be made to ensure (a) a modified cover has been supplied and (b) the cover extends the full depth of the switchgear module covering all of the terminals.

Figure 56 - Unmodified (incorrect)

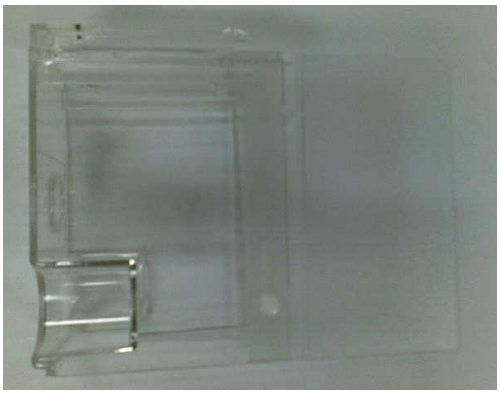


Figure 57 - Modified (correct)

Figure 58 - Unmodified (incorrect)

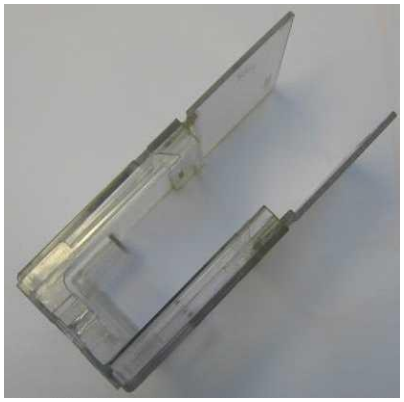


Figure 59 - Modified (correct)

25.0 OPERATION OF EQUIPMENT

25.1 Cabinet

25.1.1 Cabinet door lock

Door handle shown with the flap covering the lock.

Figure 60

The door lock is covered by a flap. The flap is fixed on a pivot at the top. To expose the lock, push the bottom of the flap towards the right.

Figure 61

Once the lock has been unlocked, the bottom of the door handle is pulled out away from the cabinet. The door handle is then rotated anti-clockwise to unlock the door.

Figure 62

25.1.2 Cabinet door removal

STEP 1

Undo top hinge catch (black)

Figure 63

STEP 2

Tip the top of the cabinet door away from the cabinet

Figure 64

STEP 3

Raise the bottom edge of the door up, releasing the bottom hinge pin from its home position. The door has now been removed

Figure 65

25.2 Base Units

25.2.1 Direct buried base unit cover removal

Step 1

Open the door to reveal cabinet bottom front cover.

Remove door.

Release left and right black catches by sliding them towards the centre of the cabinet.

Figure 66

Step 2

Tip the top edge of the cabinet bottom front cover forward and down to remove the cover.

Figure 67

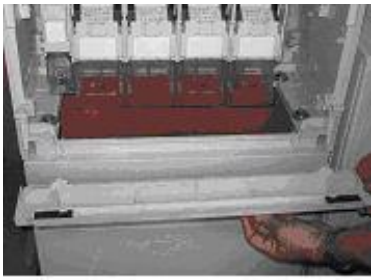


Figure 68

Step 3

The top front cover of the base unit will now be revealed. Put fingers under the cover as shown on both sides and lift the cover up as high as it will go.

Graphics for illustration purposes only. PPE required if energised.

Figure 69

Step 4

Tip the top edge of the base front top cover forward and down to remove cover as shown.

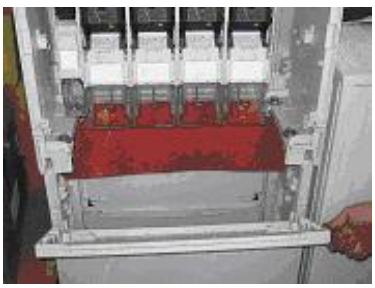


Figure 70

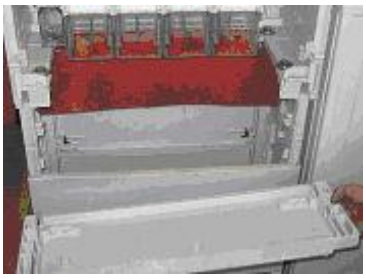


Figure 71

25.3 400A Switchgear modules

25.3.1 Link installation

Photo shows holder slots to accept the link cartridge

Figure 72

Bottom tag on link cartridge lines up on bottom slot on holder and top tag on link cartridge lines up on top slot on holder

Figure 73

Push link cartridge down so that top tag is locked into the holder by overcoming the locking device on the top slot

Figure 74

25.3.2 Link removal

Slide the release mechanism with thumb and forefinger whilst simultaneously raising the cartridge which in turn brings the top tag on the cartridge clear of the locking device on the holder as shown in Figure 76

Figure 75

Figure 76

This photo shows the cartridge clear of the holder

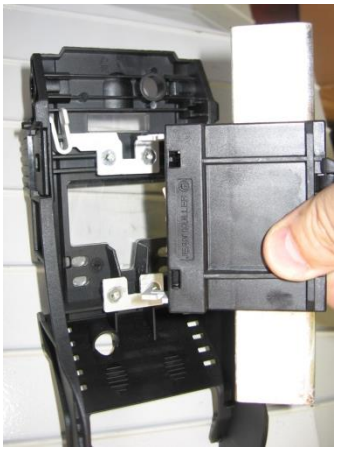


Figure 77

25.3.3 Electrical testing

400A switchgear modules have test ports for electrical testing. A test lamp probe can be inserted into the test port.

Note: Ensure the test lamp probe is fully inserted beyond the plastic moulding and is in contact with metal.

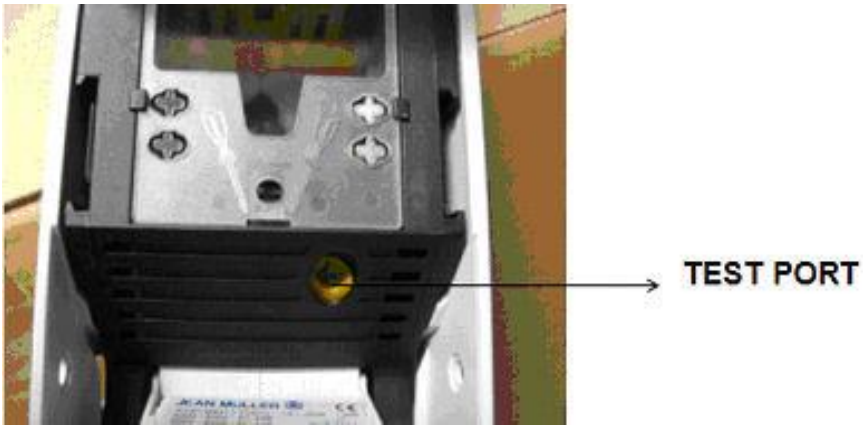


Figure 78

25.3.4 Parking of link handles

After link cartridge holder has been removed turn holder 180˚ on its vertical axis. There are two tags approx 35mm from the top of the holder (as depicted below) which need to be lined up with the corresponding slots in the switchgear module housing.

Figure 79

The holder is then pushed back until the vertical grooves in the switchgear module housing are reached

Figure 80

The holder then slides down to the bottom position of the vertical groove into its home position.

As shown in the photos the bottom link holder shall be parked first, then the middle holder, then the top holder.

Figure 81

This photo shows all three link holders parked. In this position the door is still able to be securely closed and locked

Figure 82

Graphics for illustration purposes only. If apparatus is energised PPE is required.

25.3.5 Opening links

Links shall be operated in accordance with Ausgrid's Electrical Safety Rules. If the apparatus is energised PPE shall be worn when operating links in accordance with Ausgrid's Electrical Safety Rules. The links are opened by pulling in a downward motion on the individual handles until the link blades are clear of the base contacts, the link will then sit in the open position.

Note: The link handle must be fully opened to ensure both the top and bottom contacts are disconnected from the link.

A fast action shall be used when opening links.

Figure 83

25.3.6 Closing links

Links shall be operated in accordance with Ausgrid's Electrical Safety Rules. If the apparatus is energised PPE shall be worn when operating links in accordance with Ausgrid's Electrical Safety Rules. Each link is closed by pushing in an upward motion on the handle until the link is fully engaged. The surrounds of the link handle will be flush with the switchgear module housing when closed.

The part of the link handle that is held in position allowing the link handle to pivot shall be fully seated prior to closing the link.

Electrical testing shall be conducted prior to closing links.

A fast action shall be used when closing links.

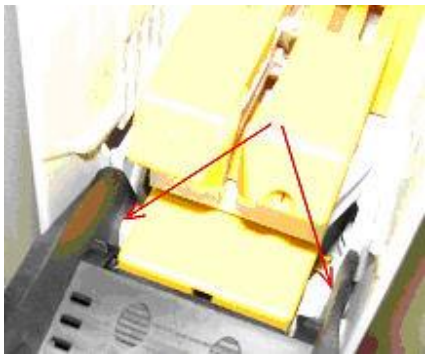


Figure 84

Figure 85

25.4 Street Lighting switchgear module

25.4.1 Fuse installation

To install fuse place fuse into holder as shown by lining up the tags on the fuse cartridge with the slots in the holder.

Figure 86

Slide cartridge downwards overcoming the top locking device to securely locate the fuse cartridge into the holder.

Figure 87

25.4.2 Fuse removal

To remove fuse, slide the release mechanism with thumb and forefinger (see Figure 88) whilst simultaneously sliding the cartridge up which in turn brings the top tag on the cartridge clear of the locking device on the holder (as shown in Figure 89)

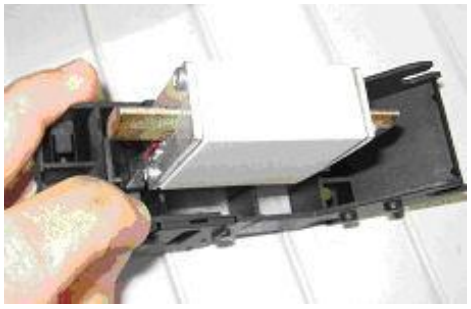


Figure 88

Top tag clear of locking device on holder.

Figure 89

Fuse cartridge can now be removed from holder as shown.

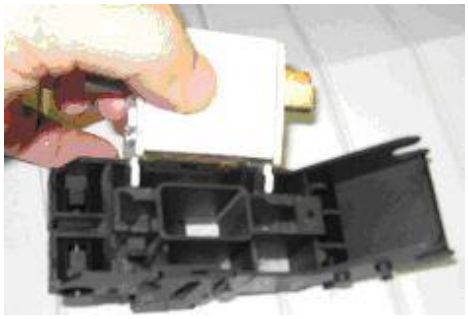


Figure 90

25.4.3 Opening

If the apparatus is energised PPE shall be worn when operating links in accordance with Ausgrid's Electrical Safety Rules.

Photo shows SL module with all (fuse links) switches open. The (fuse links) switches are opened by pulling in a downward motion on the handles until the fuse blades are clear of the base contacts, the switch will then sit in this position.

A fast action shall be used when opening links.

Note: The link handle must be fully opened to ensure both the top and bottom contacts are disconnected from the link.

Figure 91

25.4.4 Closing

Note: Electrical testing shall be conducted prior to closing.

Photo shows SL module with all switches closed.

If the apparatus is energised PPE shall be worn when operating links in accordance with Ausgrid's Electrical Safety Rules.

The switches are closed by pushing in an upward motion on the handles until the switch handle (receptacle) is flush with the body of the switch (the fuse cartridge blades will be fitted snugly into the fixed contacts)

A fast action shall be used when closing links.

Figure 92

25.4.5 Parking of fuse handles

Photo shows street lighting module with fuse holder removed.

Figure 93

To park fuse holder, insert top of holder into switchgear module housing as shown by leading with top edge of holder into base.

Figure 94

When fuse holder is pushed home at the top edge gently push bottom of holder into the switchgear module housing to locate holder. Repeat above steps to insert all three phases.

In this position the door is still able to be securely closed and locked.

Figure 95

Photo shows all three fuse holders parked.

Figure 96

Photos are for illustration purposes only. If apparatus is energised PPE is required.

25.4.6 Electrical testing

Test ports are provided in the front cover of each of the fuse holders.

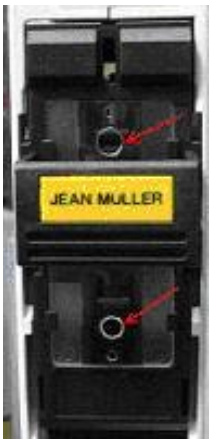


Figure 97

26.0 LABELLING (ADDITIONAL REQUIREMENTS)

26.1 Asset numbering on exterior of cabinet door

All cabinets are supplied with an asset numbering strip fixed to the door.

Step 1. Slip the tile under the left hand tab as shown in the photo

Step 2. Apply pressure to the right hand side of the tile to overcome the holding tab.

The tile snaps into place and is held behind both left and right hand side tabs.

Step 3. Repeat steps 1 and 2 for additional tiles.

Step 4. Fill the remainder of the unused strip with “blank” tiles.

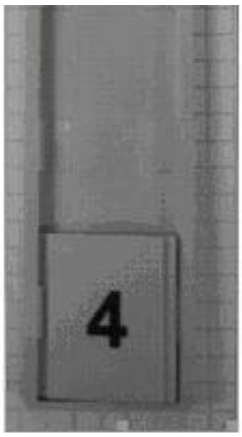


Figure 98

Figure 99

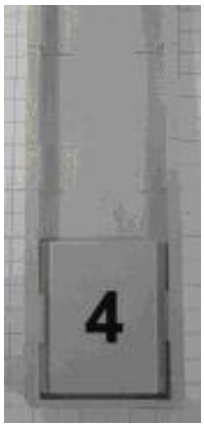


Figure 100

26.2 Asset numbering – interior of cabinet

The asset number shall be marked on the interior surface of the cabinet with a xylene-free permanent marker, to eliminate any confusion with doors from another cabinet being used.

26.3 Open point labelling on exterior of cabinet (Sydney and Central Coast only)

The open point label shall be affixed to the top front cover of the base unit using the same method as described in NS148 for attaching asset numbers to HDPE plastic pillars.

Figure 101

Example of “open point” label affixed to the top front cover of the base unit**.**

26.4 Open point labelling – interior of cabinet (Sydney and Central Coast only)

The open point number shall be labelled on the single line diagram on the rear of the cabinet door. The labelling method shall be Brother laminated 12mm Black on White tape. Brother Part No. TZ-231/TZe-231. (Brother labelling machine also required). The labelling shall be placed across the link as depicted below.

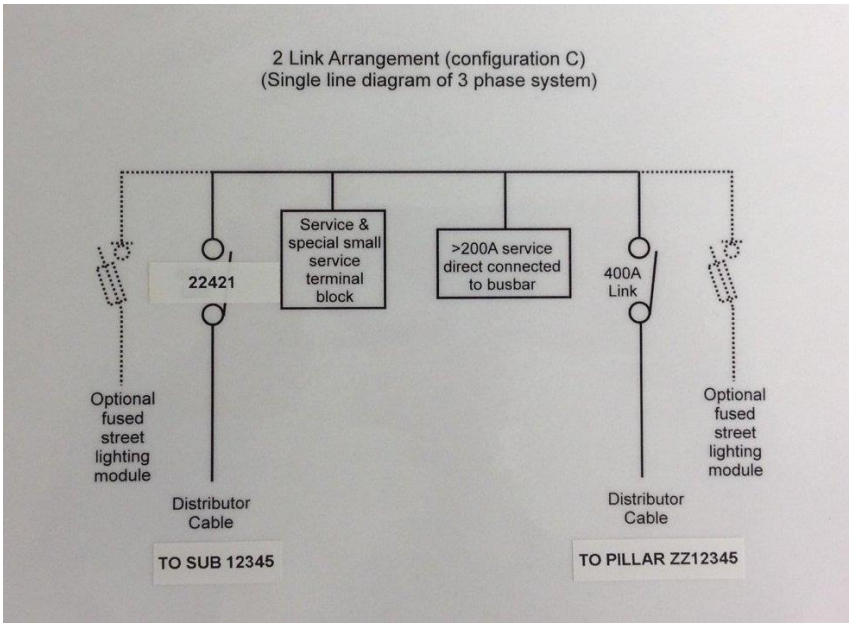


Figure 102 - Example of "open point" label on single line diagram

26.5 Link number labelling on exterior of cabinet (Hunter region only)

In the Hunter region, link numbers are issued for every link (whether normally opened or normally closed). The link numbers are shown on the design plan.

Link numbers are affixed to the top front cover of the base unit of the cabinet in the same order from left to right as the links are positioned inside the cabinet using 50mm high yellow Brady B-584 reflective tape or equivalent with 25mm high black lettering printed by labelling machine such as Brady HandiMark BMP71 Printer.

Surface preparation for affixing the reflective tape is the same method as described in NS148 for attaching asset numbers to HDPE plastic pillars.

Figure 103 - Example of "link number" labels affixed to the top front cover of the base unit in the same order as the links are positioned inside the cabinet

26.6 Link number labelling – interior of cabinet (Hunter region only)

The link number shall be labelled on the single line diagram on the rear of the cabinet door. The labelling method shall be Brother laminated 12mm Black on White tape. Brother Part No. TZ-231/TZe-231. (Brother labelling machine also required).

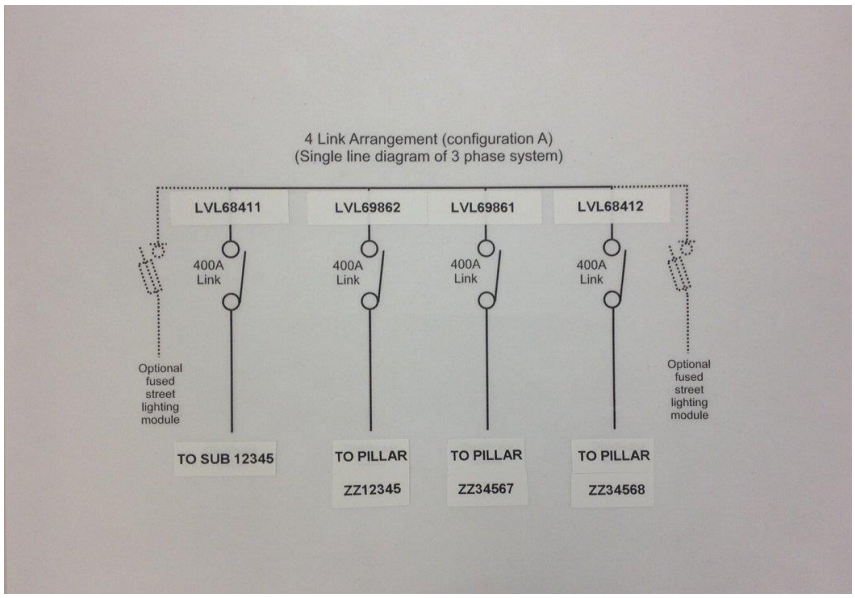


Figure 104 - Example of "link number" label on single line diagram

26.7 Cross power source labelling - interior of cabinet

Distributor switchgear modules that are cross power source shall have all three of the link handles labelled with a red "**X**" on silver background adhesive label as depicted below.

Figure 105 - Cross power source label on link handle

In addition to the labelling of the distributor switchgear module link handles, the single line diagram on the rear of the cabinet door shall have a red "**X**" on silver background adhesive label affixed to clearly identify the cross power source links, as depicted in the example below.

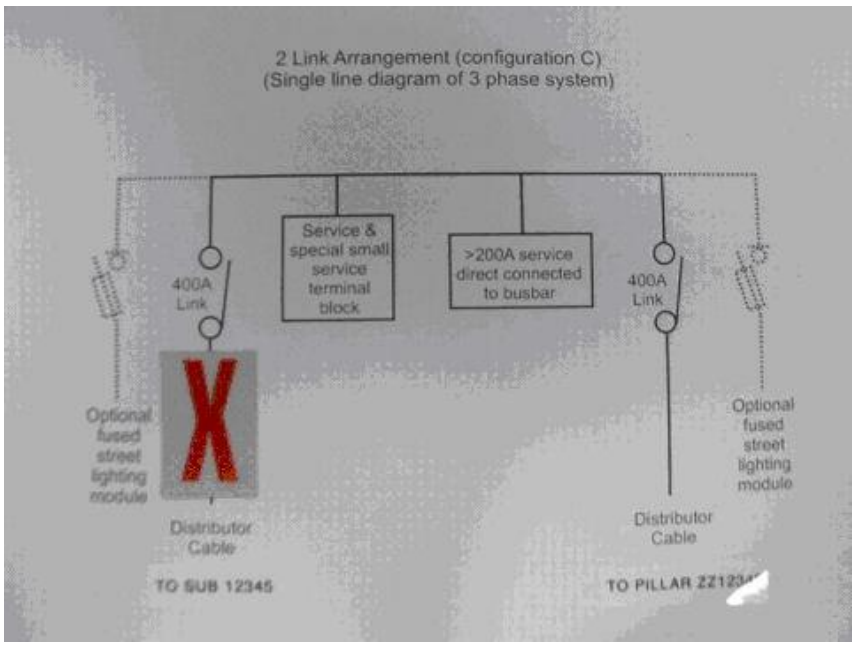


Figure 106 - Example of "cross power source" label on single line diagram

26.8 Distributor destination labelling on single line diagram

In addition to the labelling of distributor switchgear modules, the destination of distributor cables shall be labelled on the single line diagram on the rear of the cabinet door. The labelling method shall be Brother laminated 12mm Black on White tape. Brother Part No. TZ-231/TZe-231. (Brother labelling machine also required). The labelling shall be installed in an unambiguous position as depicted in the example below.

(E.G.: "TO SUB 12345" and "TO PILLAR ZZ12345")

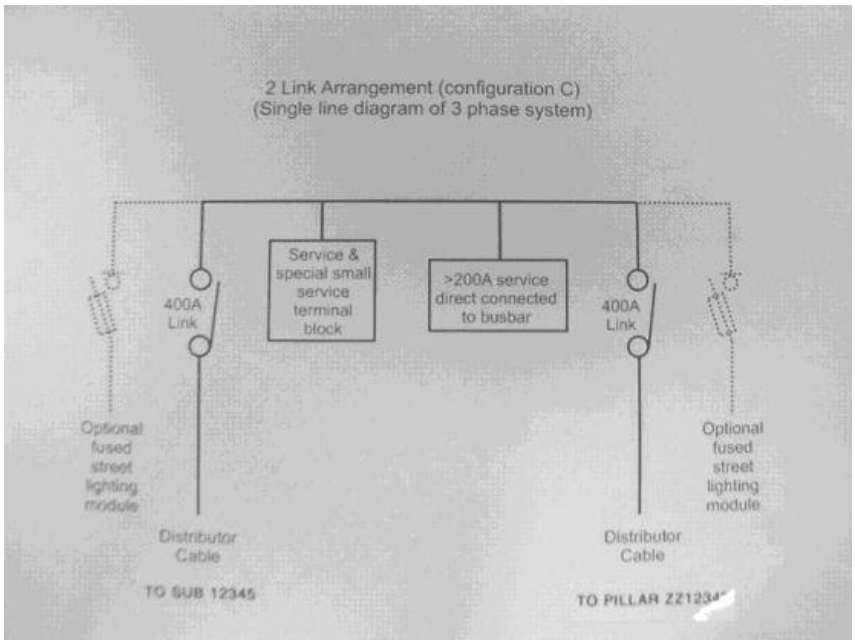


Figure 107 - Example of "distributor destination" labels on single line diagram

26.9 Street lighting destination labelling on single line diagram

In addition to the labelling of street lighting switchgear modules, the destination of the street lighting cables and the fuse current rating shall be labelled on the single line diagram on the rear of the cabinet door. The labelling method shall be Brother laminated 12mm Black on White tape. Brother Part No. TZ-231/TZe-231. (Brother labelling machine also required). The labelling shall be installed in an unambiguous position as depicted in the example below.

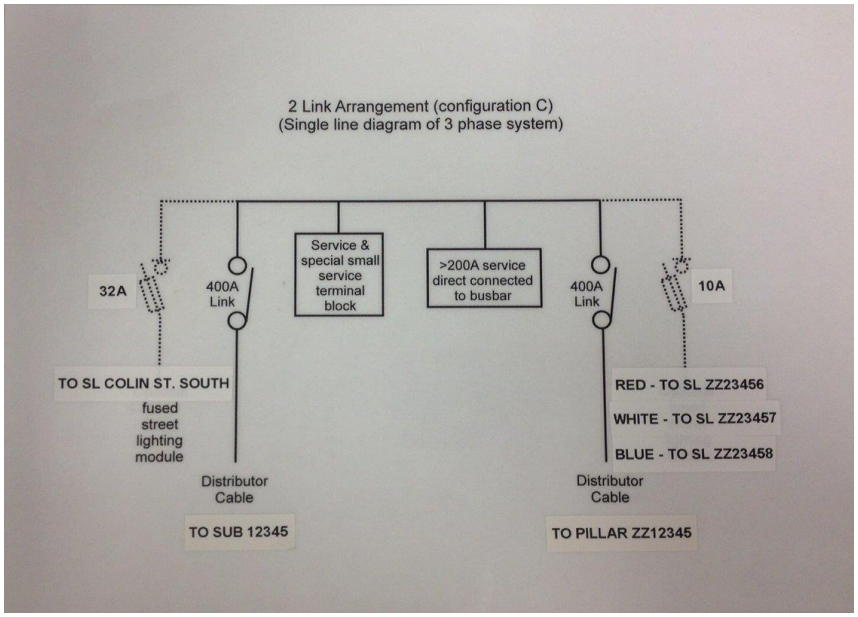


Figure 108 - Example of "street lighting destination and fuse current rating" label on single line diagram

Note: The street lighting module on the left shows the labelling for a street light circuit and the street lighting module on the right shows the labelling for individually controlled street lights.

27.0 MAINTENANCE

27.1 General

There is no specific intrusive maintenance required for the internal components of the cabinet and base unit, however periodic non-intrusive thermal inspections are carried out on these pillars in accordance with the Ausgrid Technical Maintenance Plan.

The exterior of the cabinet and base unit is coated with an ultraviolet (UV) protective coating which will age. The condition of the exterior of the cabinet and base unit will be assessed during the periodic pillar visual inspection process carried out in accordance with the Ausgrid Technical Maintenance Plan.

27.2 Cabinet and base unit - ultraviolet (UV) coating

27.2.1 Ageing

Distribution cabinets made of sheet moulding compound (SMC) and glass-fibre reinforced composites, when installed for outdoors use, it is recommended to have a lacquer-treatment in order to protect against weathering. This lacquer-treatment is initially applied to all new cabinets and base units prior to delivery to Ausgrid. Depending upon the installation location, the surface of a distribution cabinet erodes by UV-Radiation. The erosion is a maximum thickness of 50µm in 20 years. However, the mechanical characteristics of the enclosures are not impaired. Erosion of the surface can cause glass-fibres to become exposed. In the event glass-fibres come into contact with the body, they can cause skin irritation. Likewise due to the increased surface roughness the formation of moss is promoted. An effective protection against the abovementioned effects is the UV-protective lacquer coating.

The manufacturer recommends reapplication of the UV-protective lacquer coating every 10 years.

27.2.2 Inspection

During the pillar visual inspection the UV-protective lacquer coating will be inspected. During this inspection a decision will be made as to whether the UV-protective lacquer coating requires re-application. The following photos show degradation of the UV-protective lacquer coating. Where the cabinet or base unit surface appears similar to the photos below, reapplication of the UV-protective lacquer coating is required.

Degradation of UV-protective lacquer coating

Figure 109

Figure 110

27.2.3 Recoating

27.2.3.1 Mandatory assessment prior to recoating procedure

The cabinet can be recoated with UV lacquer whilst the internals of the cabinet are energised, if all of the following conditions are met:

- the cabinet is fully closed and locked;
- the UV lacquer is applied using a paint roller. Spraying the UV lacquer is not permitted;
- the cabinet and/or base unit are/is not damaged; and
- the amount of UV lacquer applied will not create any excess that may penetrate the cabinet, contacting the live electrical parts within.

If all of the above requirements cannot be met or if there is any doubt that all of the above requirements cannot be met, the cabinet shall be de-energised and proven de-energised prior to the application of UV lacquer.

27.2.3.2 Procedure

1. Lacquer-treatment can be done only on dry days at a temperature above 5°C.
2. Clean the cabinet and base unit surfaces from rough impurities, using a non-woven material, such as Scotch-Brite ® home cleaning products.

   Note: PPE required - Standard adjustable nose-clip dust mask, neoprene gloves with leather outers to prevent splinters, wrap around eye glasses.

3. To remove oils, fats or adhesive from the surfaces, wipe off using small quantities of “De Solv It Electrical Cleaner” on a lint free rag.

Note: Refer to “De Solv It” Safety Data Sheet for PPE requirements. Product can be ordered directly from: Hylec Energy Solutions Pty Ltd, (07) 3396 2220.

4. Subsequently, wipe off the whole cabinet surfaces with clean, dry and lint free rags. PPE as per step 2.
5. The cabinet must be dry for painting, therefore don’t wipe off with wet cleaning rag.
6. Use CETELON-2-components-acrylic lacquer 149/010163 grey RAL7035 Note: For PPE and additional requirements refer to Cetelon 2 UV Lacquer Safety Data Sheet.
7. Mix the lacquer with hardener in a ratio of 12:1 and stir well.
8. Apply the lacquer coating with a paint-roller. Using a paint brush to apply the lacquer will result in a “streaky” finish.

Figure 111

(Graphic for illustration purposes only.)

Table 10 Quantity of UV lacquer required

Cabinet Configurations	Qty of UV Lacquer to Recoat
Configuration A	0.31kg / Cabinet
Configuration B	0.5kg / Cabinet
Configuration C	0.31kg / Cabinet
Configuration D	0.38kg / Cabinet
Configuration E	0.38kg / Cabinet
Configuration F	0.31kg / Cabinet

The quantity can be changed according to the intensity of the coating.

The lacquer is available in the following bundle sizes:

- 9 kg including hardening agent: Article No. S8900248
- 1 kg including hardening agent: Article No. S8900247

Product can be ordered directly from: Hylec Energy Solutions Pty Ltd, (07) 3396 2220.

27.3 Thermal inspections

Thermal inspections are a non-intrusive method of assessing asset condition. Thermal inspections indicate components that have degraded leading to high resistance connections that could potentially result in connection failure. The design of the new pillars will allow thermal inspections to be performed to assess connection integrity and also to indicate circuit overloading in parts of the pillar that may be hidden by covers or other components.

28.0 STOCKCODES

28.1 Lead time

Allow a minimum 12 weeks lead time for cabinets and base units.

28.2 Cabinets (does not include base unit)

Table 11 Cabinet stockcodes

Description	Stockcode
Cabinet, electrical configuration A	180301
Cabinet, electrical configuration B	180302
Cabinet, electrical configuration C	180303
Cabinet, electrical configuration D	180304
Cabinet, electrical configuration E	180305
Cabinet, electrical configuration F	180306

28.3 Direct buried base units with whipper snipper protection

Table 12 Base units with whipper snipper protection - stockcodes

description	stockcode
Direct buried base unit suitable for electrical configuration A	181816
Direct buried base unit suitable for electrical configuration B	181817
Direct buried base unit suitable for electrical configuration C	181818
Direct buried base unit suitable for electrical configuration D	181819
Direct buried base unit suitable for electrical configuration E	181820
Direct buried base unit suitable for electrical configuration F	181831

28.4 Direct buried base units without whipper snipper protection

Table 13 Base units without whipper snipper protection - stockcodes

Description	Stockcode
Direct buried base unit suitable for electrical configuration A	180313
Direct buried base unit suitable for electrical configuration B	180315
Direct buried base unit suitable for electrical configuration C	180316
Direct buried base unit suitable for electrical configuration D	180317
Direct buried base unit suitable for electrical configuration E	180318
Direct buried base unit suitable for electrical configuration F	180319

28.5 Street lighting switchgear module

Table 14 Street lighting switchgear module stockcode

Description	Stockcode
Three phase switchgear module suitable for fused street lighting circuits (does not include fuses)	180282

28.6 Fuses for street lighting switchgear module

Table 15 Street lighting fuses - stockcodes

Description	Stockcode
10A HRC fuse, suitable for use in street lighting switchgear module (Jean Muller)	180283
32A HRC fuse, suitable for use in street lighting switchgear module (Jean Muller)	180284
50A HRC fuse, suitable for use in street lighting switchgear module (Jean Muller)	180285
63A HRC fuse, suitable for use in street lighting switchgear module (Jean Muller)	180286

28.7 Tools

Table 16 Tee bar tool stockcode

Description	Stockcode
Tee bar tool, suitable for use on service terminal blocks in Suburban Commercial and Industrial Pillars	180287

28.8 Asset numbering (cabinet exterior)

Table 17 Labelling stockcodes

Description	Stockcode
Blank tile	181261
Letter “A”	181262
Letter “B”	181263
Letter “C”	181271
Letter “D”	181272
Letter “E”	181273
Letter “F”	181274
Letter “G”	181275
Letter “H”	181276
Letter “I”	181277
Letter “J”	181278
Letter “K”	181279
Letter “L”	181280
Letter “M”	181282
Letter “N”	181283
Letter “O”	181284
Letter “P”	181285
Letter “Q”	181286

Description	Stockcode
Letter “R”	181287
Letter “S”	181288
Letter “T”	181289
Letter “U”	181290
Letter “V”	181291
Letter “W”	181292
Letter “X”	181293
Letter “Y”	181294
Number “0”	181264
Number “1”	181265
Number “2”	181266
Number “3”	181267
Number “4”	181268
Number “5”	181269
Number “6”	181270
Number “7”	181301
Number “8”	181302
Number “9”	181303

28.9 Cross power source labels

Table 18 Cross power label stockcode

Description	Part No:
Letter "X" coloured red on silver background. i.e. "X" adhesive label, suitable for use on the switchgear modules in the interior of the cabinet and on the single line diagram on the rear of the door. Hayman Industries Pty Ltd, 119 Airds Rd, Minto. Tel:8796 2600	PS1.2RWX

28.10 Components to add earthing for street lighting circuits

Table 19 Earthing component stockcodes

Description	Quantity	Stockcode
Insulated terminal block with double screw tunnels	1	177501
16mm^2 stranded copper conductor with green/yellow insulation	Length to suit	Buy in
16mm^2 copper crimp lug – M8	1	176555

28.11 Cable lugs

Table 20 Cable lug stockcodes

Cable and Stud Details	Stockcode
2.5mm^2 circular, stranded, copper conductor, M8	BUY IN
6mm^2, circular, stranded, copper conductor, M8	BUY IN
16mm^2, circular, stranded, copper conductor, M8	176555
16mm^2, circular, stranded, copper conductor, M12	H110270
50mm^2, circular, stranded, copper conductor, M8	57604
50mm^2, circular, stranded, copper conductor, M12	74823
185mm^2 circular, stranded, copper conductor, M12	175532
240mm^2, 90 degree sector shaped, stranded, copper conductor, M12	BUY IN CABAC Part No CAL240SP-12C
300mm^2, circular, stranded, copper conductor, M12	BUY IN CABAC Part No CAL300SP-12C
240mm^2, 90 degree sector shaped, solid, aluminium conductor, M12	141770
300mm^2, 90 degree sector shaped, solid, aluminium conductor, M12	186234

28.12 Heatshrink

Table 21 Heatshrink stockcodes

Description	Stockcode
35/12 medium walled mastic lined heatshrink tubing	60186
Heatshrink termination kit for LV 240mm² and 300mm² 4 core cable. Comprising of: 1 x mastic lined 4 way glove, 4 x 330mm long mastic lined medium walled tubing (expanded 50mm – recovered 18mm), 1 x piece 50mm x 300mm mastic tape and 2 x solvent wipes. (Refer to NS127 for a general overview of component installation)	60079
Insulation sleeving heatshrink 50/18mm, medium walled mastic lined tubing, 1200mm lengths, expanded diameter of 50mm, recovered diameter of 18mm.	143776

28.13 Nylon cable ties

Table 22 Nylon cable tie stockcodes

Description	Stockcode
12.5mm wide black nylon cable tie	157610
7.5mm wide black nylon cable tie	59907

28.14 Laminated labelling tape

Table 23 Laminated label stockcode

Description	Part No.
Brother laminated 12mm Black on White tape. This item is not held as a stockcode and is a “buy in”. Officeworks, or similar stationery supplier. (Brother labelling machine also required).	TZ-231/TZe-231

28.15 External material suppliers – contact details

Table 24 Contact Details

External Material Suppliers	Contact Details
Zip tie labels	HellermanTyton Australia Pty Ltd Unit 2, 12-14 Mangrove Lane, Taren Point NSW 2229 02 9540 3955
UV coating materials and spare parts for cabinets and base units	Hylec Energy Solutions Pty Ltd 39 Millenium Place, Tingalpa QLD 4173 (07) 3396 2220
Pre-cast concrete slabs	Potential suppliers are listed below (in alphabetical order): Boral – 1300 131 599 Hanson – 132 662 Austral – 9604 9444

29.0 FIELD RECORDING OF NETWORK ASSETS

Refer to NS100 for the requirements of recording network assets.

30.0 MAINTENANCE OF LABELLING

Labelling of cable destinations shall be maintained when alterations are made to the low voltage network.

31.0 ACID SULFATE SOILS

For determining the presence of acid sulfate soils (ASS) and the additional requirements, refer to NS174C.

32.0 STORES AND MATERIALS

Only approved materials and equipment may be used in the construction of infrastructure which ultimately forms part of Ausgrid's electrical network. The approved materials and equipment contained in this Network Standard are detailed in Ausgrid's Approved Material List (AML) with manufacturer and supplier information and Ausgrid stockcodes where appropriate. Ausgrid will consider adding alternative materials and equipment to the AML in accordance with NS181.

ASPs may obtain approved materials and equipment items as listed in the AML from any source. Where an ASP wishes to use alternative materials and equipment, application to have the materials or equipment considered for approval is to be made in accordance with NS181. Alternatively, where approved materials and equipment are held as stock in Ausgrid's stores system, ASPs may purchase them from Ausgrid. All enquiries and requests for quotations shall be directed by email to aspsales@ausgrid.com.au and include the appropriate stockcode numbers.

All materials used on Ausgrid's network must be new.

33.0 RECORDKEEPING

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

Table 25 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. 2014/21250/238)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	Records management system Work Folder for Network Standards (HPRM ref. 2014/21250/238)	Unlimited

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

34.0 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.

35.0 DOCUMENT CONTROL

Content Coordinator : Mains Engineering Manager

Distribution Coordinator : Manager Asset Standards